A Different Application for Productivity Measures, or Has the Difficulty of Measuring Physician Productivity Caused the Federal Deficit to be Understated?

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Those interested in measuring economy-wide productivity often have an overall welfare context in mind, and those interested in measuring productivity in particular industries may have issues around technological change in mind. A rather unusual context for productivity measures is the Medicare administered pricing system.

Background

In FY1984 P.L. 98-21 authorized Medicare to implement what became known as the Prospective Payment System (PPS) to reimburse hospitals for inpatient stays. Prior to 1984 Medicare had paid hospitals a percentage share of the hospital's total patient care costs equal to the Medicare share of inpatient days. The PPS was a higher powered contract that reimbursed hospitals a lump sum per stay, with the lump sum amount varying by diagnosis and to some degree with the procedure performed.[1]

To oversee this administered price system on its behalf, Congress authorized the creation of an ongoing commission, the Prospective Payment Assessment Commission (ProPAC), that would annually recommend to the Congress how much the lump sum(s) should be increased, or "updated." Section 1886(e)2 of P.L. 98-21 instructed the ProPAC, in making its update recommendation, to "take into account changes in the hospital market basket [an input price index], *hospital productivity*, technological and scientific advances, the quality of health care provided in hospitals (including the quality and skill level of professional nursing required to maintain quality care) and long-term cost effectiveness in the provision of inpatient hospital services." (emphasis added).

This instruction proved difficult to implement. Each year the ProPAC duly estimated the components enumerated in the above paragraph, including productivity, but only the estimate of the hospital market basket component was data driven, while the remaining items were left to the judgment of the Commissioners.

In 1997 the Congress merged the ProPAC with its sister commission for physician payment, the Physician Payment Review Commission, to form the Medicare Payment Advisory Commission or MedPAC. MedPAC retained the responsibility for making annual update recommendations to the Congress. In 2002 the Commission formally abandoned the above framework for updating Medicare hospital payments and instead each year made two determinations as a predicate for its update recommendation to the Congress: Was current spending at a level adequate for an efficiently run hospital to provide care at the desired standard of quality? And what increase would be needed in the succeeding year to maintain quality at the desired standard? Thus, productivity was not singled out as a specific factor to be accounted for in the recommendation. The Congress continues to take the MedPAC update recommendation, along with the recommendation from the Administration, and legislate a payment rate for the following year. Medicare spending on hospitals is not

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[1] There were a small percentage of outlier cases that continued to be reimbursed an additional amount for additional services. See (McClellan, 1997)

small change; it is projected to be $199 billion in CY2007, about three-quarters of which is for inpatient services.[2]

As with hospital services, Medicare also operates an administered price system for physician services. Though a lesser amount than hospital services, CBO estimates payment for physician services will be $63 billion in FY2007, nearly half a percent of GDP.[3] Unlike hospital services, for which Congress sets a unit price based on the MedPAC and administration recommendations, unit prices (or fees) for physician services are given by an explicit formula. The exact formula is complicated because of lags, but its intent is to set fees so as to achieve a fixed amount of total spending on physician services on an annual basis.[4] The formula that determines fees and thus the intended growth overall spending accounts for input prices, real GDP growth, the change in the number of beneficiaries, and the cost of any changes in benefits or other regulations, for example adding coverage of mammograms.

Importantly for our story, the formula deducts private, non-farm business multifactor productivity from the estimated change in the input price index on the grounds that not to do so would double count physician productivity gains and thus pay physicians more than intended. The logic is that the input price index, as a measure of factor prices, over the long run rises at roughly the rate of economy-wide productivity, but that the services physicians bill to CMS such as office visits or surgical operations also rise as physician productivity in producing them rises. Hence, if there were no productivity deduction, it would be double counted.[5] This formula has been in place since 1998, although an analogous formula has been in place since 1992.

Which Measure of Productivity?

Assuming economy-wide and physician productivity differ, one can ask conceptually which measure is intended to be netted out from physician payments. We think one's view on this question turns on whether the deduction is meant to be an adjustment to an input price (physician wages) or to an (intermediate) output price (i.e., the service that Medicare pays for such as an office visit).

If the adjustment is assumed to be to an input price and if one is trying to emulate the outcome of a competitive economy, which we assume is what Medicare is trying to do, one would conceptually want to net out a measure of the growth in physician productivity in producing services, assuming one could measure that. But one would want to use economy-wide labor productivity weighted by the labor share and not

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[2] http://www.cms.hhs.gov/NationalHealthExpendData/downloads/proj2005.pdf, accessed November 6, 2006. (Medicare Payment Advisory Commission, 2006)

[3] http://www.cbo.gov/budget/factsheets/2006b/medicare.pdf, accessed November 3, 2006.

[4] See http://www.cms.hhs.gov/SustainableGRatesConFact/Downloads/sgr2007p.pdf, accessed November 3, 2006 for the details of the formula.

[5] Because real GDP growth also rises at the rate of multifactor productivity, the formula actually triple counts productivity, but because of a legislated floor on how much payments can fall in any one year, real GDP growth is irrelevant to current updates, though it is potentially relevant to future updates since the difference between the formula's result and the legislated floor is carried forward.

economy-wide multifactor productivity, because in a competitive economy, wages rise at that rate.

