

Measuring productivity for the US health sector¹

Ana Aizcorbe
Bureau of Economic Analysis
May 26, 2013

U.S. health care expenditures as a share of gross domestic product (GDP) reached 17.9 percent in 2011. That share will continue to grow significantly, according to recent studies by the Congressional Budget Office. This trend has raised questions about the sources of this growth, whether the spending is worth it, and whether we can afford it.

Data in the National Accounts can help improve our understanding of the sources of cost growth. BEA's accounts currently focus on separately measuring the output of each type of provider (e.g., physicians, hospitals, outpatient facilities, pharmaceutical manufacturers and distributors, etc.). However, both academics and policy makers have advocated for more detailed statistics on health-care expenditures centered around the ultimate goal: disease treatment. Restating the commodity in these terms would provide relevant information on the sources of cost growth by answering questions like, "What medical conditions are driving medical care costs?"

It also represents the first step in addressing questions about the benefits of the spending; as national statistics develop, focusing on spending by disease rather than by service is an essential step for connecting spending with associated health outcomes and improving our understanding of productivity in the health sector.

Changing how one defines the service provided to patients and properly accounting for improvements in health outcomes will almost surely increase measured real GDP growth. That will, in turn, translate into faster measured productivity growth in the economy. Incorporating these changes into the spending side of the National Accounts is relatively straightforward once the new deflator is in hand: one simply redefines the good and applies the new deflator.

However, the faster-measured real GDP growth must be reflected in the industry accounts as well. Incorporating those changes will require that one take a stand on which industry (or industries) should be credited with the productivity gains currently not shown in the industry accounts.

This paper provides a formal statement of the problem and discusses alternative strategies one might take to ensure that measured real GDP growth as measured in the spending side of the NIPAs equals that measured using the industry accounts.

¹ Colleagues at the BEA provided helpful comments, especially Tina Highfill, Kyle Brown, Andy Schmidt, Anne Hall and Abe Dunn.

1. Introduction

Health care expenditures as a share of gross domestic product (GDP) reached 17.9 percent in 2011.² That share will continue to grow significantly, according to recent studies by the Congressional Budget Office. This trend has raised questions about the sources of this growth, whether the spending is worth it, and whether we can afford it.³ Economists need answers to these questions in order to formulate policies that allow for society's efficient consumption of health care as well as for the improvement of the nation's overall health status.

Data in the National Accounts can help improve our understanding of the sources of cost growth. The accounts provided by the Bureau of Economic Analysis (BEA) currently focus on separately measuring the output of each type of provider (e.g., physicians, hospitals, outpatient facilities, pharmaceutical manufacturers and distributors, etc.). Thus, one can parse out the spending growth into these categories. Moreover, using existing deflators, one can also answer fundamental questions about how much of the growth is from higher prices versus higher quantities.

However, both academics and policy makers have advocated for more detailed statistics on health care expenditures centered around the ultimate goal: disease treatment. Restating the commodity in these terms would provide relevant information on the sources of cost growth by answering questions like "What medical conditions are driving medical care costs?"⁴ It also represents the first step in addressing questions about the benefits of the spending; as national statistics develop, focusing on spending by disease rather than by service is an essential step for connecting spending with associated health outcomes and improving our understanding of productivity in the health sector. This is the preferred way to define the output of this industry and is advocated by health economists and public health experts. Indeed, a recent panel of the National Academies urged statistical agencies to begin thinking in this way (National Research Council (2010)).

Thus, an important aspect of developing a health care satellite account involves a change in the definition of the final good(s) provided by the health sector from the individual treatments to the provision of "medical care." Using the latter definition, the BEA satellite account will use

² Estimate from the Centers for Medicare and Medicaid Services (CMS).

³ See Chernew and Newhouse (2012).

⁴ See Roehrig and Rousseau (2011) for a recent study that does this.

disease-based price indexes to deflate consumer spending on medical care and thus potentially change the growth rate of real gross domestic product (GDP).

This paper discusses how BEA’s accounts might be modified to accommodate this new definition. The delivery of medical care generally requires the coordinated provision of goods and services by several providers. BEA’s accounts have traditionally focused on separately measuring the output of each type of provider (e.g., physicians, hospitals, outpatient facilities, pharmaceutical manufacturers and distributors, etc.). Consequently, the accounts do not directly measure the improvements that are possible through substituting or more efficiently combining the various modes of service. We suggest a modified framework in which a physician orchestrates and manages patients’ medical care by making diagnoses and pointing the patient to other providers for procedures, lab work, and the like. The services provided by these other providers would be viewed as intermediate goods and services in the provision of the final output, medical care. The advantage of adopting this view of the health sector is that it provides a natural way to accommodate the new definition of the “good” through standard double-deflation methods. An important side benefit is that the new structure provides a role for both disease-based price indexes—to deflate nominal spending—and the Bureau of Labor Statistics’ Producer Price Indexes (PPIs)—to deflate the intermediate goods.⁵

The paper is organized as follows. We trace through how this redefinition changes the presentation of medical care spending in the National Income and Product Accounts (section 2) and the attendant price indexes (section 3). We then turn to the Industry Accounts and propose a new structure that accommodates this redefinition (section 4) and provide a numerical illustration of how applying this new structure changes measures of gross output, intermediate inputs, and value added (section 5). We close with a discussion of the implications for multifactor productivity measurement.

2 Redefining the commodity in the National Income and Product Accounts (NIPAs)

The notion behind this redefinition is that the commodity provided to patients is the entire bundle of treatments required to treat a medical condition. That bundle of “treatments” is the final service and the components of the treatments (e.g., prescription drugs, hospital

⁵ Aizcorbe and Nestoriak (2007) used this framework to interpret differences in disease-based and treatment-based price indexes.

confinements) are intermediate goods and services. For the NIPAs, this means that only the final commodities would be listed in the spending side of the accounts. So, for example, prescription drugs would no longer be listed as a separate good in the NIPAs. Instead the value of those drugs would be moved to the new category “prescribed medical care” along with the other intermediate goods used in the delivery of care. Notably, moving medical goods (like drugs and medical therapeutic equipment) to medical care means a shift in classification from (PCE/GDP) Goods to Services.

