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Is Price Inflation Different for the Elderly? An Empirical Analysis of Prescription Drugs

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Executive Summary

Recently controversy has surrounded the issue of whether Social Security payments to the elderly should continue to be adjusted automatically according to changes in the Consumer Price Index (CPI). One issue in the public policy debate concerns whether price inflation is different for the elderly, particularly because the official Bureau of Labor Statistics price indexes for medical care have been growing more rapidly than the overall CPI, and medical care expenditures constitute a larger proportion of the elderly's budget than of the young's.

Using annual IMS data from 1990 to 1996, we examine empirically whether elderly-nonelderly price inflation differentials exist for prescription pharmaceuticals. We assess prices for prescription drugs destined for ultimate use by the elderly versus the nonelderly at three points in the distribution chain: initial sales from manufacturers, intermediate purchases by retail pharmacies, and final sales from retail pharmacies to patients or payors. We find that at the initial point in the distribution chain, no differences in price inflation exist for the aggregate of drugs destined for use by the elderly versus those for the nonelderly. At the intermediate sell-in point to pharmacy distribution, we examine antibiotics (ABs), antidepressants (ADs), and calcium channel blockers (CCBs). For ABs, since 1992 price inflation has been somewhat greater for the elderly than for the young, reflecting in part the elderly's more intensive use of newer branded products having fewer side effects, adverse drug interactions and more convenient dosing—attributes of particular importance to

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the elderly. For ADs, price inflation is considerably less for the elderly than for the young, due in large part to the elderly's greater use of older generic products. For CCBs, elderly-nonelderly differentials are negligible. None of these differentials adjust for variations in quality.

At the final retail sell-out point, we examine only ADs. We find that because retailers obtain larger gross margins on generic than on branded products, and because the elderly are disproportionately large users of generic ADs, the elderly-nonelderly price inflation differential benefiting the elderly at the intermediate point is reduced considerably at final sale.

I. Introduction

Over the next few decades, the U.S. population aged 65 and older will grow both in absolute numbers and as a share of the total population. As people age, they tend to have higher medical care expenses. Thus an increasingly elderly society can be expected to devote a greater amount of its expenditures to medical care. The implications of a graying society for future medical care expenditures depend of course on both the price and the quantity of future medical care for the elderly.

To the extent that they live on fixed incomes, the elderly are particularly vulnerable to price inflation. Moreover, medical care price increases are likely to affect the elderly differentially, because medical care is a larger share of their current budgets. Recently there has been substantial controversy concerning the continued automatic adjustment of Social Security payments to the elderly on the basis of changes in the Consumer Price Index (CPI). A panel of experts estimates that the CPI overstates true cost-of-living increases by about 1.1% per year (U.S. Senate Finance Committee 1996).

Relatively little is known about the extent to which price inflation of the basket of medical care goods and services used by the elderly differs from the price inflation of the set of medical care goods and services used by younger Americans. In this chapter, we focus on elderly-nonelderly price inflation differentials for one component of medical care, namely, prescription pharmaceuticals, from 1990 to 1996.[1]

The systems by which prescription pharmaceuticals are distributed and paid for in the United States are complex and rapidly changing.

1. For a discussion of patterns in total acute care health expenditures by patient age group from 1953 to 1987, see Cutler and Meara 1997.

We assess elderly-nonelderly price differentials at three different points in the distribution chain: (1) the initial point involving sales from manufacturers to wholesalers, retailers, and hospitals; (2) an intermediate point at which retail pharmacies acquire prescription drugs from wholesalers and manufacturers; and (3) a final point at which retail pharmacies dispense and sell prescription drugs to patients. With respect to payors, at the retail sell-out point in the distribution chain, we distinguish consumers' out-of-pocket expenditures for pharmaceuticals from those expenditures involving government funds (Medicaid and various public assistance programs) as well as from payments by private, third-party insurance sources (fee-for-service insurance plans and various forms of "medigap" and managed care).

One potential reason for elderly-nonelderly drug price inflation differentials is that the brand-generic proportions could vary by age. For treatment of acute conditions, the elderly may be more fragile, and thus prudent medical practice might suggest prescribing for them the newest generation of drugs having the fewest side effects and adverse drug interactions and the most convenient dosing. Under this hypothesis, for certain acute conditions, one might expect the elderly to use newer, branded drugs disproportionately. To the extent newer, branded drugs increase in price more rapidly than older, off-patent and generic drugs, the elderly's bundle of drugs would be expected to increase more rapidly than that of the young.

Although the same considerations would apply for treatment of chronic conditions, the surviving elderly are more likely to be using older drug products, for physicians are hesitant to change medications when a particular existing drug regimen is working well in treating a chronic condition. Because they have stickier usage patterns and have survived to old age, the elderly would therefore disproportionately use older drugs, which are more often available as generics, to treat their chronic conditions. Under this hypothesis, drug price inflation for the elderly's bundle would be less than that for the young. We examine both these hypotheses empirically, focusing on three therapeutic classes—antibiotics, antidepressants and calcium channel blockers.

We begin in the next section by providing background information on various trends and demographic aspects of the U.S. medical care marketplace and summarizing the literature dealing with age differentials in the rate of health care price inflation. In Sections III, IV, and V we focus on prices at initial, intermediate, and final links of the

distribution chain, respectively. We document and then examine implications of the fact that the elderly and nonelderly have differential uses of drugs across various therapeutic classes, and varying brand-generic consumption patterns within therapeutic classes. We compute and report on separate elderly-nonelderly price indexes, using a fixed-weight Laspeyres index that mimics procedures currently employed by the U.S. Bureau of Labor Statistics (BLS), and also employ a changing-share Divisia price index recommended for use by the CPI commission. We also comment on the important role of differential brand-generic gross margins at retail pharmacies. In section VI we summarize our findings, offer caveats, and outline important issues for future research.

II. Background

Health Care Expenditures

We begin by reviewing recent changes in the components, sources, location, and methods of payment for health care items with a particular focus on pharmaceuticals. In 1995, prescription drugs accounted for 6.3% of the $878.8 billion in total personal health expenditures, nonprescription drugs constituted 3.2%, professional medical services 34.1%, hospital care 39.8%, nursing home care 8.9%, home health care 3.3%, and supplies and other, the remaining 4.4%.[2]

The sources of funds for personal health expenditures varied considerably. Whereas consumers' out-of-pocket expenditures accounted for 18.3% of expenditures for physician services, 3.3% of those for hospital care, and 42.4% of those for nursing home care, direct consumer expenditures (including copayments and deductibles) constituted 39.5% of total prescription drug spending, down from 48.3% in 1990; private third-party insurance covered 39.8% of total prescription drug spending in 1994, up from 34.5% in 1990.[3]

The locus of prescription pharmaceutical sales is also undergoing change. In 1996, for example, about 57% of the money spent on pharmaceuticals involved retail sales (chain pharmacies, independents, mass merchandisers, and food stores), down from 64% in 1990.

2. Statistics in this and the following paragraph are taken from Levit et al. 1996, Table 1 (p. 179), Table 5 (p. 185), Table 12 (p. 206), Table 13 (p. 207), and Table 14 (p. 208).
3. In 1995 (1990), the portion of total prescription drug spending from governmental sources was 20.7% (17.0%).

Whereas the dollar share for mail order increased from 5% to 9%, that for hospitals, clinics, and nursing homes remained relatively constant, 28% in 1990 and 29% in 1996, as did that for staff model health maintenance organizations (HMOs)—2% in both years.[4]

Within the retail sector, method of payment has changed dramatically over the last several years. As table 2.1 shows, since 1991 the share of new prescriptions paid for by cash has fallen sharply from 59% to 32%, whereas that paid for directly by third-party sources other than Medicaid has doubled, increasing from 28% to 57%. Third-party insurance has now become the predominant method of payment for prescription pharmaceuticals sold in retail outlets. The Medicaid share of dollars has varied less, from a high of about 15% in 1993 to about 11% in 1996. (Note that Medicare does not cover outpatient pharmaceutical expenses.) In terms of numbers of new prescriptions, the 1990–96 average annual growth rate (AAGR) for cash customers is –6.6% vs. 20.5% for third-party payors.

The above discussion on health expenditures does not distinguish by age group. Through its annual Consumer Expenditure Survey (CES), the BLS collects data on consumers' out-of-pocket expenditures (OOPs) for various budget items, including components of health care. The CES's unit of observation is the consumer unit ("household"), defined as "the person/group of persons in the household who is/are independent of all other persons in the household for payment of their major expenses" (U.S. Department of Commerce 1994, 3). The person in the consumer unit (CU) with major financial responsibility for payment of housing expenses is called the reference person ("head of household") of the consumer unit. CUs are stratified in a number of ways, including one of particular interest to us, namely, by age of the reference person. In tables 2.2 and 2.3 we summarize data from the 1990 and 1995 CES. Five points are particularly worth noting.

First, as one would expect, older Americans tend to have larger OOPs on medical care items and services than do the younger. The OOPs per CU health expenditure share generally grows with age, but it increases particularly sharply after age 65, as the top three panels of table 2.2 show. In 1995, for example, total OOP health-related expenditures for those under age 25 averaged $465, for those aged 55–64 it was $1,909, and for those 75 and over the average was $2,683. Whereas the average share of health care expenditures over all consumer units

4. IMS 1996 Class of Trade Analysis and Retail Method of Payment Analysis.

Table 2.1
Retail methods of payment, 1991–1996

	New prescriptions, in millions				New prescriptions, percentage distribution		
Date	Cash	MEDICAID	Third party	Total	Cash	MEDICAID	Third party
3Q91	262.4	59.3	122.2	443.9	59.1%	13.4%	27.5%
4Q91	279.2	66.8	136.3	482.3	57.9%	13.9%	28.3%
1Q92	268.6	67.5	140.9	477.0	56.3%	14.2%	29.5%
2Q92	262.5	65.3	140.9	468.7	56.0%	13.9%	30.1%
3Q92	254.0	65.8	137.1	456.9	55.6%	14.4%	30.0%
4Q92	268.2	72.0	151.9	492.1	54.5%	14.6%	30.9%
1Q93	259.1	74.4	165.2	498.7	52.0%	14.9%	33.1%
2Q93	247.0	71.1	164.8	482.9	51.1%	14.7%	34.2%
3Q93	233.5	69.5	164.0	467.0	50.0%	14.9%	35.1%
4Q93	250.1	76.3	186.4	512.8	48.8%	14.9%	36.3%
1Q94	232.4	69.5	201.4	503.3	46.2%	13.8%	40.0%
2Q94	225.2	67.5	205.9	498.6	45.2%	13.5%	41.3%
3Q94	215.5	63.4	205.4	484.3	44.5%	13.1%	42.4%
4Q94	222.2	66.7	229.0	517.9	42.9%	12.9%	44.2%
1Q95	213.9	70.6	251.7	536.2	39.9%	13.2%	46.9%
2Q95	200.5	66.1	252.0	518.6	38.7%	12.7%	48.6%
3Q95	192.7	63.9	251.9	508.5	37.9%	12.6%	49.5%
4Q95	199.8	68.2	282.2	550.2	36.3%	12.4%	51.3%
1Q96	192.8	67.6	291.8	552.2	34.9%	12.2%	52.8%
2Q96	180.0	61.5	294.2	535.7	33.6%	11.5%	54.9%
3Q96	176.6	60.3	296.3	533.2	33.1%	11.3%	55.5%
4Q96	183.6	65.7	325.5	574.8	31.9%	11.4%	56.6%
AAGR	–6.6%	2.0%	20.5%	5.0%			

Source: IMS America 1996.

in 1995 was 5.4%, for those under age 25 it was 2.5%, between ages 55 and 64 it was 5.9%, for those 65 and over it doubled to 11.9%, and for those 75 and over it increased further to 14.4%. Moreover, the data in table 2.2 reveal that the share of health care expenditures attributable to each age group was quite stable over 1990–95.[5]

Second, as the elderly constitute a greater proportion of the population, they account for an increasingly large and disproportionate percentage of the nation's total OOP health expenditures. As shown in the bottom three panels of table 2.2, whereas CUs over age 65 accounted for 20.7% of all consumer units in 1990, their larger per capita out-of-pocket health expenditures implied that the CUs over age 65 constituted 30.9% of OOP health expenditures over all age groups; by 1995, these numbers increased slightly to 21.1% and 32.3%, respectively.[6] Interestingly, the proportion of consumer units aged 65–74 decreased very slightly between 1990 and 1995, from 11.7% to 11.6%, but the percentage of consumer units aged 75 and over increased more sharply, from 9.0% to 9.6%, resulting in an increase in their OOP health expenditures share over all age groups from 13.5% to 14.8%.