Because Medicare is actually paying for an (intermediate) output, however, it seems to us that the adjustment is better treated as an adjustment to an output price rather than to an input price. In a competitive economy the percentage change in output price, d(output price)/output price, equals:

(1) d(output price)/output price = d(unit cost)/unit cost - d(productivity)/productivity,

where d(unit cost)/(unit cost) is the change in an input price index for the unit cost of the product, and d(productivity)/productivity is the change in multifactor productivity for the product.

The current physician input price index can be construed as an approximation to the d(unit cost)/(unit cost) term. The index is a mixture of a sector-specific input price index for inputs used by physicians other than their own time and economy-wide wages for physician time inputs. Thus, the approximation is assuming the economy-wide wage index measures the cost of the physician input.

Because we have historically not had a sufficiently precise physician-specific measure of productivity, the actual productivity adjustment, d(productivity)/(productivity), is measured as private, non-farm business multifactor productivity over a ten year period. The obvious question is how good that approximation is to a physician-specific measure?

Biases in the Measurement of Physician Productivity

Unfortunately it is exceedingly difficult to measure physician productivity. Two recent efforts to measure physician productivity strongly suggest difficulties (Triplett and Bosworth, 2004; Ho and Jorgenson, 2006).[6] Both estimated physician productivity to be negative, which, as Ho and Jorgenson say, is logically possible but suspicious.

Why is measurement so difficult? Four factors complicate any physician-specific productivity measurement and likely serve to bias measured productivity down. The first is adjusting for quality change. 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), (Cutler and Berndt, 2001), (Newhouse, 2001). Adjusting for quality change in the context of the 6600 specific physician services that Medicare pays for is much harder. Consider an example of new, more costly imaging equipment that allows more accurate diagnosis. This

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[6] A recent third effort by Charles Fisher was presented at a meeting in Washington on October 18, but has not yet been published.

would in principle change the quality of a physician visit. If the price index for physician visits used in the calculation of productivity failed to account for this change in quality, it would overstate the price increase and hence understate the gain in productivity.

A second issue is the constant addition of new codes for new physician services. Over the 2000-2005 period, the number of non-duplicated codes that Medicare used rose by over 6 percent.[7] New goods in a price index pose well known measurement problems, and in practice any gain in the physician's ability to prevent or treat disease from the introduction of the new product is unmeasured. This too would mean the measured rate of productivity increase is understated.

A third problem stems directly from Medicare's use of administered prices. Productivity may change because of learning-by-doing (e.g., as surgeons become more proficient at an operation, time required may drop and clinical results may improve), but Medicare's fee for that procedure may not sufficiently decrease – often it will not decrease at all – to reflect the changed production circumstances. In particular, the method for updating relative fees for specific services (as opposed to the overall level) appears biased toward recognizing services whose prices should increase rather than decrease (Medicare Payment Advisory Commission, 2006). As a result, the standard assumption in productivity measurement that a factor is paid its marginal product is a strong assumption in this context. The failure of prices to register productivity gains means measured productivity is understated.

A fourth factor is the inability to measure hospital capital and labor that affects the productivity of physician services delivered in the hospital, such as a change in the number of nurses or the installation of cardiac catheterization capability. About a quarter of Medicare spending on physician services comes from physician services to hospitalized patients, and another 15 percent goes to patients treated in the hospital outpatient department or in the emergency room.[8] In addition to possible changes in nurse staffing, changes in the number of residents (physicians in training who do not separately bill Medicare) likely affect physician productivity. For example, during the period 1985-1997, when Medicare subsidized the hiring of residents, the number of residents rose 30 percent (Newhouse and Wilensky, 2001), while the number of days of hospital care fell 31 percent. Although the increased number of residents presumably increased physician productivity, the effect of omitting other hospital labor and capital inputs on physician productivity in the hospital obviously depends on whether those inputs are increasing or decreasing.

A second effect of omitting hospital inputs arises because the site of many services has been shifting to the outpatient sector. For example, surgical procedures

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[7] Frederick Ensor, Centers for Medicare and Medicaid Services, private communication, December 15, 2005.

[8] http://www.cms.hhs.gov/MedicareMedicaidStatSupp/LT/itemdetail.asp?filterType=none&filterByDID=-99&sortByDID=1&sortOrder=ascending&itemID=CMS060372, Table 58, accessed November 8, 2006. The data are from 2002. I am indebted to Kevin Hayes of the MedPAC staff for alerting me to this source.

that used to require a several day stay in the hospital to recover now are done in a minimally invasive fashion on an outpatient basis. Ulcers, which used to be treated surgically, are now treated with antibiotics on an outpatient basis. The fall in the number of days of hospital care cited in the previous paragraph reflects the magnitude of that shift. As a result, the influence of unmeasured hospital capital and labor inputs has probably been declining. This would have biased up measured productivity.