Ideally, the prescribed medical care category would be further broken out into four types of spending: prevention, screening, diagnosis, and treatment of disease. Within the treatment category, one would show spending for the treatment of infectious conditions, or spending for the treatment of neoplasms, etc., rather than breaking out the treatments separately. For example, specific treatments provided in the treatment of cancer will be classified as household consumption expenditures for the treatment of cancer, rather than splintering out the individual services into existing commodities: spending on surgeries which are currently shown in “Hospital Services,” spending on prescription drugs which are currently shown in “Prescription Drugs,” and so on.

Table 1 shows growth rates for nominal spending on medical care over 2001-2005 under the current and proposed presentations.⁶ The current presentation of medical care spending provides information on spending by provider, or by the industry that provided the good or services. In contrast, the new presentation provides information on how the spending was used: to treat cancer or infectious conditions, for example. This restatement does not change the totals for nominal spending—the spending is just allocated to different categories—so the growth rates for nominal spending are unchanged.

⁶ Aizcorbe, Liebman, Cutler and Rosen (2012) provide a more comprehensive treatment of this restatement and a fuller explanation of the underlying methods.

Table 1. Old vs. New Presentations of Growth in Nominal Spending, 2001-2005

Growth in Nominal Spending (2001-2005)		
Old Method		New Method
Revenues by Industry		Medical Core Spending for the Treatment of:
Prescription Drugs	12.10%	1 Infectious and Parasitic Diseases 15.00%
Physician Services	10.00%	2 Neoplasms 11.80%
Hospital Services		3 Endocrine, Nutritional and Metabolic Diseases, and Immunity Disorders 11.60%
Inpatient	8.40%	4 Diseases of the Blood and Blood-Forming Organs 28.30%
Outpatient	9.10%	5 Mental Disorders 10.70%
Emergency Room	7.30%	6 Diseases of the Nervous System and Sense Organs 11.80%
		7 Diseases of the Circulatory System 5.30%
		8 Diseases of the Respiratory System 4.50%
		9 Diseases of the Digestive System 11.10%
		10 Diseases of the Genitourinary System 15.80%
		11 Complications of Pregnancy, Childbirth, and the Puerperium 7.60%
		12 Diseases of the Skin and Subcutaneous Tissue 9.30%
		13 Diseases of the Musculoskeletal System and Connective Tissue 9.80%
		14 Congenital Anomalies and Certain Conditions Originating in the Perinatal Period 22.70%
		15 Certain Conditions Originating in the Perinatal Period 18.90%
		16 Symptoms, Signs, and Ill-Defined Conditions 10.80%
		17 Injury and Poisoning I 8.60%
		18 Supplementary Classifications--E Codes 5.70%
	9.70%	9.70%

3. Implication for Price Deflators used in the NIPAs

Redefining the commodity provided by the health sector as the treatment of disease does change how one constructs the price deflators that one would use to obtain real spending in the NIPAs.

Health economists think of the output as the treatment of an episode of care. For acute conditions, like an ear infection, the episode might last a week or so and the treatment might involve a visit to the doctor and a prescription for antibiotics. In this case, the “good,” or output, is the treatment of the ear infection. And the price is the cost of all treatments—including both the doctor’s visit and the antibiotics. Overall, there will be as many prices as there are different types of episodes (i.e., different diseases). And, the price index will be a weighted average of the price changes of each type.

This notion is very different from how the BLS currently constructs its price indexes for medical care.⁷ For physician services, for example, the BLS chooses a representative encounter (an office visit) where a patient was treated for some condition using particular procedures. It then obtains prices for identical encounters to see how the price of an office visit like this

⁷ A full description of how the CPI measures medical care price movement can be found in “Consumer Price Index: Measuring Price Change for Medical Care in the CPI”, www.bls.gov/cpi/cpifact4.htm.

changes over time. This strategy essentially prices a bundle of procedures (a fixed basket) provided by a particular type of provider (office visits). It will provide a distorted view of what is happening to the cost of treating the condition if the bundle of procedures used to treat this condition changes over time. Moreover, to the extent that similar procedures are provided by other industries (e.g., hospitals), the BLS prices those services separately and, therefore, will not account for any declines in the cost of services that might occur when treatments shift from higher-cost to lower-cost industries (surgeries in hospitals moving to surgeries in ambulatory surgical centers, for example).

How does this differ from the notion of pricing an episode of care? The episode of care includes any treatment, regardless of who provided it, that was used to treat the condition. A National Academies Panel coined the phrase “Medical Care Expenditures Price Index” (MCE) to emphasize that all spending is included. One important difference between this and how BLS currently prices medical care has to do with shifts in where the treatment is provided—substitution of care across industry lines. There are several examples of substitution in healthcare services that have held down spending growth. Consider the treatment of depression. In recent years, there has been a shift away from talk therapy to lower cost drug therapy. Conventional price indexes that track these two treatments separately cannot account for the substitution that has occurred. As another example, knee surgery used to involve a costly overnight stay in a hospital but now is often performed on an outpatient basis, resulting in a lower cost for the treatment of the bad knee. By tracking the cost of hospital stays separately from the cost of outpatient services, standard medical care price indexes cannot capture the cost savings that arise from the change in treatments.

In the empirical literature, the importance of shifts across industries has been quantified both in case studies that were done for a number of conditions and in studies that aim to provide measures over a broader range of conditions. Existing case studies have shown that this type of substitution occurs and that it tends to lower costs or restrain increases in the price of treating certain conditions. This effect was found for several important conditions in early work—for example depression (Frank, Berndt, and Busch 1999), cataract (Shapiro, Shapiro and Wilcox, 2001), and schizophrenia (Frank, Berndt, Busch, and Lehman 2004).