Third, although total OOPs health care expenditure patterns may be stable, since 1990 people of all ages (and especially the elderly) appear to have significantly substituted payments to health insurance for direct payments for professional medical services, drugs, and medical supplies.[7] Note that in the CES, consumer OOP expenditures for health insurance are the sum of employees' pretax contributions at work and direct health insurance premium payments, but employers' health insurance contributions are not included, for those are treated as a business expense. As the second panel of table 2.3 shows, for all consumers the health insurance share increased from 39% to 50% between 1990 and 1995. For those under age 65, the 1995 health insurance share was about 45%, up from slightly under 40% in 1990; for the elderly, however, the increase was even greater, from 45% in 1990 to 58% in 1995. Thus by 1995 more than half of the elderly's OOPs health care budget was devoted to health insurance.

5. For comparisons back to 1980, see Acs and Sabelhaus 1995.

6. Note that these OOPs exclude all government funding, such as that for Medicare. Thus the 32% figure likely understates the elderly's proportion of total OOPs plus government health care expenditures.

7. Employers may also be shifting health insurance premium costs and copayments/deductibles to their employees. For discussion, see Baker and Kramer 1991 and Cowan et al. 1996.

Table 2.2
Out-of-pocket health care expenditures by reference person age group, United States, 1990 and 1995

Category	All consumers	Under 25	25–34	35–44	45–54	55–64	65 and over	65–74	75 and over
Total expenditures per consumer unit									
1990 $	28,381	16,525	28,117	35,594	37,012	29,263	18,551	20,901	15,450
1995 $	32,277	18,429	31,488	38,425	42,181	32,604	22,265	25,302	18,575
Health care expenditures per consumer unit									
1990 $	1,480	403	981	1,415	1,597	1,791	2,208	2,197	2,223
1995 $	1,732	465	1,096	1,609	1,850	1,909	2,647	2,617	2,683
Health care share of total expenditures per consumer unit									
1990	5.21%	2.44%	3.49%	3.98%	4.31%	6.12%	11.90%	10.51%	14.39%
1995	5.37%	2.52%	3.48%	4.19%	4.39%	5.86%	11.89%	10.34%	14.44%
Number of consumer units (in thousands)									
1990	96,968	7,581	21,287	21,003	14,855	12,162	20,079	11,318	8,761
1995	103,024	7,067	19,500	23,441	18,633	12,626	21,759	11,924	9,855
Share of consumer units by age of reference person									
1990	100.00%	7.81%	21.95%	21.66%	15.32%	12.54%	20.71%	11.67%	9.03%
1995	100.00%	6.86%	18.93%	22.75%	18.09%	12.26%	21.12%	11.57%	9.57%
Share of national health OOPs expenditures by age of reference person									
1990	100.00%	2.13%	14.55%	20.71%	16.53%	15.18%	30.87%	17.33%	13.57%
1995	100.00%	1.84%	11.98%	21.14%	19.32%	13.51%	32.28%	17.49%	14.82%

Source: United States Department of Labor, Bureau of Labor Statistics, *Consumer Expenditure Survey, 1990–91*, Table 12, and *Consumer Expenditure Survey, 1995*, Table 1300.

Table 2.3
Components of out-of-pocket health care expenditures by age group, United States, 1990 and 1995

Category	All consumers	Under 25	25–34	35–44	45–54	55–64	65 and over	65–74	75 and over
Total health care expenditures per consumer unit									
1990 $	1,480	403	981	1,415	1,597	1,791	2,208	2,197	2,223
1995 $	1,732	465	1,096	1,609	1,850	1,909	2,647	2,617	2,683
Health insurance									
1990 $	581	106	391	485	583	700	990	1,014	960
1995 $	860	209	517	726	817	896	1,541	1,528	1,557
1990 %	39.3	26.3	39.9	34.3	36.5	39.1	44.8	46.2	43.2
1995 %	49.6	44.9	47.2	45.1	44.2	46.9	58.2	58.4	58.0
Medical services									
1990 $	562	190	391	646	664	654	664	656	674
1995 $	511	157	380	596	664	587	479	471	487
1990 %	37.8	47.2	39.9	45.7	41.6	36.5	30.1	29.9	30.3
1995 %	29.5	33.8	34.7	37.0	35.9	30.8	18.1	18.0	18.2
Drugs (prescription and nonprescription)									
1990 $	252	65	135	183	236	340	475	455	501
1995 $	280	65	139	205	254	344	544	536	555
1990 %	17.0	16.1	13.8	12.9	14.8	19.0	21.5	20.7	22.5
1995 %	16.2	14.0	12.7	12.7	13.7	18.0	20.6	20.5	20.7
Medical supplies									
1990 $	85	41	64	100	113	96	80	73	88
1995 $	80	34	60	81	115	83	83	82	84
1990 %	5.7	10.2	6.5	7.1	7.1	5.4	3.6	3.3	4.0
1995 %	4.6	7.3	5.5	5.0	6.2	4.4	3.1	3.1	3.1

Source: See table 2.2.

Fourth, in a related development, the professional medical services component of OOP expenditures has fallen sharply since 1990, as insurers presumably have borne a greater share. In 1990, for example, the average expenditure on medical services by those aged 65 and over was $664, but by 1995 this had fallen 28% to $479. For all consumers, the medical service expenditure share fell from 38% to 30%, but for those 65 and over the drop was even larger, from 30% in 1990 to 18% in 1995.

Fifth, for drugs (the CES data include both prescription and over-the-counter nonprescription drug expenditures), in both 1990 and 1995 expenditures increased with age and were about twice as large for the elderly relative to all consumers. The level of OOP expenditures increased about 11% for all consumers from 1990 to 1995 ($252 to $280), but for the elderly, the OOPs increase was larger, about 14–15% ($475 to $544). In terms of expenditure shares, the drug component fell slightly, from 17% to 16% for all consumers, presumably reflecting a shift to payments by health insurers. For those 75 and over, the drop in the drug component of OOPs was slightly larger, from 22.5% in 1990 to 20.7% in 1995.

In summary, the CES data indicate that the composition of OOPs has changed considerably since 1990, and in different ways for the elderly versus the nonelderly. A dominant trend for people of all ages, however, is away from direct out-of-pocket payments for medical services, drugs, and medical supplies and instead toward health insurance. To the extent that this growth in health insurance results in greater buying power by agents of consumers relative to that of providers and suppliers, and to the extent any resulting lower provider-supplier prices are passed on to consumers in the form of lower health insurance premiums, this shift could result in benefits to consumers, particularly the elderly.

Medical Prices: Entire U.S. Population

Expenditures are by definition the product of price times quantity. Disaggregating the growth of health expenditures into price and quantity components involves many conceptual and practical difficulties.[8] The BLS publishes an aggregate medical care Consumer Price Index (MCPI) as well as price indexes for various of the MCPI components, such as prescription drugs, professional medical services, and hospital

8. For an overview discussion, see Triplett 1997 and Getzen 1992.

Table 2.4
Price inflation in the overall CPI and in the Medical CPI, 1927–1996, average annual growth rates

Time period	CPI-Urban	Medical CPI	Ratio MCPI/CPI
1927–46	0.60%	1.03%	1.72
1946–56	3.38%	4.22%	1.25
1956–66	1.76%	3.36%	1.91
1966–76	5.79%	7.05%	1.22
1976–86	6.78%	8.90%	1.31
1986–96	3.65%	6.46%	1.77
1927–96	3.24%	4.59%	1.42

Sources: U.S. Department of Labor, Bureau of Labor Statistics. For the MCPI prior to 1935, Langford 1957, Table 1, p. 1055.

and related services. Each of these price indexes is based on consumers' OOPs and thereby excludes all payments by governments and third-party insurers.[9]

Recent MCPI data show that prices consumers pay for medical care have been increasing more rapidly than those for other items. Indexed to 100 in 1990, the 1996 MCPI was 140.2, for prescription drugs it was 133.7, for nonprescription drugs and medical supplies 118.7, for physicians' services 134.6, and for hospital and related services 151.4, whereas the CPI for all items was only 120.0.[10] Thus, except for nonprescription drugs, prices of health-related items and services generally appear to have risen more rapidly than the overall CPI. Moreover, as table 2.4 shows, this more rapid increase of the MCPI relative to the CPI is not a recent phenomenon. Since 1927, the first year for which MCPI data are available, medical inflation has generally been greater than that of all goods and services.[11] Over the entire 1927–96 time period, the MCPI has risen at an AAGR of 4.59%, more than 40% above the 3.24% for the overall CPI.

In its recent report to the U.S. Senate Finance Committee (1996), however, the CPI commission concluded that the MCPI was substantially upward biased, stating that ". . . healthcare inflation is seriously

9. However, in constructing the BLS's MCPI, the out-of-pocket payments for health insurance are in turn distributed into payments by insurers for medical services, medical commodities, and health insurers' retained earnings. See Fixler 1996, Daugherty 1964, Ford and Sturm 1988, and Getzen 1992.

10. United States Department of Labor, Bureau of Labor Statistics, 1996, *CPI Detailed Report*, Tables 1 and 3 (CPI for All Urban Consumers).

11. For several years in 1927–46, however, year-to-year changes in the CPI were greater than for the MCPI. See Getzen 1992 for a discussion.

overstated because of the substantial uncounted quality change" (72, footnote 71), such as improvements in outcomes (60; see also Shapiro and Wilcox 1996). Specifically, the commission estimated that the upward bias of the MCPI is 3% per year for prescription drugs, for professional medical services, and for hospital and related services, and 1% for nonprescription drugs (58–62). Moreover, the commission recommended major changes in the BLS's treatment of health insurance expenditures (iv). Currently the BLS's procedures for the health insurance component do not take changing coverages into account, but instead simply multiply a medical care price index by an index of health insurance ex post retained earnings, that is, the ratio determined by health insurance revenues minus health insurance payments, all divided by health insurance revenues (Lane 1996, 22; see also references in note 9).