Except for the ambiguity with respect to unmeasured hospital inputs, the remaining factors all bias down estimates of physician productivity. For that reason it is not surprising that both the Ho-Jorgenson and Triplett-Bosworth measures cited above arrived at a negative estimate of physician productivity.

Before leaving this issue, we note that CMS uses an aggregate input price index that applies to all physicians, whereas changes in unit costs and productivity almost certainly vary across specialties. As a result, the actual formula is almost certainly non-neutral across specialties. The changes in unit costs and productivity also may vary across local markets as well, but Medicare has also traditionally ignored that variation.

Lacking a reliable measure of physician-specific productivity, one might have more confidence in the formula's use of an economy-wide measure if most industries clustered around the average, but unfortunately this is not the case in manufacturing. The last row of Table 1 shows a considerable variance in multifactor productivity across manufacturing sectors measured for approximately ten year periods. (Triplett and Bosworth, 2004) found a similar result within the service sector.

So What?

In recent years the formula for updates to physician fees in the law appears to have fallen into disuse. Since 2002 it has produced the result that the unit prices Medicare pays physicians should fall a little over 4 percent annually. In 2002 the Congress did let physician fees fall by the amount indicated by the formula, but in every year since then the Congress, fearing physician response to cuts in fees would impede beneficiary access to care, has overridden the formula and either raised fees a small amount (2003-2005) or kept them constant in nominal terms (2006). Because the law requires that such overrides be carried forward and accounted for in future updates, the cumulative amount of the difference between what the formula indicated and the actual updates is now 28 percent.[9] In other words, under current law Medicare physician fees should be 28 percent lower than they are.

One reason why the formula is spewing out negative updates could be errors in the measurement of productivity. If the economy-wide productivity measure was

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[9] http://www.cms.hhs.gov/SustainableGRatesConFact/Downloads/sgr2007p.pdf, accessed November 3, 2006.

overstated by one percentage point annually relative to a true physician-specific measure, that would cumulate over a decade to a little more than a 10 percent error, or a $6+ billion underpayment annually. A probably larger quantitative cause of the 28 percent value is beneficial innovations in medicine that add expense but that Congress wishes to make available to beneficiaries. The formula effectively assumes the resulting costs rise at the rate of real GDP, but long-run rates of increase in health care spending have exceeded the growth of GDP in all developed countries, a phenomenon generally ascribed to welfare increasing technological change in medicine (Newhouse, 1992; Fuchs, 1996; Cutler, 2004).

Even if some of cuts in physician fees indicated by the current formula are attributable to an excessive deduction for productivity (i.e., if physician productivity is less than economy-wide productivity), it seems unlikely to us that we will have an estimate of physician productivity that is serviceable enough to be used in the formula anytime soon. In the meantime current formula is in trouble because no one believes that Medicare physician fees could be cut 28 percent without large numbers of physicians becoming unwilling to see Medicare beneficiaries, a politically impossible situation. The 4+ percent per year cuts, however, are part of the federal baseline budget because that budget reflects current law; hence, jettisoning the formula effectively adds to the federal deficit in a non-trivial way.

As pointed out above, most current work by economists on medical productivity focuses on medical care as a whole, not specific intermediate inputs such as physician services. It is easier to handle the many of the measurement problems in that context, but adopting such an approach in the Medicare payment context would require that Medicare pay some entity by the disease or episode. In fact, Medicare pays health plans in something approximating that fashion, but health plans enroll fewer than 20 percent of Medicare beneficiaries. In traditional Medicare, which enrolls the remainder of the beneficiaries, such an approach is not feasible politically because of the autonomy of physicians. That is, physicians have always insisted that they be paid independently of other inputs; more generally, none of the providers of intermediate inputs wants to be a subcontractor to a supplier of another intermediate input.

In sum, the fees that Medicare pays physicians depend in part on a measure of productivity. In lieu of a serviceable measure of physician-specific productivity, Medicare uses a measure of private, non-farm business multifactor productivity. Perhaps in part because productivity of physicians may increase less than economy-wide productivity, the increases in Medicare physician fees assumed in the federal baseline budget appear too low. In other words, the inability to measure physician productivity may have contributed to what is widely perceived to be an understatement of future Medicare spending on physician services and hence an understatement of the likely budget deficit.

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Table 1

Annual Growth Rates in Multifactor Productivity, by Manufacturing Industry

	AVERAGE GROWTH RATES IN MULTIFACTOR PRODUCTIVITY (% CHANGE AT A COMPOUND ANNUAL RATE)			
	1962-72	1970-80	1980-90	1989-99
Manufacturing Sector				
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 & 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 & allied products	2.4	-1.1	1.6	0.3
Petroleum refining	0.7	-0.3	0.1	0.4
Rubber & miscellaneous products	1.0	-0.4	1.6	1.2
Leather & 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 & 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 & commercial machinery	1.0	1.0	3.5	4.4
Electronic & other electrical equipment	2.8	1.8	3.3	6.4
Transportation equipment	1.3	0.0	0.7	0.6
Instruments	1.7	1.3	1.6	0.7
Miscellaneous manufacturing	1.7	-1.1	2.1	0.0
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**