More recently, studies have included a broader range of conditions and found that the new definition typically involves price indexes that show slower price growth (Aizcorbe and

Nestoriak (2012), Dunn et al. (2012) and Bradley (2013)). Bradley (2013), for example, estimates that the BLS price indexes currently used in the national accounts overstate price growth of medical care spending by about 1 percentage point per year. Applying this estimated bias to the deflators currently in the national accounts implies faster growth for real spending on medical care (2.7% vs 1.8%) and faster real GDP growth (about .1 percentage point faster growth per year).

Table 2. Effect of Changing the Deflator for Medical Care Spending

Effect of redefining the output of the medical care sector, 2001-2005 (compound annual growth rates)		
Output Definition		
	<i>Old Method</i>	<i>New Method</i>
Medical Care Sector		
Nominal spending	9.70%	9.70%
Price Deflator	7.80%	6.80%
Real spending	1.80%	2.70%
Contribution to real GDP	.36pp	.47pp

4. Proposed Changes to the Industry Accounts

The industry accounts also imply a growth rate for real GDP growth that should be consistent with the growth rate implied by the spending side of the accounts. While the new presentation in the NIPAs implies a 2.7% growth rate for real spending on medical care, the corresponding growth rate from the industry accounts is 1.8%, about .1 percentage point lower.⁸

The numerical problem, then, is that the two growth rates should, in principle, be equal. Conceptually, the issue is that the new method implies that productivity growth for the sector is faster than what is currently shown in the industry accounts (table 3). The current structure is illustrated in figure 1, where the goods and services purchased by consumers (services from

⁸ Of course, it is not this simple. Not all of the spending recorded in PCE is produced by the industries we have listed above and not all of the production reported in the industry accounts is purchased by consumers (PCE). We ignore this complication in order to provide a simple illustration of the problem.

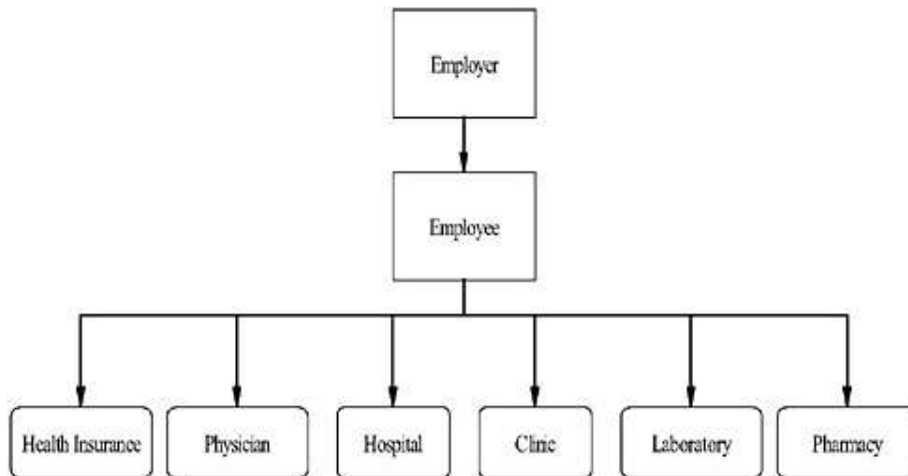
Table 3. Comparison of New Presentation of Medical Care Spending in the NIPAs and Old Presentation of Medical Care Industries in the Industry Accounts

Spending side of the accounts		Production Side of the accounts	
Growth in Real Spending, 2001-2005			
Medical Care Spending for the Treatment of:		Revenues by Industry	
1 Infectious and Parasitic Diseases	-0.2%	Prescription Drugs	3.6%
2 Neoplasms	0.4%	Physician Services	3.9%
3 Endocrine, Nutritional and Metabolic Diseases, and Immunity Disorders	5.3%	Hospital Services	
4 Diseases of the Blood and Blood-Forming Organs	-1.8%	Inpatient	-0.1%
5 Mental Disorders	6.5%	Outpatient	-1.8%
6 Diseases of the Nervous System and Sense Organs	-0.1%	Emergency Room	1.1%
7 Diseases of the Circulatory System	4.9%		
8 Diseases of the Respiratory System	0.2%		
9 Diseases of the Digestive System	3.5%		
10 Diseases of the Genitourinary System	0.2%		
11 Complications of Pregnancy, Childbirth, and the Puerperium	0.2%		
12 Diseases of the Skin and Subcutaneous Tissue	-1.3%		
13 Diseases of the Musculoskeletal System and Connective Tissue	2.6%		
14 Congenital Anomalies and Certain Conditions Originating in the Perinatal Period	3.2%		
15 Certain Conditions Originating in the Perinatal Period	0.9%		
16 Symptoms, Signs, and Ill-Defined Conditions	0.2%		
17 Injury and Poisoning I	0.6%		
18 Other	0.7%		
	2.7%		1.8%

physicians, hospitals, etc.) are defined as the final commodities, which are provided by a corresponding industry in the industry accounts.

To have a comprehensive accounting of these productivity gains, the gains must be attributed to one or more of the provider industries. One simple possibility would be to allocate the productivity gains across industries, assuming that they all contribute proportionally to the gains. However, we note that physicians may play an especially important role, since they tend to serve as managers and decision-makers in combining the goods and services of various providers in producing medical care. For example, physicians tend to make decisions about what lab tests to run, when hospital services are needed, and so forth. That suggests another approach that BEA is currently investigating, the possibility of rerouting existing health care transactions through the physician services industry, whose output can then be classified by products defined along lines of type of disease.