The BLS also publishes producer price indexes (PPIs) for various industries, focusing on the initial point in the distribution chain, where it "measures average changes in selling prices received by domestic producers for their output" (U.S. Department of Labor, Bureau of Labor Statistics 1992, 140). Although the BLS has published PPIs for certain health-related industries such as prescription pharmaceuticals for many years, currently there is no overall medical care PPI. Recently, however, the BLS introduced separate PPIs for offices and clinics of doctors of medicine (December 1993), skilled and intermediate care facilities (December 1994), general medical and surgical hospitals (December 1992), psychiatric hospitals (December 1992), and medical laboratories (June 1994). A number of recent research studies report that for pharmaceuticals, the PPI overstates price inflation considerably.[12] Studies by Cutler et al. (1996) on the treatment of heart attacks and by Shapiro and Wilcox (1996) on cataract surgery also suggest substantial upward bias in medical-related PPIs. Cutler et al. point out that apparent price inflation actually involves frequent substitution of more expensive but also more effective inputs.

Medical Prices: Focus on the Elderly

Larger medical-related expenditure weights for the elderly than for the young combined with apparent greater price inflation for medical care items than for the overall CPI has created an impression that the

12. See, for example, Berndt, Griliches, and Rosett 1993, Griliches and Cockburn 1994, and Berndt, Cockburn, and Griliches 1996.

relatively large price increases involving health care items and services in the last decade have adversely affected the elderly in particular. Indeed, such considerations played a prominent role in the recent debate concerning a possible downward adjustment of the CPI to index Social Security benefits for the elderly.[13] As noted earlier, however, the greater growth of the MCPI than for the CPI goes back at least to 1927. Hence, for the many years when today's elderly were younger, they too benefited from inflation that was less burdensome for them than for the elderly of their time. Over the entire life cycle, it is not at all clear whether today's elderly cohort is relatively better or worse off than earlier or future elderly cohorts. With this caveat in mind, along with the understanding that growth in the MCPI may be overstated because of overlooked quality improvements, we now briefly summarize the existing literature on separate price indexes for the elderly.[14]

Anticipating that the introduction of Medicare in July 1966 might have an impact on medical care prices in summer 1965 the Social Security Administration arranged with the BLS to collect supplementary prices for three surgical procedures—cholecystectomy (removal of gall bladder), prostatectomy (removal of prostate gland), and fractured neck of femur (hip surgery)—and two in-hospital medical services—acute myocardial infarction (treatment of heart attack) and cerebral hemorrhage (stroke)—that were particularly important to older persons, though not necessarily limited to them. A report to the President, summarized by Rice and Horowitz (1967, based on U.S. Department of Health, Education, and Welfare 1967), concluded that "[t]he index of the five in-hospital surgical and medical procedures particularly significant for the aged did not increase as rapidly during 1966 as the combined index for physicians' fees regularly priced for the CPI" (28).[15]

More recently, in response to a mandate from 1987 amendments to the Older Americans Act of 1965, the BLS created an experimental price index for elderly consumers (CPI-E). The CPI-E employs differential expenditure weights for the elderly (defined as ages 62 and over)

13. See, for example, Kuttner 1997 and Gephardt 1997.

14. For a review of literature on various BLS experimental price indexes, including a separate price index for the poor, both old and young, see Garner et al. 1996 and Moulton-Stewart 1997.

15. Rice and Horowitz (1967, 25) report that the December 1965–December 1966 price index growth rates ranged from 2.5% for cholecystectomy to 6.9% for prostatectomy, whereas the combined index for physicians' fees regularly priced for the CPI increased 7.8%.

and nonelderly, based on CES data, but assumes that within each category weight, the distribution of prices, the outlets from which consumers buy, the use of coupons and availability of discounts, as well as the quality of the items purchased, are the same for the elderly and the nonelderly.[16] From 1982 through 1996, the CPI-E for the elderly rose 67.9%, while the CPI rose 62.5%, implying that over the entire fourteen-year time span, the CPI had an AAGR of 3.53%, while the CPI-E for the elderly grew at a slightly larger 3.77% per year.[17] The larger health care expenditure weights for the elderly, along with greater measured medical price inflation, account almost entirely for the difference in AAGRs. As noted by the CPI commission, however, medical care prices are likely to have overstated inflation by not fully accounting for improvements in quality. If this is correct, then as Moulton and Stewart (1997) note, "A reduced rate of inflation for medical care would mitigate and perhaps eliminate any difference between the CPI-E and the official CPIs" (21).

A related recent study by Garner, Johnson, and Kokoski (1996) focuses on experimental price indexes for the poor, based on several alternative definitions of "poor." Using CES data for weights, along with CPI prices from 1984 to 1994, they find "very little difference between the experimental consumer price indexes produced for the poor and the corresponding CPI for the whole sample" (33). Similarly, Rubin and Koelin (1996), examining real income growth and expenditures on necessities for a variety of demographic groups from 1980 to 1990, conclude that

> . . . for the population in general, well-being increased over the 1980s, as measured by both real income and discretionary spending. The well-being of elderly households increased relatively more than that of nonelderly households, and the well-being of recipients of cash assistance increased relatively less than that of those who did not receive assistance.[18] (P. 30)

In summarizing their findings concerning differential rates of price growth experienced by diverse groups in the population, the CPI commission stated:

> Some have suggested that different groups in the population are likely to have faster or slower growth in their cost of living than recorded by changes in the

16. See Garner, Johnson, and Kokoski 1996, 37, and Moulton and Stewart 1997, 18. The time costs of shopping could also differ for the elderly.

17. See Amble and Stewart 1994 and Mason 1988. The overall CPI refers to the CPI-All Urban Consumers index.

18. Also see Hitschler 1993.

CPI. We find no compelling evidence of this to date. . . . Further work on this subject remains to be done. In particular, the prices actually paid, not just expenditure shares, may differ. (U.S. Senate Finance Committee 1996, 72)

With this information and brief overview of related literature as background, we now turn to a discussion of our own new research. In section III we focus on drug prices at the first point in the distribution chain, from producers to wholesalers, hospitals, and retailers.[19] In section IV we examine an intermediate point, namely, the acquisition prices retail pharmacies pay to wholesalers and manufacturers. Then in section V we assess prices at final points in the distribution chain, from retail pharmacies to patients and payors. Because of data limitations, we do not examine prices received by mail order pharmacies, which account for roughly 9% of total prescription dollar sales.

III. Producers' Prices for Drugs Destined for Use by Old versus Young

In reporting on prices at the first point in the distribution chain from manufacturers to wholesalers and retailers, the BLS publishes monthly PPIs for about fifty therapeutic classes of prescription pharmaceuticals, such as analgesics, broad- and medium-spectrum antibiotics, cancer therapy products, cardiovascular therapy products, antidepressants, and vitamins. Prices in these various therapeutic classes have increased at different rates. Since 1981, PPIs for anticoagulants, antiarthritics, and systemic anti-infectives, for example, have increased at much lower rates than have those for sedatives, central nervous system (CNS) stimulants/antiobesity preparations and psychotherapeutics.[20] Because the elderly are likely to have conditions, diseases, and illnesses that differ from those of the nonelderly, there is no a priori reason to expect that the price inflation for the basket of drugs used by the elderly has occurred at the same rate as that for the drug combinations used by the nonelderly.

IMS America, a firm specializing in sales and marketing data for medical and pharmaceutical products, regularly samples the prescrib-

19. In 1995 (1990), 78.9% (71.8%) of manufacturers' sales were to wholesalers, 12.1% (15.8%) were to retailers, and 4.8% (9.3%) were to hospitals (Pharmaceutical Research and Manufacturers of America 1997, fig. 4-12, p. 30).

20. Indexed to June 1981 = 100, the PPI index values in June 1996 were 145.9, 192.6, and 221.5 for anticoagulants, antiarthritics, and systemic anti-infectives, respectively and 730.9, 605.8, and 500.5 for sedatives, CNS stimulants/antiobesity preparations, and psychotherapeutics, respectively. (U.S. Department of Labor, Bureau of Labor Statistics, 1996, table 5, p. 61).

Table 2.5
Twenty top-selling market classes of prescription drugs, by age group, 1996

USC code	Class name	Mentions (thousands)	Percentage
Under age 65 (81.3% of all mentions)			
15100	Broad- and medium-spectrum antibiotics	116,623	15.79
02200	Narcotic analgesics	40,955	5.55
64300	Antidepressants	34,623	4.69
09100	Systemic antiarthritics	32,446	4.39
52200	Plain corticoids	28,348	3.84
27100	Biological vaccines	26,593	3.60
28100	General bronchodilators	24,519	3.32
52100	Sex hormones	18,831	2.55
31400	Adrenergic blockers	16,753	2.27
64600	Antianxiety agents	16,611	2.25
31100	Antihypertensives	16,184	2.19
02100	Nonnarcotic analgesics	16,057	2.17
34300	Cough/cold preparation prescriptions	16,000	2.17
28400	Respiratory steroid inhalants	15,000	2.03
23400	Other antispasmodics	14,925	2.02
31700	Calcium channel blockers	14,876	2.01
37400	Fungicides alone/combination	11,993	1.62
34100	Oral cold preparation prescriptions	11,432	1.55
15500	Trimethoprim	11,374	1.54
33200	Oral contraceptives	11,203	1.52
Sum for twenty leading market classes, under age 65		495,346	67.07
65 and over (18.7% of all mentions)			
15100	Broad- and medium-spectrum antibiotics	12,616	7.44
31100	Antihypertensives	10,718	6.32
31400	Adrenergic blockers	10,565	6.23
31700	Calcium channel blockers	10,479	6.18
41200	Noninjectable diuretics	8,736	5.15
02200	Narcotic analgesics	7,710	4.55
28100	General bronchodilators	7,268	4.29
09100	Systemic antiarthritics	6,874	4.05
52200	Plain corticoids	6,424	3.79
39200	Oral diabetes therapy	6,337	3.74
23400	Other antispasmodics	5,035	2.97
32100	Cholesterol reducers	4,918	2.90
31500	Digitalis preparations	4,037	2.38
64300	Antidepressants	3,987	2.35
31200	Vasodilators	3,694	2.18

Table 2.5 (continued)

USC code	Class name	Mentions (thousands)	Percentage
61600	Miotics plus glaucoma	3,433	2.02
30200	Other cancer/transplant cytotoxics	3,381	1.99
64600	Antianxiety agents	2,969	1.75
72100	Thyroid hormones	2,430	1.43
61400	Ophthalmic corticoids	2,362	1.39
Sum for twenty leading market classes, age 65 and over		123,973	73.10

Source: National Disease and Therapeutic Index (IMS America 1996).
Note: Data were also obtained and analyzed for 1994 and 1992 and yielded similar results.

ing behavior of office-based physicians and publishes the results in the *National Disease and Therapeutic Index* (NDTI). Based on an extensive sample of new prescriptions written by a panel consisting of about 3,000 physicians, information is gathered on, among other matters, patient age, physician specialty, physician age, diagnosis code, drug therapy prescribed, concomitant diagnoses, and desired actions; this sample NDTI data is then projected by IMS to national totals.[21]

NDTI data therefore permit us to compare the drugs prescribed for use by the elderly with those prescribed for younger patients, including differences involving brands versus generics. Based on annual NDTI data for 1996 we list, in the top panel of table 2.5, the twenty top-selling therapeutic classes of drugs for the elderly; in the bottom panel, we list the corresponding leading classes for the nonelderly. Prescriptions written for the elderly constitute 18.7% of all new prescriptions, whereas those for the nonelderly account for the remaining and much larger 81.3%. For both the young and the old, the leading therapeutic class is broad- and medium-spectrum antibiotics; drugs in this class comprise almost 15.8% of new prescriptions written for those under age 65, but only 7.4% for the elderly. The most frequent new prescriptions for the young include antidepressants, sex hormones, cough/cold preparations and oral contraceptives; those for the elderly include various cardiovasculars (antihypertensives, adrenergic blockers, calcium channel blockers, diuretics), as well as glaucoma and cancer therapies. The table does not consider differences between young and old in the relative use of drugs by therapeutic class; figure 2.1 highlights the most substantial of these differences. As the

21. For further details, see IMS America 1996, ch. 11. A new prescription refers to a new script written by the physician and is distinguished from continuing therapy.

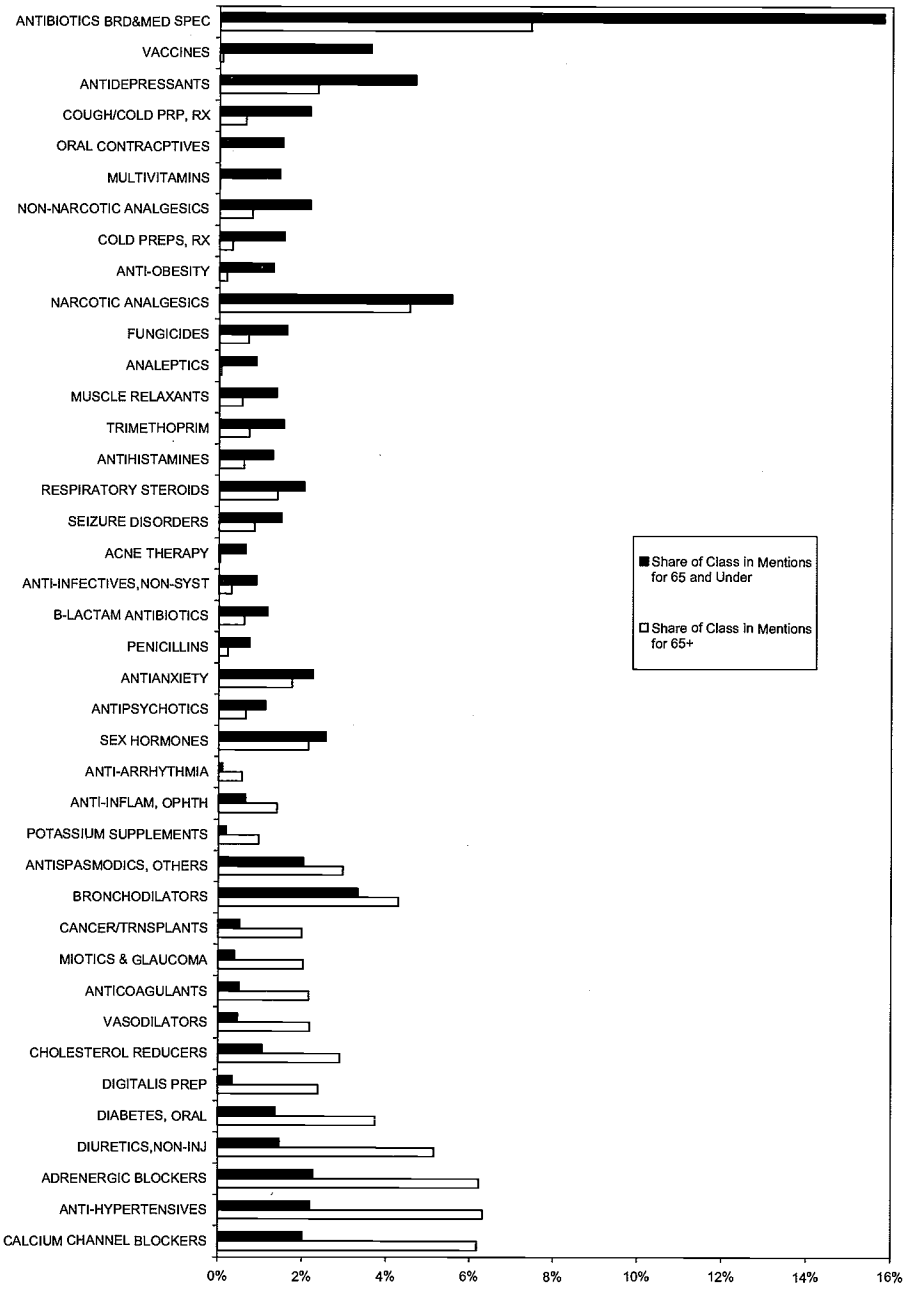

Figure 2.1
1996 NDTI drug mentions by age group and therapeutic class (largest differences between age groups)

figure shows, the five therapeutic classes with the largest differences in elderly-nonelderly usage are antibiotics, vaccines, antidepressants, cough and cold preparations, and oral contraceptives, all of which are more intensively used by the young.

We now turn to price data. The BLS makes publicly available the fixed-quantity weights it employs in aggregating the various therapeutic class-specific price indexes into an overall prescription pharmaceutical PPI. The third column of table 2.6 lists these quantity weights from the BLS's 1993 Cycle C sample; the next column lists the percentage of all new prescriptions in that therapeutic class that are written for the elderly. The final six columns list the BLS's PPI by therapeutic class annually from 1991 to 1996, normalized to 100.0 in 1990.

As shown in table 2.6, the elderly are particularly important consumers in a number of therapeutic classes—anticonvulsants (51%), cancer therapy products (39%), cardiovascular therapy products (42%), diabetes therapy (38%), diuretics (45%), and nutrients and supplements (53%)—although only for the cancer and cardiovascular therapy products are the PPI weights substantial. Therapeutic classes in which the elderly account for a relatively low fraction of consumption include systemic anti-infectives (10%), cough and cold preparations (7%), dermatological preparations (7%), muscle relaxants (8%), and vitamins (3%). Therapeutic classes with the largest price increases since 1990 include cough and cold preparations (57%), bronchial therapy (54%), anticonvulsants (48%), systemic antihistamines (45%), and psychotherapeutics (45%), and in all cases except anticonvulsants, these are therapeutic classes with disproportionately large to average use by the young, rather than by the elderly. Those therapeutic classes having the smallest price increases since 1990 include muscle relaxants (16%), ophthalmic and otic preparations (19%), miscellaneous prescription pharmaceuticals (21%), antiarthritics (22%), and vitamins (23%); these show a more mixed pattern of relative usage by old and young.

To aggregate these various therapeutic class PPIs into overall price indexes separately for the elderly and the nonelderly, we first assume, for the moment, that within each of the therapeutic classes old and young face the same prices (an assumption we relax in section IV) and multiply these BLS therapeutic class quantity weights by the relative old versus young proportions of 1996 new prescriptions, based on NDTI data. We then multiply these therapeutic class–specific elderly and nonelderly quantity weights times the BLS's published PPI for that

Table 2.6
BLS weights, elderly usage of prescription drugs, and producer price index by therapeutic class, 1990–1996

SIC code 2834-	Therapeutic class	PPI weight	Percentage elderly	BLS Producer Price Index (1990 = 100)					
				1991	1992	1993	1994	1995	1996
102	Analgesics	11,339	14	106.3	115.7	122.5	128.7	132.1	135.6
105	Antiarthritics	8,049	17	108.6	116.7	123.2	113.1	114.5	121.8
107	Anticonvulsants	2,100	51	112.7	125.9	132.7	136.8	142.1	148.3
109	Systemic antihistamines	9,336	13	111.7	121.3	126.5	131.4	135.7	145.4
111	Systemic anti-infectives	44,412	10	105.9	111.2	115.9	119.9	123.9	125.8
118	Bronchial therapy	11,956	19	111.2	122.5	129.0	139.6	145.8	154.2
119	Cancer therapies	10,079	39	106.0	116.6	120.8	123.4	127.7	132.7
121	Cardiovasculars	35,709	42	108.9	116.2	119.5	123.5	127.2	132.9
125	Cough and cold preparations	2,501	7	111.3	120.8	128.2	135.6	146.9	157.0
126	Dermatological preparations	5,237	7	104.8	111.8	118.8	124.2	133.5	140.5
127	Diabetes therapy	1,479	38	107.8	114.7	120.5	124.6	131.0	134.0
128	Diuretics	2,512	45	107.3	115.1	122.2	130.6	126.3	136.9
135	Hormones	13,047	17	108.7	116.3	122.9	133.5	137.8	137.3
139	Muscle relaxants	2,391	8	106.9	114.4	120.8	118.1	116.7	116.4
141	Nutrients and supplements	427	53	109.2	119.7	129.1	135.5	141.8	147.6
142	Ophthalmic and otic preparations	5,437	31	101.1	106.7	107.4	112.6	119.4	119.2
144	Psychotherapeutics	15,873	11	114.4	123.2	129.8	133.0	138.2	144.7
145	Sedatives	902	16	113.9	125.0	128.4	132.3	138.5	141.6
148	Vitamins	1,000	3	111.2	115.5	108.9	110.6	114.7	122.7
198	Miscellaneous pharmaceuticals	21,511	19	108.0	115.6	123.0	119.3	119.0	120.9

Notes: Percentage elderly is drug mentions for the elderly as a fraction of elderly plus nonelderly mentions. Drug mentions for age bracket not recorded in the NDTI are ignored. BLS PPIs for SIC 2834-116 (antispasmodic/antisecretory) and SIC 2834-147 (tuberculosis therapy) were not published from 1987 through 1993 and thus are ignored here; their elderly weights were 23 and 16, respectively, and their 1993 PPI weights were 11,956 and 1,607, respectively.

Table 2.7
Producer Price Indexes for all pharmaceuticals, those destined for use by the elderly, and those destined for use by the nonelderly

Year	Overall price index	Elderly price index	Nonelderly price index
1990	1.000	1.000	1.000
1991	1.083	1.083	1.083
1992	1.160	1.163	1.159
1993	1.213	1.211	1.213
1994	1.248	1.247	1.249
1995	1.287	1.284	1.288
1996	1.330	1.331	1.329

Note: See text for source and details of procedure for calculation.

class, normalized to unity in 1990.[22] Finally, we aggregate over the various therapeutic classes and thereby obtain separate prescription pharmaceutical PPIs for drugs destined for use by the elderly and the nonelderly. Table 2.7 summarizes results from this calculation over 1990–96.