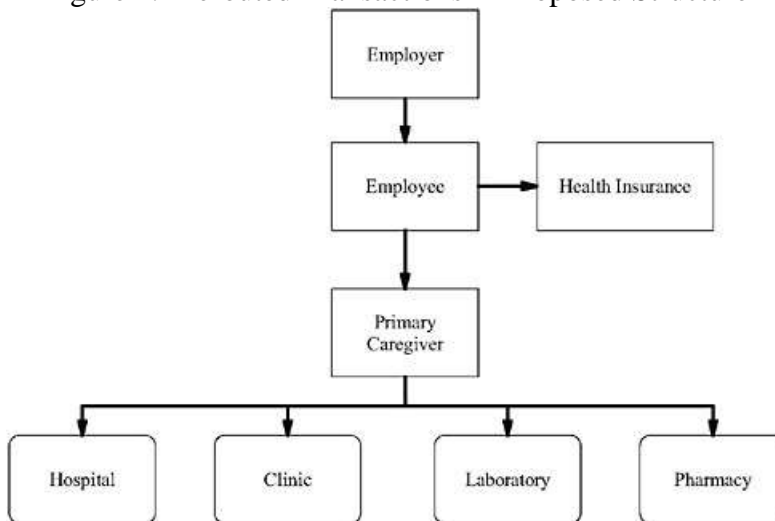
Figure 1. Current Structure of Medical Care Spending in the National Accounts



Consider an example in which the management services are provided by a primary caregiver. (Depending on the type of care, the manager/decision maker may be a physician specialist or a non-physician medical professional.) Comparing with Figure 1, there is a rerouting of transactions to create a primary caregiver who then treats each of the other types of providers as an intermediate input to the caregiver's production. The notion underlying this modification to the existing framework is that patients have a primary caregiver who acts as a manager in orchestrating patients' medical care. This is the type of organization used, for example, by health maintenance organizations, which consolidate all types of services so that customers transact with a single organization with respect to copayments or other billing. In many cases, it seems reasonable to think of other providers as performing an intermediate role to the primary caregiver. For example, for lab work associated with a routine office visit, the patient probably has no direct interactions with the lab and probably does not know the identity of the lab until the bill arrives; it seems a bit anachronistic that the billing is done separately, rather than being charged through the physician who ordered the lab work. For other types of providers, the patient may exercise more discretion—for example, the patient may choose a pharmacy based on price or convenience, but the physician controls what drug is prescribed. Similarly, a physician may or may not offer a patient a choice of hospitals when an inpatient stay is required. These examples suggest that the relationship between the primary caregiver and other providers may have

important similarities to the typical general relationship between a producer and the providers of intermediate inputs. Figure 2 illustrates the rerouting that may be used in this case.

Figure 2. Rerouted Transactions in Proposed Structure



Within BEA’s industry accounts, the modified framework would introduce a new, primary caregiver industry that would subsume the existing industry, “offices of physicians.” The output of this new industry would include the value of the intermediate inputs purchased from the individual health-care-providing industries and the value added of offices of physicians. The output of the consolidated health care industry would then be deflated using disease-based price indexes, while its intermediate inputs would be deflated using PPIs. Real value added—computed using the double-deflation method as the difference between real output and real intermediate inputs—would reflect this new industry’s contribution to real GDP, including industry productivity gains. One can think of a health care system that facilitates the diffusion of new goods by providing information on new treatments. When these efforts successfully prompt the primary caregiver to prescribe different, lower cost treatments, this is reflected in the real value added of the consolidated health care industry.

5. Numerical Illustration

Rerouting Transactions Table 4 illustrates how transactions for the industry “Offices of Physicians” could be rerouted to accommodate the new structure in Figure 2. Under the current

treatment, gross output of “offices of physicians” is \$263b in 2002. In the proposed treatment, \$786b of the output of the following industries is added to the gross output of Offices of Physicians: Prescription drugs, home health, medical labs, other professional medical services and hospitals. The \$786b includes only the portion of output for these industries that represents medical treatment. So, for example, it excludes the estimated value of services by cafeterias and parking attendants at hospitals.

As seen in the middle panel, intermediate inputs for offices of physicians also increase by \$786b, accounting for the fact that these medical services were provided by other industries. Nominal value added under this treatment (last panel) remains unchanged because the capital and labor services directly employed by the office of physicians industry remains the same.

We note that the increase in gross output and intermediate inputs for offices of physicians is substantial, more than triple the current presentation for gross output, for example. The large share of intermediate inputs in gross output is similar to what is seen in industries that primarily play the role of assemblers (e.g., motor vehicles).

Table 4: Nominal Gross Output, Intermediate Inputs, and Value Added by Industry, 2002
Selected Health Industries, Current vs. New Structure (\$millions)

Industry Code	Industry Description	Gross Output			Intermediate Inputs			Value Added		
		Current	Alternate	Difference	Current	Alternate	Difference	Current	Alternate	Difference
62	Health care and social assistance	1,140,378	1,927,367	786,989	449,435	1,236,424	786,989	690,943	690,943	0
621	Ambulatory health care services	524,779	1,311,768	786,989	189,508	976,497	786,989	335,271	335,271	0
621110	Offices of Physicians	263,588	1,050,577	786,989	85,648	872,636	786,989	177,940	177,940	0
621Other	Ambulator health care services excluding offices of physicians	261,191	261,191	0	103,860	103,860	0	157,330	157,330	0
622HO	Hospitals and nursing and residential care facilities	516,099	516,099	0	220,031	220,031	0	296,068	296,068	0
624	Social assistance	99,501	99,501	0	39,896	39,896	0	59,605	59,605	0

Changing the structure of the industry accounts in this way can potentially alter the aggregate price indexes and real output measures in the industry accounts. Even when using the existing price indexes for the very disaggregate industries, the composition of industries included in gross output and intermediate inputs for “offices of physicians” changes. Because the price indexes across these industries differ, changing the composition of underlying industries will, in general, change the price index associated with the top line.

Table 5 shows how these changes in the structure of the industry accounts affect the price indexes for “offices of physicians” and the resulting measures of real growth in this example. The growth rates for gross output and intermediates do change, but the resulting impact on the value added measures is minimal.