The very striking conclusion that emerges from inspection of table 2.7 is that in aggregate, manufacturers' prices for pharmaceutical products destined for use by the elderly change at virtually the same rate as those destined for use by the nonelderly. By 1996, the PPI over all consumers was 1.330, that for the elderly was 1.331, and that for the nonelderly was 1.329. Hence, despite substantial differences in usage among the elderly and nonelderly of drugs from various therapeutic classes, and even though manufacturers' price changes since 1990 have varied considerably among the therapeutic classes, in the aggregate, at the initial point in the distribution chain from drug manufacturers, there appears to be no price inflation differential by age group, at least according to the official BLS price statistics.

IV. Retail Sell-In Prices: Elderly versus Nonelderly

The PPI calculations presented in the previous section assume that within each therapeutic class, prices for products destined for use by the elderly have the same distribution as those for the nonelderly. We now relax that assumption.

22. Notice that we are implicitly assuming here that the old-young distribution within each therapeutic class is the same for sales from manufacturers to wholesalers, to hospitals, and to retailers. We relax this assumption in section IV.

Based on its electronic computer record survey of about 34,000 retail pharmacies (independents, chains, mass merchandisers, and food stores), IMS gathers data on brand and generic sales for each chemical compound as well as on pharmacy acquisition prices and pharmacy selling prices for the highest selling form/strength/package of each product. In addition, IMS collects separate retail prices for the top-selling presentation of each product by method of payment—cash, Medicaid, and private third party. IMS reports these data in its *Retail Perspective* and its *Retail Methods of Payment*.[23]

Within each of these three therapeutic classes, data are therefore available on what drugs were prescribed, whether brand or generic, the leading selling form/strength/package of each product, whether destined for use by the elderly or the nonelderly, sell-in price to pharmacy, and sell-out prices to consumers and payors. Here we focus on that point in the distribution chain involving acquisition prices paid by retail pharmacies (what IMS calls sell-in prices), whereas in section V we focus on retail pharmacy sell-out prices to various consumers and payors. We now concentrate on three leading therapeutic classes: broad- and medium-spectrum antibiotics, calcium channel blockers, and antidepressants.

A priori, two possible hypotheses come to mind concerning differential elderly-nonelderly drug usage within these therapeutic classes. The first concerns medications used to treat acute conditions. It is plausible to assume that the health of seniors is more fragile than that of the nonelderly and that as a result, prudent medical practice would advise prescribing for the elderly those products that, given similar efficacy, had the fewest adverse interactions with other drugs and the fewest side effects.[24] Newly introduced drugs are frequently about as efficacious as older products but have superior adverse-interaction and side-effect profiles. More convenient dosing of newer products, such as once-a-day "sustained release" versions, also facilitates patient compliance, particularly for the elderly, who are more likely to have memory lapses. These newer products typically command a price premium and experience greater price inflation than older, off-patent generic drugs.[25] To the extent these assumptions are valid, therefore, we would hypothesize that for medications used to treat acute condi-

23. For further details, see IMS America 1996, chaps. 20 and 41.

24. One might also argue that the very young are more vulnerable as well.

25. This is clearly the case for antidepressants, such as the selective serotonin reuptake inhibitors, which have similar efficacy but superior adverse-interaction and side-effect

tions, prices faced by the elderly would tend to grow more rapidly than those for the young.[26]

A second hypothesis concerns medications used to treat chronic conditions. Here the same basic factors are at work as noted above for acute conditions. In addition, however, for chronic conditions, the old might be expected to have chosen to use older drug products, for physicians are hesitant to change medications when a particular existing drug regimen is working well.[27] With stickier consumption patterns and by surviving to old age, the elderly would therefore disproportionally use older drugs, which are more often available as generics. If this hypothesis is true, drug prices within certain chronic areas might grow less rapidly for the elderly versus the nonelderly, because generic prices have fallen in the last decade while prices of brands typically increased. (See, for example, Griliches and Cockburn 1994 and Berndt, Cockburn, and Griliches 1996.)

However, patent protection has expired for only the *very* old drugs. For older drugs still patent protected, price increases tend to be larger than for younger drugs. (See, for example, Berndt, Griliches, and Rosett 1993; Kanoza 1996; and Ristow 1996.) Thus, any price inflation differential between old and young consumers of both acute and chronic medications depends on the distribution of sales between older drugs with and without patent protection. Because such a distribution is an empirical matter that could vary by therapeutic class and change over time, our hypotheses make no definitive prediction for any elderly-nonelderly price inflation differential but must be examined in the context of the distribution of sales between brands and generics in each therapeutic class.

Among the three therapeutic classes we examine here, we expect that the cardiovascular products, such as calcium channel blockers, are used predominantly for treatment of chronic conditions, whereas the broad- and medium-spectrum antibiotics are used primarily to treat acute conditions. In terms of protracted use, antidepressants are most likely to fall between the antibiotics and the cardiovasculars, because they are used to treat both episodic and more chronic forms of depression. In all three therapeutic classes, however, the elderly and

profiles relative to the older tricyclic antidepressants. See Berndt, Cockburn, and Griliches 1996 for further discussion.

26. For a discussion of pricing considerations involving drugs to treat acute versus chronic conditions, see Lu and Comanor 1996.

27. This is consistent with the common medical adage, "Don't shoot a singing bird."

nonelderly may use drugs for a different set of conditions. In the case of antidepressants, for example, physicians frequently prescribe tricyclic antidepressants for "off-label" conditions, such as chronic pain syndromes, that the elderly experience more frequently.

With this as background, we begin by examining retail pharmacy acquisition (sell-in) costs and price indexes for the broad- and medium-spectrum antibiotic (AB) class of drugs. As the top panel of table 2.8 shows, retail acquisitions of ABs almost doubled from 1990 to 1996, growing from \$2.1 to \$3.8 billion. Roughly 90% of the retail pharmacy acquisition costs are for ABs destined for use by the young. The overall brand/generic shares for ABs are somewhat volatile, ranging from 81%/19% in 1990 to 90%/10% in 1993. Over the entire time period, brand share for the elderly has grown from 82% to 91% (generic share has fallen from 18% to 9%), whereas for the young, the brand share has increased only from 81% to 87%. The AB brand share hit its peak in 1992–94 at about 89–90% (for all), then fell to about 88% (all), 87% (young) and 91% (elderly) in 1996. Thus, particularly since 1992–94, the elderly's use of branded antibiotic products has grown considerably more rapidly and to greater proportions than that of the young. This is, of course, consistent with the acute-care hypothesis discussed above. It is also consistent with the notion that the elderly are increasingly using newer, branded products having higher efficacy in treating severe or life-threatening infections such as pneumonia, in part because of increasing bacterial resistance to older drugs.[28]

We now turn to price indexes, which can be constructed in a number of ways. The BLS employs a fixed-weight procedure known as the Laspeyres price index that keeps weights of the various items in the index fixed over time. The CPI commission has criticized this fixed-weight procedure and has recommended instead a chain-weighted index with changing weights that reflect evolving market shares of items over time. (See U.S. Finance Committee 1996.) The most common version of such a chained index is the (Tornqvist discrete approximation to the) Divisia index.[29] We therefore construct price indexes mim-

28. Successful brands introduced since 1990 with substantial use by the elderly include Floxin and Lorabid. Sales of other, older brands such as Ceftin and Cipro (introduced in 1987) have also grown substantially.

29. The fixed-weight Laspeyres price index is calculated as $L_t \equiv \Sigma_i p_{it} q_{i0} / \Sigma_i p_{i0} q_{i0}$, where p_{it} is the price of item i in period t, p_{i0} is the base period price, and q_{i0} is the base period quantity. The Tornqvist discrete approximation to the Divisia index is calculated as $D_t \equiv \exp[\Sigma_i \varpi_{it}(\ln p_{it} - \ln p_{i,t-1})] \cdot D_{t-1}$, where $\varpi_{it} \equiv .5*(\omega_{it} + \omega_{i,t-1})$ and $\omega_{it} \equiv p_{it} q_{it} / \Sigma_i p_{it} q_{it}$, and were D_0 is normalized to unity in the base year.

icking the BLS fixed-weight procedure, using 1990 fixed-quantity weights, but also report price indexes with the more preferred Divisia index calculation that allows for changing market shares.[30]

In rows labeled "Laspeyres" in the top panel of table 2.8, we present 1990–96 retail acquisition price indexes for ABs over all consumers (Laspeyres index—All), for ABs destined for use by the young (Young) and for ABs destined for use by the old (Elderly).[31] We first obtain the somewhat surprising result that with the Laspeyres index, over the entire 1990–96 time period, ABs used by the elderly increased in price about 12%, whereas for the nonelderly the price increase was somewhat larger, at 17%. However, if one looks only from 1992 onward, the reverse occurred—the elderly AB price index increased 11%, from 1.009 to 1.121, whereas that for the nonelderly increased 7%, from 1.096 to 1.173.

These findings for ABs are essentially unaffected when one employs changing share weights and the preferable Divisia index.[32] As seen in the bottom three rows of the top panel of table 2.8 and graphically in figure 2.2, using the Divisia, by 1996 the price index for ABs destined for use by the elderly was 1.07, slightly less than the 1.11 for the young. After 1992, however, the AB price index increased only very slightly for the young (2% from 1.08 in 1992 to 1.11 in 1996), whereas for the elderly it increased considerably more (7%, from 1.00 to 1.07). In part, this old-young differential reflects a greater increase in use of newer branded drugs by the old than by the young since 1992, as noted above. To show this in greater detail, in figure 2.3 we present 1996 elderly utilization for each AB molecule and distinguish brands (light bars) from multisource (dark bars) drugs. The dotted vertical line in figure 2.3 represents the elderly average percentage over all ABs (9.8%). The elderly's differential use of brands and generics can be seen by noting that for the vast majority of drugs involving relatively

30. This fixed-weight procedure is not the same as that employed by the BLS in its CPI for prescription drugs for a number of reasons, including the fact that the CPI uses only OOPs' weights, whereas weights here include retail acquisition costs for products destined for payment by cash, third party and Medicaid. Moreover, the index here refers to retail acquisition costs, not retail sales to patients and payors. Cleeton, Goepfrich, and Weisbrod (1992) and Armknecht, Moulton, and Stewart (1994) describe the BLS's CPI method for prescription drugs.

31. The elderly-nonelderly split for each drug is based on the average of the 1992, 1994, and 1996 NDTI values.

32. For the Laspeyres, the number of AB items is fixed at 156, whereas for the Divisia, the numbers are 162, 172, 188, 188, 190, 192, and 196, respectively, from 1990 to 1996.

Table 2.8
Retail pharmacy acquisition (sell-in) costs and price indexes by therapeutic class, 1990–1996

Class/Category	1990	1991	1992	1993	1994	1995	1996
Antibiotics—Broad- and medium-spectrum							
Total drug costs (thousands)	$2,094,060	$2,527,380	$2,839,640	$3,274,900	$3,422,040	$3,791,320	$3,767,950
Share—Young	.891	.890	.888	.889	.885	.881	.875
Share—Elderly	.109	.110	.112	.111	.115	.119	.125
Share—Brand—All	.814	.846	.892	.897	.894	.833	.879
Share—Generic—All	.186	.154	.108	.103	.106	.167	.121
Young	.187	.156	.110	.105	.109	.173	.126
Elderly	.175	.141	.094	.088	.088	.120	.088
Laspeyres index—All	1.000	1.055	1.087	1.125	1.132	1.096	1.167
Young	1.000	1.055	1.096	1.135	1.141	1.103	1.173
Elderly	1.000	1.056	1.009	1.040	1.060	1.043	1.121
Divisia index—All	1.000	1.055	1.073	1.101	1.112	1.117	1.106
Young	1.000	1.055	1.083	1.112	1.121	1.125	1.109
Elderly	1.000	1.055	0.995	1.020	1.038	1.056	1.072
Antidepressants							
Total drug costs (thousands)	$940,460	$1,047,720	$1,402,000	$1,715,030	$2,396,310	$3,064,150	$3,730,927
Share—Young	.899	.899	.901	.904	.909	.910	.911
Share—Elderly	.101	.101	.099	.096	.091	.090	.089
Share—Brand—All	.882	.899	.905	.893	.935	.956	.970
Share—Generic—All	.118	.101	.095	.107	.065	.044	.029
Young	.115	.098	.090	.100	.061	.041	.028
Elderly	.149	.126	.138	.176	.110	.073	.048

Laspeyres index—All	1.000	1.077	1.176	1.208	1.228	1.267	1.320
Young	1.000	1.077	1.176	1.209	1.230	1.269	1.321
Elderly	1.000	1.074	1.168	1.200	1.209	1.247	1.304
Divisia index—All	1.000	1.077	1.168	1.187	1.190	1.217	1.272
Young	1.000	1.077	1.169	1.189	1.195	1.224	1.279
Elderly	1.000	1.076	1.161	1.172	1.145	1.158	1.201
Calcium Channel Blockers							
Total drug costs (thousands)	$1,697,136	$2,068,896	$2,597,408	$2,821,445	$3,061,874	$3,146,177	$3,179,213
Share—Young	.546	.560	.566	.575	.577	.580	.585
Share—Elderly	.454	.440	.434	.425	.423	.420	.415
Share—Brand—All	.985	.973	.973	.928	.921	.936	.955
Share—Generic—All	.015	.027	.027	.072	.079	.064	.045
Young	.015	.034	.032	.072	.077	.062	.046
Elderly	.014	.018	.021	.072	.082	.068	.045
Laspeyres index—All	1.000	1.072	1.135	1.178	1.197	1.234	1.267
Young	1.000	1.072	1.134	1.175	1.192	1.229	1.261
Elderly	1.000	1.072	1.136	1.181	1.203	1.242	1.273
Divisia index—All	1.000	1.061	1.105	1.132	1.087	1.098	1.105
Young	1.000	1.061	1.103	1.130	1.082	1.093	1.100
Elderly	1.000	1.061	1.108	1.135	1.094	1.105	1.111

Notes: Laspeyres index employs fixed 1990 weights. See text discussion for sources.

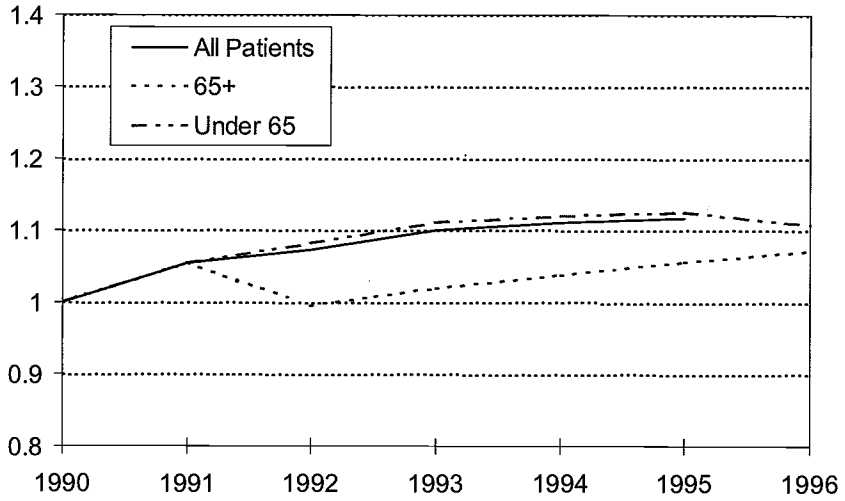

Figure 2.2
Divisia price indexes for antibiotics ("sell in" prices to retail pharmacies)
Source: IMS *Retail Audit*, IMS *NDTI*, authors' calculations.

intense use by the elderly, the molecule in question is a branded, single-source (light bar) drug.

We now turn to retail sell-in prices for antidepressants (ADs). As the top row of the middle panel of table 2.8 shows, retail-sector purchases of ADs surged by a factor of about four between 1990 and 1996, thereby growing considerably more rapidly than those of ABs, although by 1996 total retail acquisition expenditures for the two were about equal, at $3.73 billion for ADs versus $3.77 billion for ABs. ADs were also similar to ABs in that the retail acquisition dollar share for products destined for use by the young for both classes was about 90%, with a very slight upward trend over the period. A distinctive feature of the AD market involves the tremendous growth in sales of the newest generation of ADs, the selective serotonin reuptake inhibitors (SSRIs) such as Prozac, Zoloft, Paxil, Luvox, and Serzone. This high growth of new branded products has resulted in a sharply declining generic dollar share of retail-sector purchases (from 12% in 1990 to 3% in 1996) and a corresponding increase in the dollar share for brands (88% to 97%). In each year between 1990 and 1996, the share of retail drugstore purchases of generic ADs for use by the elderly was larger than that for the young; the 1990 generic shares for old and young were 15% and 12%, respectively, and by 1996 they had fallen to 5% and 3%, respec-

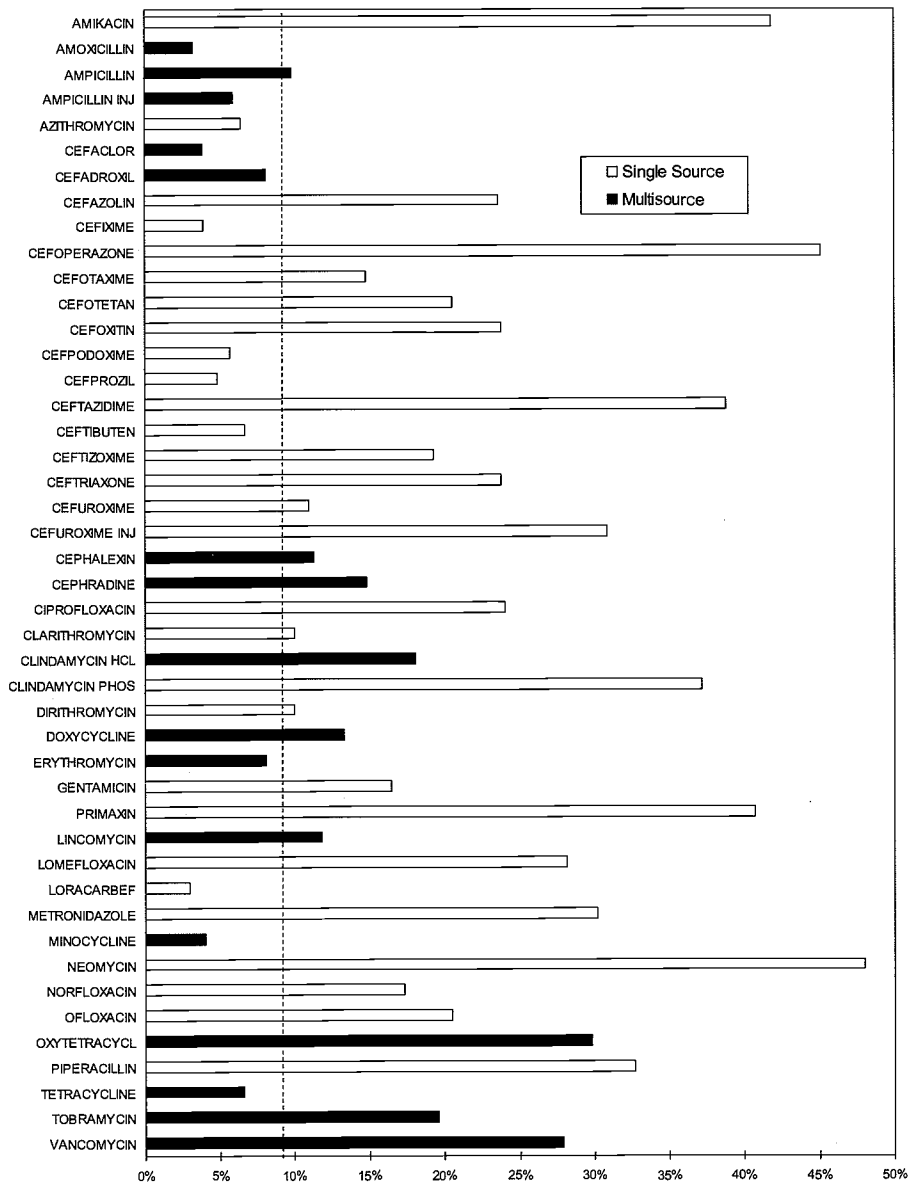

Figure 2.3
Share of 1996 NDTI mentions for age 65+ patients: Antibiotics
Source: IMS *NDTI* and authors' calculations.

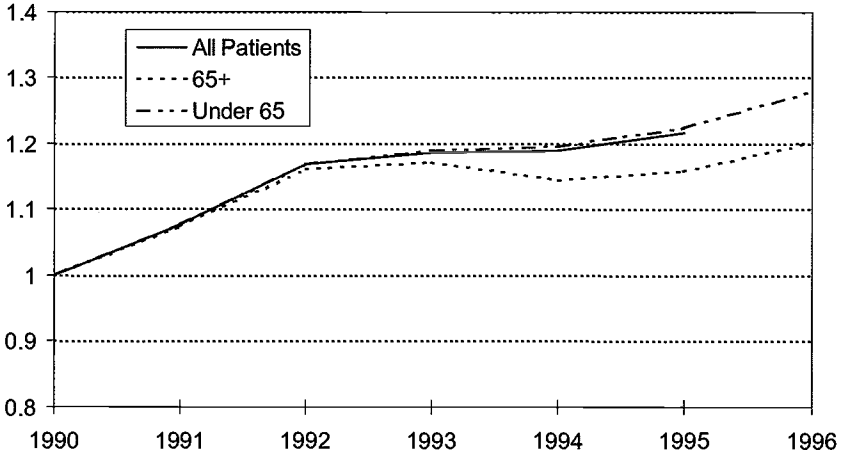

Figure 2.4
Divisia price indexes for antidepressants ("sell in" prices to retail pharmacies)
Source: IMS *Retail Audit*, IMS *NDTI*, authors' calculations.

tively. This differential brand-generic pattern could reflect the phenomenon noted above that certain generic tricyclic antidepressants are often prescribed "off-label" to treat chronic pain syndromes that occur more frequently in the elderly.