Table 5 Effect of changing the structure on the growth of GO, II, and VA for Offices of Physicians, 2002-2006 (compound annual growth rates)

	Gross output		Intermediate inputs		Value added	
	current	new structure	current	new structure	current	new structure
Growth in deflators	1.6	3.1	2.4	3.7	--	--
Growth in reals	4.3	3.5	2.0	3.2	5.4	5.3

Deflation Earlier, we explained that the way that Gross Outputs and Intermediate Goods are allocated changes as a result of redefining the good to the treatment of an episode of care. The issue now is: How should these new series be deflated?

BEA uses the double-deflation technique to produce its featured measure of real value added by industry, because it requires the fewest assumptions about the relationship between gross output by industry and intermediate inputs by industry. Real gross output by industry is computed by deflating separately each of the commodities that are produced by an industry and included in its gross output. Real intermediate inputs are derived by separately deflating the commodities that are consumed as intermediate inputs in production. The domestic and imported portions of intermediate inputs are deflated separately to account for the commodities that are purchased as inputs from domestic and from foreign sources. Real value added by industry is computed as the difference within a Fisher index number framework. Washington, Bellone, Jacobson, and Lee (2012) provide the most up-to-date source data currently used to generate price-adjusted statistics in the Industry Economic Accounts. Moyer, Planting, Fahim-Nader, and Lum (2004) include a technical note that details the computation of the chain-type price and quantity indexes for gross output, intermediate inputs, and value added by industry.

In the proposed framework for the health sector, price deflators for the intermediate goods would remain the usual PPIs. It's as if doctors were purchasing these materials and services in order to provide the patient with the final good. Studying the productivity of the

pharmaceutical industry, for example, would focus on the goods produced by that industry, not on all goods and services provided in an episode of care.

The price indexes for Offices of Physicians would change. The new Gross Output aggregate includes the value of all the goods and services used to treat medical conditions. The appropriate deflator for this output would be the price indexes that use the treatment of disease as the final service provided to patients (the indexes that were used in the spending side of the accounts).

Applying the Bradley-adjusted deflator for medical care spending to the new Offices of Physicians industry decreases the measured growth of gross output price index by 1 percentage point (2.1 vs. 3.1) and increases that of real output by 1 percentage point (4.5 vs. 3.5). Because the growth rates for intermediate inputs are unchanged, the increase in the measured growth of real output would imply an increase in the measured growth of real value added.

Table 6. Alternative Measures of Growth in Gross Output, Intermediate Inputs, and Value Added for Offices of Physicians
(compound annual growth rates)

	Gross output		Intermediate inputs		Value added	
	new structure	Bradley (2013)	new structure	Bradley (2013)	new structure	Bradley (2013)
Growth in deflators	3.1	2.1	3.7	3.7	--	--
Growth in reals	3.5	4.5	3.2	3.2	5.3	10.9

That implied increase in the growth of real value added is not one-to-one with the increase in real gross output: the 1-percentage-point increase in real gross output of Offices of Physicians doubles the measured growth of real value added (10.9 vs. 5.3). Numerically, for industries where value added is a relatively small share of gross output (as in auto assembly), small changes in real gross output can generate large changes in value added (OECD 2001). The change in gross output is calculated on a large denominator whereas the change for value added is the same change but divided by a much smaller denominator. Thus, the percent changes can be very different.

Applying the new deflator to Offices of Physicians raises measured real GDP growth to a level consistent with that in the spending side (table 7). Measured growth of real value added is 5.5 percentage points faster for the Offices of Physicians industry, which raises the growth rates

for all the aggregates that include that industry. Ultimately, real GDP growth is .1 percentage point faster, consistent with the increase in measured real GDP growth seen in the NIPAs.

Table 7. Changes to the Growth in Real Value Added (compound annual growth rates)

All industries	0.1%
Private industries	0.1%
Educational services, health care, and social assistance	1.2%
Health care and social assistance	1.4%
Ambulatory health care services	2.9%
Offices of Physicians	5.5%
Other ambulatory health care services	--
Hospitals and nursing and residential care facilities	--
Social assistance	--
Not allocated to Health Care and Social Assistance Industry	--
Government	--
Not allocated by industry	--

Section 6. Implications for Multifactor Productivity (MFP)

Because the new structure changes measured growth of gross output, intermediate inputs and value added for Offices of Physicians, measured MFP for this industry could also potentially change. To illustrate the differences between the old and new MFP measures, we use MFP estimates that were developed by Fisher (2008). As seen in column 1 of table 8, under the old structure, MFP growth for this industry is 1.7%.

The old and new MFP measures will differ because the new measure is based on 1) rerouted transactions that affect nominal output and intermediate inputs, and 2) a new price index for output. The effects of the rerouting are seen by comparing the first two columns in table 8. Rerouting changes both the nominals and price indexes for output and intermediate inputs. In this example, measured growth of real output and intermediate inputs is lower after rerouting. This reflects changes in the underlying composition of goods.

Because the nominal value of intermediate inputs is higher after rerouting, the weight applied to intermediate inputs is higher (81.6% vs 30.6%) and those for labor and capital inputs are lower. All of these changes do little to measured MFP, which measures 1.6% after rerouting (vs 1.7% before).

Applying the new price index to measured output increases measured MFP growth by about 1 percentage point: comparing the second and third columns, measured output growth is 1 percentage point higher which translates into the same increase in MFP.

Table 8. MFP calculations for Offices of Physicians, alternative scenarios 2001-2004, compound annual growth rates

		Fisher (2008)	New Structure	
			old price indexes	new price indexes
Output	growth	6.74%	5.21%	6.25%
Labor	share	62.4%	16.5%	16.5%
	growth	2.50%	2.50%	2.50%
Capital	share	7.0%	1.9%	1.9%
	growth	3.80%	3.80%	3.80%
Intermediates	share	30.6%	81.6%	81.6%
	growth	10.55%	3.80%	3.80%
MFP		1.68%	1.63%	2.66%

7. Concluding remarks

BEA is in the beginning stages of developing a health care satellite account. As discussed in this paper, efforts are under way to identify how existing accounting frameworks can be adapted to best suit a satellite account. Efforts are also under way to develop disease-based estimates of health care spending using private insurance claims data, Centers for Medicare and Medicaid Services data on Medicare and Medicaid recipients, and data on the uninsured from the U.S. Department of Health and Human Services. In addition, BEA is developing disease-based price indexes that will be used to deflate these new nominal health expenditures.