With respect to price indexes, we first report results based on the fixed-weight Laspeyres procedure. As shown in the middle panel of table 2.8, the AD price inflation differential between old and young appears to be negligible—by 1996, the Laspeyres index for the elderly was 1.30, very slightly less than that for the young at 1.32.

For the more appropriate Divisia index, which takes changing shares into account, however, the inflation differential is considerably larger, with the 1996 index being 1.20 for the elderly but 1.28 for the young.[33] In figure 2.4 we plot these Divisia AD price indexes for the entire population, for the elderly, and for the young. As the figure shows, price inflation for retail acquisitions of ADs destined for use by the elderly has been appreciably less than that for ADs destined for use by the young.

To understand the reason underlying this inflation differential, in figure 2.5 we plot the elderly share for each AD chemical molecule; the patent-protected drugs are again marked with light bars, and generic

33. The number of items in the 1990 fixed weight Laspeyres index is 46, whereas for the Divisia it is 50 in 1990–1, 54 in 1992–3, 58 in 1994–5, and 60 in 1996.

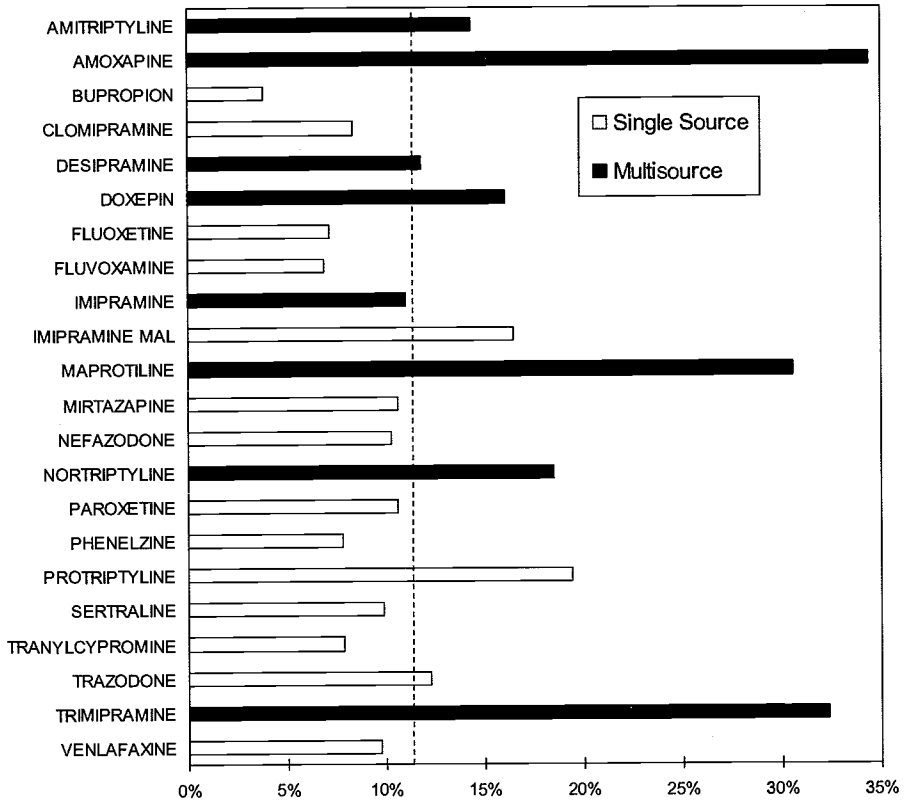

Figure 2.5
Share of 1996 NDTI mentions for age 65+ patients: Antidepressants
Source: IMS *NDTI* and authors' calculations.

or multisource drugs are marked with dark bars; over all AD molecules, the elderly average share is 10.3%, represented by the dotted vertical line. As the figure shows, the elderly's use of off-patent and generic drugs such as trimipramine, protriptyline, nortriptyline, maprotiline, imipramine, doxepin, amoxapine, and amitriptyline is above that of the general population. Elderly use of some newer and still patent-protected branded drugs such as venlafaxine (brand name Effexor), sertraline (Zoloft), paroxetine (Paxil), and nefazodone (Serzone) is about the same as that of the general population, but elderly use of other patent-protected ADs such as fluvoxamine (Luvox), fluoxetine (Prozac), and buproprion (Wellbutrin) is less than that by the general population. Given these differential brand-generic uses by the elderly versus the young, and with generic prices falling while

brand prices are increasing, the basket of ADs destined for use by the elderly is increasing more slowly in price than the basket of ADs destined for use by the young. Because it employs changing share rather than fixed weights, the Divisia index better captures these dynamics. Note that the inflation differential would be even larger if the dollar share of generics had not been falling.

Next we turn to the calcium channel blockers (CCBs), drugs used to treat cardiovascular conditions, which have brand names such as Cardizem, Norvasc, and Procardia XL. As with the ABs, acquisition costs of CCBs among retailers approximately doubled from 1990 to 1996, with total acquisition costs of around $3.2 billion in 1996, about 15% less than for ABs. The elderly share of CCBs, however, is much larger than that for ABs and ADs. As the bottom panel of table 2.8 shows, the retail acquisition dollar share of CCBs for the elderly is more than 40%, having fallen slightly from 45% in 1990 to 42% in 1996. The brand-generic market share pattern is also different, and is not monotonic over time, reflecting in part episodic patent expirations and generic entry within the 1990–96 time frame. For the elderly, the generic share increased from 1% in 1990 to 8% in 1994, then fell to about 4% in 1996; for the young, the respective generic shares are similar, at 2%, 8%, and 4% for those same years, respectively.

In terms of price indexes, because of the relatively small brand-generic differences by age group, there is only a negligible difference between CCB retail-acquisition price inflation for products destined for use by the elderly versus those for the young. Specifically, as shown in the bottom panel of table 2.8 and graphically in figure 2.6, the old-young Laspeyres indexes are 1.27 versus 1.26, whereas for the Divisia they are 1.11 versus 1.10. In large part, this similarity in elderly-nonelderly price inflation for CCBs reflects the fact that brand-generic differences between the old and young are much smaller in any given year for the CCBs than they are for the ADs and ABs. Figure 2.7 displays this more modest relative variability for each of the CCB chemical molecules. Variations in elderly-nonelderly differences, other than for bepridil (brand name Vascor) and nimodipine (Nimotop), are modest.

In summary, therefore, over the entire 1990–96 time period, retail-acquisition price inflation for antidepressants destined for use by the elderly has been less than that for the young, reflecting the elderly's greater use of generic antidepressants. Price inflation has been consid-

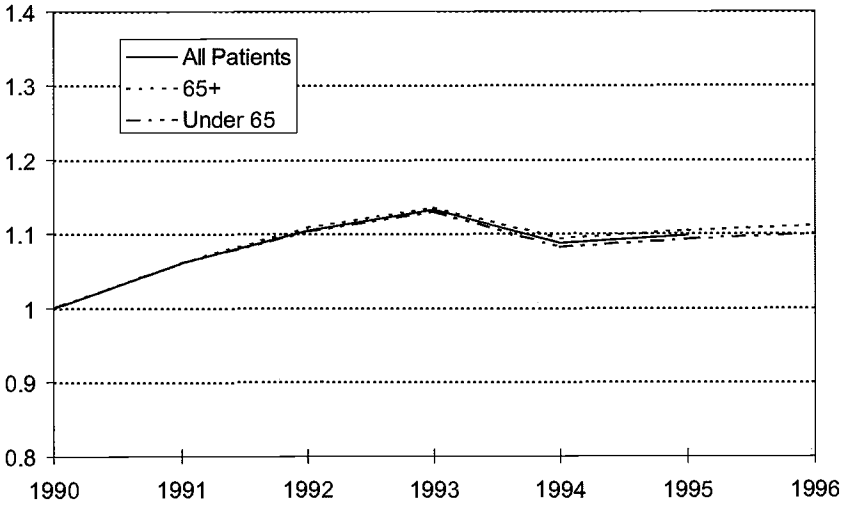

Figure 2.6
Divisia price indexes for calcium channel blockers ("sell in" prices to retail pharmacies)
Source: IMS *Retail Audit*, IMS *NDTI*, authors' calculations.

erably greater since 1992 for antibiotics used by the elderly, but the differential is much smaller over the entire 1990–96 time period. Moreover, for antibiotics, the greater elderly price inflation since 1992 appears to reflect the more rapid growth in the elderly's use of the newest, branded drugs, for which bacterial resistance is less. For calcium channel blockers, however, the elderly-nonelderly inflation differentials are negligible.

Two other general results are worth noting. First, growth over time in the sell-in prices for all three therapeutic classes based on the IMS data employed here is less than the inflation as measured by the BLS's producer price index, even when employing the Laspeyres procedure; the 1990–96 differences here are 1.29% per year for ABs, 1.61% for ADs, and 0.83% for CCBs.[34] This differential could reflect different pricing for leading (best-selling) presentations of drugs (the IMS data) than for the basket examined by the BLS, but it could also reflect a known BLS bias in oversampling older branded drugs. (For further discussion, see

34. These differences are computed as growth in the BLS's PPI by therapeutic class (systemic anti-infectives for ABs, psychotherapeutics for ADs, and cardiovasculars for CCBs), reported in table 2.6, minus growth in the Laspeyres index—All entries of table 2.8.

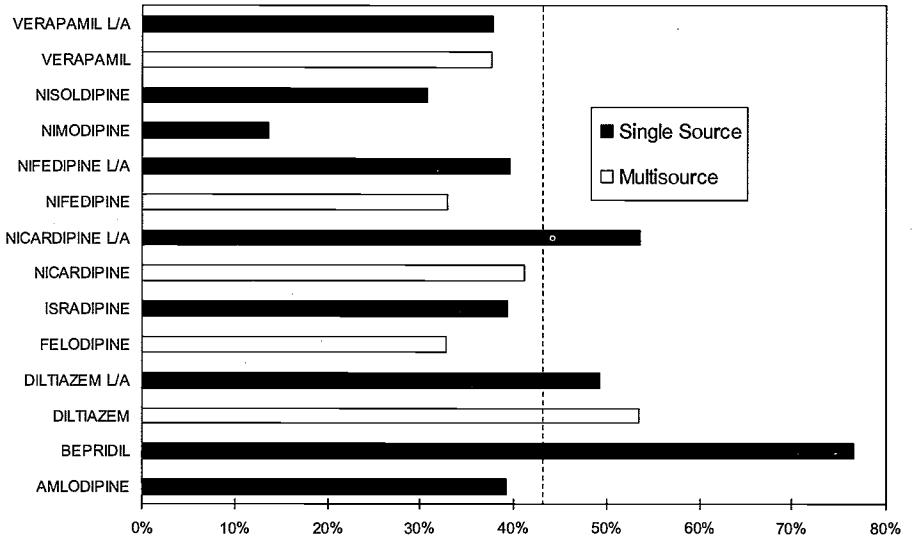

Figure 2.7
Share of 1996 NDTI mentions for age 65+ patients: Calcium channel blockers
Source: IMS *NDTI* and authors' calculations.