When complete, BEA's health care satellite account will generate measures of health care spending that can be used to better track the sources of rising health care costs. In addition, BEA

is working with economists and health care experts to explore ways that these cost measures may be integrated with models of disease prevalence and health status in order to better assess the potential benefits of spending on health care.

References

- Abraham, Katharine G., and Christopher Mackie, ed. 2005. *Beyond the Market: Designing Nonmarket Accounts for the United States*. National Academies Panel on Conceptual, Measurement and Other Statistical Issues in Developing Cost-of-Living Indexes. Washington, DC: The National Academies Press for the National Research Council.
- Aizcorbe, Ana, Eli Liebman, David Cutler, and Allison Roseon "[Household Consumption Expenditures for Medical Care: An Alternate Presentation](#)", *Survey of Current Business*, June 2012.
- Aizcorbe, Ana and Nicole Nestoriak, (2011), .Changing Mix of Medical Care Services: Stylized Facts and Implications for Price Indexes., *Journal of Health Economics*, 30(3) pgs 568-574.
- Aizcorbe, Ana M., Bonnie A. Retus, and Shelly Smith. 2008. "Toward a Health Care Satellite Account." *Survey of Current Business* 88 (May): 24–30.
- Ana Aizcorbe, Ralph Bradley, Ryan Greenaway-McGrevy, Brad Herauf, Richard Kane, Eli Liebman, Sarah Pack, Lyubov Rozental (2011) *Alternative Price Indexes for Medical Care: Evidence from the MEPS survey*. Bureau of Economic Analysis working paper WP2011-01
- Berndt, Ernst, David Cutler, Richard Frank, Zvi Griliches, Joseph Newhouse, and Jack Triplett, (2000), "Medical Care Prices and Output", *Handbook of Health Economics*, Chapter 3.
- Berndt, Ernst R., Susan H. Busch, and Richard G. Frank. 2001. "Treatment Price Indexes for Acute Phase Major Depression." In *Medical Care Output and Productivity*, edited by David M. Cutler and Ernst R. Berndt, 463–505. *Studies in Income and Wealth*, vol. 62. Chicago: University of Chicago Press.
- Bradley, Ralph, Elaine Cardenas, Daniel H. Ginsburg, Lyubov Rozental, and Frankie Velez. (2010) *Producing Disease-Based Price Indexes*. *Monthly Labor Review*, 133(2):20-28.
- Bradley, Ralph (2013) "Feasible methods to estimate disease based price indexes," *Journal of Health Economics*, 32(2013) 504-514.
- Chernew, Michael E. and Joseph P. Newhouse (2012) "Health Care Spending Growth" chapter 1 in *Handbook of Health Economics*, Elsevier.
- Cutler, David M. 2004. *Your Money or Your Life: Strong Medicine for America's Health Care System*. Oxford University Press.
- Cutler, David M., Mark McClellan, Joseph E. Newhouse, and Dahlia Remler. 1998. "Are Medical Prices Declining? Evidence from Heart Attack Treatments." *Quarterly Journal of Economics* 113, no. 4, 991–1,024.
- Cutler, D.M., M. McClellan, J. Newhouse (2000) "How Does Managed Care Do It?" *RAND Journal of Economics* Vol. 31. No. 3. Autumn 2000 pp. 526-548

- Dunn, Abe, Eli Liebman, Sarah Pack, and Adam Shapiro, (2013), .Medical Care Price Indexes for Patients with Employer-Provided Insurance: Nationally- Representative Estimates from MarketScan Data., Health Services Research.
- Dunn, Abe, Eli Liebman, Adam Shapiro, and Lindsey Rittmueller, (2013), .Defining Disease Episodes and the Effects on the Components of Expenditure Growth., Bureau of Economic Analysis, mimeo.
- Dunn, Abe, Eli Liebman, and Adam Shapiro, (2012b), .Developing a Framework for Decomposing Medical-Care Expenditure Growth: Exploring Issues of Representativeness., Chapter 17 in Dale Jorgenson, Steven Landefeld, and Paul Schreyer, eds., Measuring Economic Sustainability and Progress, NBER Book Series Studies in Income and Wealth, Forthcoming
- Dunn, Abe, Eli Liebman, and Adam Shapiro, (2012a), Implications of Utilization Shifts on Medical-Care Price Measurement., Bureau of Economic Analysis, Working Paper WP-2012-9.
- Dunn, Abe, Adam Shapiro, and Eli Liebman, (2011), .Geographic Variation in Commercial Medical-Care Expenditures: A Framework for Decomposing Price and Utilization, Bureau of Economic Analysis, Working Paper WP2011-07.
- Fisher, Charles (2008) “Multifactor Productivity in Physician’s Offices: An Exploratory Analysis. Health Care Financing Review, 29(2):15-32.
- Frank, Richard G., Ernst R. Berndt, and Susan M. Busch. 1999. “Price Indexes for the Treatment of Depression.” In Measuring the Prices of Medical Treatments, ed. Jack E. Triplett, 72–102. Washington DC: The Brookings Institution.
- Frank, Richard G., Ernst R. Berndt, Susan M. Busch, and Anthony F. Lehman. 2004. “Quality-Constant Prices for the Ongoing Treatment of Schizophrenia: An Exploratory Study.” Quarterly Review of Economics and Finance 44 (July): 390–409.
- Ho, Mun S., and Dale W. Jorgenson. Forthcoming. “The National Health Accounts, the National Income and Product Accounts, and Input-Output Accounts: Constructing Accounts for Health Expenditures in the Information Age.” Health Care Financing Review.
- Mayerhauser, Nicole M. and Erich H. Strassner, “Preview of the Comprehensive Revision of the Annual Industry Accounts: Changes in Definitions, Classifications, and Statistical Methods,” Survey of Current Business 90 (March 2010): 21-34.
- Moulton, Brent, Brian Moyer and Ana Aizcorbe National Research Council. 2009. Strategies for a BEA Health Care Satellite Account: Summary of a Workshop. Christopher Mackie, Rapporteur. Steering Committee for the Workshop to Provide Guidance for Development of a Satellite Account at the Bureau of Economic Analysis. Committee on National Statistics, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

- Moyer, Brian C., Mark A. Planting, Mahnaz Fahim-Nader, and Sherlene K.S. Lum, "Preview of the Comprehensive Revision of the Annual Industry Accounts: Integrating the Annual Input-Output Accounts and the Gross Domestic Product by Industry Accounts," *Survey of Current Business* 84 (March 2004): 38-51.
- National Research Council. 2009. *Strategies for a BEA Health Care Satellite Account: Summary of a Workshop*. Christopher Mackie, Rapporteur. Steering Committee for the Workshop to Provide Guidance for Development of a Satellite Account at the Bureau of Economic Analysis. Committee on National Statistics, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.
- National Research Council. (2010) *Accounting for Health and Health Care: Approaches to Measuring the Sources and Costs of their Improvement*. Committee on National Statistics, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press
- OECD (2001) *Measuring Productivity: OECD Manual. Measurement of Aggregate and Industry-level Productivity Growth*.
- Rosen, Allison B., and David M. Cutler. 2007. "Measuring Medical Care Productivity: A Proposal for U.S. National Health Accounts." *Survey of Current Business* 87 (June): 54–58.
- Roehrig C., Miller G., Lake C., Bryant J. (February 2009) *National Health Care Spending by Medical Condition, 1996-2005*. *Health Affairs*. 28: w358-w367.
- Roehrig and Rousseau (2011) *The Growth In Cost Per Case Explains Far More Of US Health Spending Increases Than Rising Disease Prevalence*
- Schultze, Charles L., and Christopher Mackie, ed. 2002. *At What Price? Conceptualizing and Measuring Cost-of-Living and Price Indexes*. National Academies Panel on Conceptual, Measurement and Other Statistical Issues in Developing Cost-of-Living Indexes. Washington,DC: National Academy Press for the National Research Council.
- Shapiro, Irving, Matthew D. Shapiro, and David W. Wilcox. 2001. *Measuring the Value of Cataract Surgery*. In *Medical Care Output and Productivity*, ed. David M. Cutler and Ernst R. Berndt, 411–437. *Studies in Income and Wealth*, vol. 62. Chicago: University of Chicago Press.
- Song, Xue, William D. Marder, Onur Baser, Robert Houchens, Jonathan E. Conklin, and Ralph Bradley. 2004. "Can Health Care Claims Data Improve the Estimation of the Medical CPI?" Paper presented at the National Bureau of Economic Research Conference on Research in Income and Wealth, Vancouver, BC, June 28.
- Thorpe K.E., Florence C.S., Joski P. (2004) *Which Medical Conditions Account for the Rise in Health Care Spending?* *Health Affairs Web Exclusive*.
- Thorpe, Kenneth E., Curtis S. Florence, David H. Howard and Peter Joski, "The Impact of Obesity on Rising Medical Spending," *Health Affairs* (October 20, 2004), p. W4-483.

Washington, Patricia A., Jeff M. Bellone, Anna M. Jacobson, and Jennifer Lee, "Annual Industry Accounts: Revised Statistics for 2009-2011," Survey of Current Business 92 (December 2012): 14-36.

Appendix:

REROUTING OF HEALTH CARE TRANSACTIONS IN BEA'S ACCOUNTS

The financing of health care, whether by private health insurance or government social insurance funds, involves complicated transactions. The standard presentation of BEA's core accounts already involves *rerouting* transactions—that is, recording transactions as taking place through channels different from the ones through which they actually occur—to identify the economic purpose of these transactions⁹.² As part of developing a health care satellite account, some different forms of rerouting are likely to be required.

Some of the actual transactions for health care provided through an employer-provided traditional health insurance plan are shown in [Figure C.1](#). Typically, both the employer and the employee pay premiums into the plan. The employee and his or her family then obtain goods or services from various health care providers. The health plan pays an agreed-upon portion of the cost to the provider, and the employee also pays copayments and deductibles.

BEA's accounts, in contrast, show the entire employer contribution as part of labor cost (compensation of employees) for the firm and as part of personal income for the employee ([Figure C.2](#)). All of the purchases of health care are shown as purchases by households, representing the ultimate consumer of the health care goods and services, rather than as shared purchases by the household and the health insurance plan. In the economic accounts, the principal role of the health insurance plan is as a provider of health insurance services, an imputed transaction equal in value to the difference between premiums and expected benefits, which is treated as a service purchased by the covered employees.

A similar rerouting of transactions is associated with Medicare Part A (hospital insurance). (Other types of health care funding, such as Medicare Parts B,

⁹ See Commission of the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, and the World Bank (1993, paragraphs 3.24-3.27).

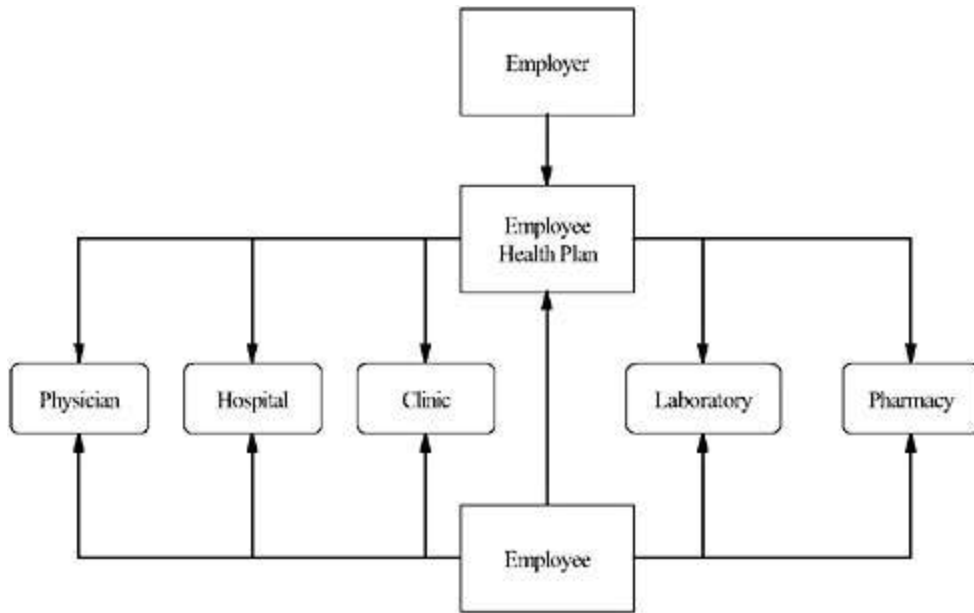


FIGURE C.1 Funding of health care, employer-provided health insurance.

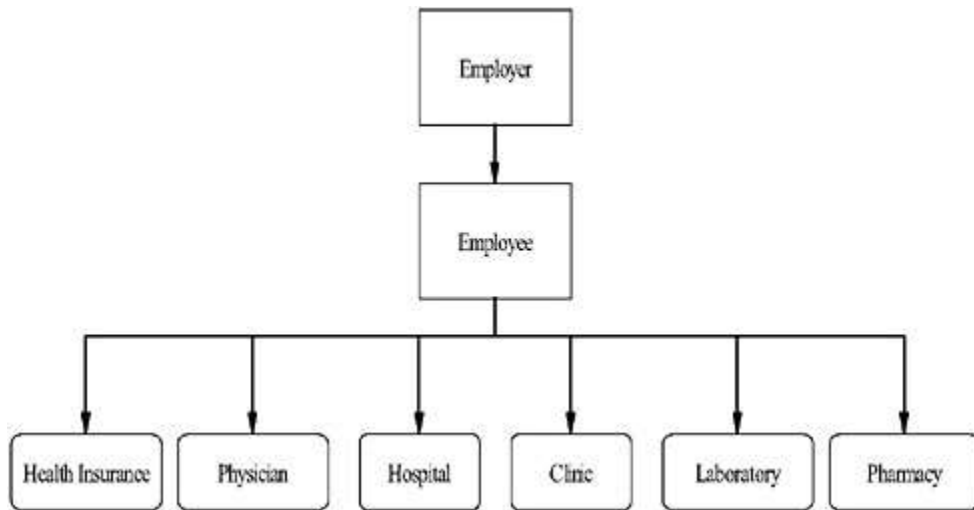


FIGURE C.2 Private employer-provided health insurance after rerouting.

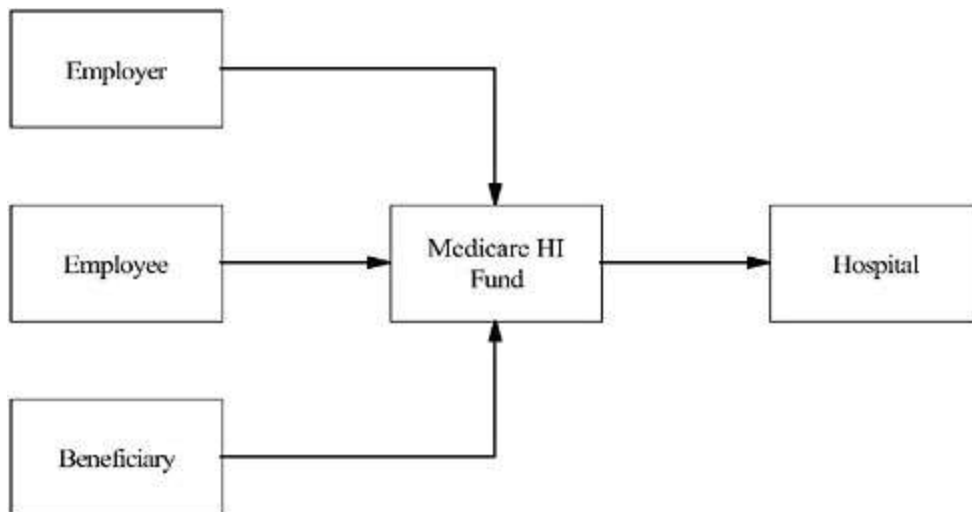


FIGURE C.3 Funding of Medicare Part A (hospitalization insurance).

C, and D and Medicaid, exhibit similar rerouting of transactions.) As shown in [Figure C.3](#), the Medicare hospital insurance fund is financed largely through employer and employee contributions (payroll taxes). Note that in contrast to the last example, in most cases the employee is not a current beneficiary of the program and therefore is not the consumer of the health care, although the employee and employer contributions provide for future eligibility. Most beneficiaries are not required to pay premiums for Part A, but some individuals who are not otherwise eligible pay premiums to buy coverage; thus they are another source of funding for the Medicare HI (hospitalization insurance) Fund. In most cases, Medicare Part A pays for covered medical services (primarily hospital inpatient services and inpatient services in skilled nursing facilities) without requiring copayments or deductibles.

After rerouting, the Medicare Part A transactions take the form shown in [Figure C.4](#).³ The employer contributions are counted as part of the compensation of employees, so that they are included in the enterprise's labor costs. They are then shown as contributed to the Medicare fund, so that they are not included in personal income. The value of the benefits is shown as a transfer (social benefits) to persons and included in personal income. The consumption of health services by covered individuals is recorded as an imputed purchase of health services in personal consumption expenditures. The administrative costs of the Medicare program are included in government consumption expenditures.

The treatment of government-funded health care is discussed in Bureau of Economic Analysis (2005).



FIGURE C.4 Medicare Part A after rerouting.