Berndt, Cockburn, and Griliches 1996; Berndt, Griliches, and Rosett 1993; IMS America 1996; and Kanoza 1996.)

Secondly, as shown in table 2.8, in each case the fixed-weight Laspeyres price index yields a larger measure of price inflation than does the corresponding Divisia index. Over all consumers, for example, the difference is 0.92% per year for ABs, 0.65% for ADs, and 2.34% for CCBs. If one sums these two differentials, the differences in average annual growth rates between the BLS's PPI and the Divisia for retail acquisition prices is 2.21% for ABs, 2.26% for ADs and 3.17% for CCBs. These results are therefore quite consistent with other findings reported by the CPI commission and emphasize the importance of the recommendations the commission made, particularly those involving use of changing versus fixed weights.

V. Retail Sell-Out Prices: Elderly Versus Nonelderly

We now examine price growth in the final point of the distribution chain, that from retail pharmacies to patients and payors. Our research here must be viewed as preliminary in at least two respects. First, we have been unable to obtain reliable method-of-payment data that sepa-

rates cash, Medicaid, and third-party insurance payment for the elderly and the nonelderly since 1991. Data graciously made available to us involving a third-party insurer implied an implausibly huge decline in the elderly's use of cash as a method of payment. Our inability to obtain reliable national data is unfortunate, for casual empiricism suggests to us that the elderly's use of third-party payment arrangements to pay for drugs has increased more rapidly in the last few years than that of the general population, particularly because the retired have moved into "Medigap" managed-care arrangements that offer prescription drug benefits. If in fact in recent years seniors have moved to third-party drug payment more rapidly than the young (consistent with the OOPs data in table 2.3) and therefore increasingly are less affected by higher cash prices, then seniors are disproportionately availing themselves of lower managed-care prices, resulting in lower drug price inflation (but perhaps still higher average price levels) than that experienced by the nonelderly. Research on this issue must be postponed until appropriate data become available.

Second, the IMS sell-out methods-of-payment data are based on the best-selling presentation of a particular branded or generic drug. Problems emerge in measuring price and quantity changes consistently over time when these leading presentations change for brands, and even more so for specific generic manufacturers, over the time period under consideration. These problems are particularly evident in our data involving the antibiotics and calcium channel blockers, as are related problems involving products embodying combinations of chemical molecules. In the future we will be working with IMS to obtain data on additional presentations for branded and generic chemical molecules as well as information involving the combination products.

For antidepressants, fortuitously, this second problem involving leading presentations turns out essentially not to be an issue. Thus we report here our preliminary findings on sell-out prices by retail pharmacies for only the antidepressant class of prescription drugs. Moreover, because reliable method-of-payment data distinguishing among cash, Medicaid, and third party are not yet available for the elderly and the nonelderly, here we simply employ a weighted average of prices among the three payment methods, assuming the weights in table 2.1 to be the same for the elderly and nonelderly.

IMS method-of-payment data are available only since 1991, whereas the sell-in data analyzed in the previous section go back to 1990. We therefore begin by renormalizing the AD sell-in data from table 2.8 so that the Divisia price index for the AD drugs is 1.000 in 1991. The upper left panel of table 2.9 presents the results of that renormalization. As the table shows, from 1991 to 1996, sell-in prices for AD drugs destined for use by the elderly increased 12%, whereas sell-in prices for AD drugs destined for use by the young increased 19%.

In the introduction to this chapter, we noted the dramatic change over time in retail methods of payment, away from cash and toward third-party payor. For retail pharmacies, the growth in third-party payment implies dealing with a more organized and powerful buyer/payor than is the typical cash customer. We therefore expect that over this time period, sell-out prices (the sum of copayments and third-party reimbursements received by the retail pharmacies) have increased less rapidly than have sell-in prices. One very simple way of highlighting this difference is to compute a "gross margin index," defined as the sell-out price index divided by the sell-in price index, the former incorporating data from table 2.1 on changing methods of payment over time, assumed to be the same for ADs as for all drugs.

In the top right panel of table 2.9, we present the Divisia price index for retail sell-out, normalized to unity in 1991, and in the bottom panel we list the gross margin index, constructed as outlined in the previous paragraph. Two results are particularly interesting.

First, as expected, the increased role of third-party payors since 1991 has pressured pricing downward in the retail pharmacy sector; although AD prices on a sell-in basis increased 18% over all customers from 1991 to 1996, corresponding sell-out prices increased only 14%. Thus, gross margins for retail pharmacies selling AD products fell 3.5% from 1991 to 1996.

Second, this declining gross margin primarily involved sales of ADs to the young, for whom sell-in retail acquisition prices increased 18.8% from 1991 to 1996 while sell-out prices increased 14.2%, implying a decline of 3.8% in gross margins. For the elderly, however, the gross margin hardly declined at all; indeed, it increased very slightly, 0.4%.

One reason for this disparity is that, as noted earlier and shown visually in figure 2.5, the elderly are disproportionately large consumers of generic AD drugs. A number of studies have documented that the retail gross margin on generic drugs is larger, not only in percent-

Table 2.9
Divisia retail sell-in and sell-out price indexes for antidepressants

	Sell-in Divisia price index			Sell-out Divisia price index		
Year	Young	Elderly	Total	Young	Elderly	Total
1991	1.000	1.000	1.000	1.000	1.000	1.000
1992	1.085	1.079	1.084	1.075	1.073	1.075
1993	1.104	1.089	1.102	1.083	1.076	1.082
1994	1.110	1.064	1.105	1.081	1.073	1.080
1995	1.136	1.076	1.130	1.114	1.096	1.112
1996	1.188	1.116	1.181	1.142	1.121	1.140

Gross margin index (Sell-out/Sell-in)

Year	Young	Elderly	Total
1991	1.000	1.000	1.000
1992	0.990	0.994	0.992
1993	0.981	0.988	0.982
1994	0.974	1.008	0.977
1995	0.980	1.018	0.984
1996	0.962	1.004	0.965

Note: Sell-out is in dollars per daily dose of leading presentation, weighted average over channels, with the same channel weights for old and young.

age terms, but often also in absolute amounts, than that on branded products (see, for example, the Federal Trade Commission study by Masson and Steiner (1985) as well as Caves, Whinston, and Hurwitz 1991); that turns out to be the case here as well.[35] One implication of this larger generic retail margin along with disproportionately large elderly use of generics is that retail pharmacy margins have been under greater downward pressure from nonelderly customers than from the elderly. It must be emphasized, however, that these calculations in table 2.9 assume that the method-of-payment trends displayed in table 2.1 are the same for ADs as over all drugs, and the same for the elderly and the young. If in fact the elderly are moving into

35. For one well-known branded selective serotonin reuptake inhibitor, for example, the sell-in price in 1996 was $1.71, but the sell-out price averaged over method-of-payment channel was $2.06, implying a $0.35 absolute margin and a 20.5% percentage gross margin [(sell-out/sell-in) −1]. By comparison, for one well-known older generation tricyclic antidepressant, the sell-in price was $0.12, and the sell-out price was $0.54, implying a $0.42 absolute margin and a 350% percentage gross margin. Note that one would expect the percentage margin to be larger for generics, because a common dispensing fee is added to a lower generic acquisition price.

third-party payment arrangements for drugs more rapidly than the young, these gross margin differentials between young and old tend to be overstated.

VI. Summary and Issues for Further Research

Our purpose in this chapter has been to examine whether prescription drug price inflation in the 1990s has differed between the elderly and the nonelderly when prices are viewed at three alternative points in the distribution chain. Our first finding is that in the aggregate, over all therapeutic classes of prescription drugs, we find essentially no age-related price inflation differential at the initial point in the distribution chain involving manufacturers' sales to wholesalers, retailers, and hospitals.

At an intermediate point in the distribution chain involving acquisition prices of retail pharmacies for purchases from manufacturers and wholesalers, we examined sell-in prices for three therapeutic classes of pharmaceuticals, antidepressants, antibiotics and calcium channel blockers over 1990–96. Here we observed some elderly-young price inflation differentials. Specifically, we found that from 1990 to 1996, the Divisia price index for ADs destined for use by the elderly grew at an average annual growth rate (AAGR) of 3.10%, whereas that for ADs destined for use by the young grew at a higher AAGR of 4.19%. The source of the elderly's lower inflation rate was their disproportionately greater use of older and generic drugs, whose prices are typically falling, whereas those of newer and branded ADs are generally increasing.

For ABs, we observed a slightly different set of trends. Over the entire 1990–96 time period, the Divisia price index for ABs destined for use by the elderly grew at an AAGR of 1.17%, again somewhat less than the 1.74% for those destined for use by the young. Since 1992, however, the elderly price index for ABs has grown at an AAGR of 1.88%, considerably more than the 0.59% for the nonelderly. This difference appears to arise from a more rapid growth among the elderly in the use of the newer, branded drugs than among the young, particularly since 1992. One interpretation of this apparent price inflation differential is that the more fragile elderly are disproportionately using the newer antibiotics that have not yet developed bacterial resistance, when being treated for severe or life-threatening infections such as pneumonia.

Finally, for the calcium channel blockers, the elderly-young sell-in price inflation differential was found to be negligible, with AAGRs being 1.60% for the young and 1.77% for the elderly.

The final point we examined in the distribution chain involves sales of retail pharmacies to consumers and payors. Because of data limitations, we were able to compute sell-out price indexes only for the antidepressant class of prescription drugs. The dramatically increasing share of prescriptions paid for by third-party insurance since 1991 has resulted in retail pharmacy sell-out prices for ADs increasing less rapidly than sell-in prices. The retail pharmacy gross margin index over all customers appears to have fallen about 3.5% between 1991 and 1996, with young patients enjoying most of the benefits of this increased power of managed care over time at the expense of the retail pharmacy sector. For the elderly, the retail gross margin on ADs has not fallen—indeed it has risen very slightly, reflecting in part the fact that the elderly are disproportionately large users of generic ADs, along with the previously documented finding that retail margins on generics tend to be larger than those on branded products. Our sell-out and gross margin calculations assume that trends in methods of payment among cash, Medicaid, and third-party payors are the same for the elderly and the young. To the extent that recently the elderly are enrolling in third-party arrangements with drug benefits at a more rapid rate than the young, this gross margin differential tends to be overstated, as does growth in sell-out prices for the elderly.

One useful extension of our empirical analysis would involve the introduction of mail-order data into our analysis. Although mail-order sales currently account for only about 9% of all prescription drug sales dollars, mail order is a rapidly growing segment, and apparently one in which the elderly are disproportionately represented.[36] Excluding mail-order prescription drug sales from our analysis most likely results in our overstating overall price growth for the elderly.

In this chapter we have made no attempt to adjust estimated price inflation differentials for variations in the quality of the products used by the elderly versus the young, nor have we linked prices of generics at entry with previous prices of their patented antecedents. It is possible, of course, that our findings on greater elderly AB price inflation relative to the young and smaller elderly AD price inflation when

36. Data made available to us involving one mail-order firm showed that more than half the prescriptions it dispensed were mailed to patients 65 years and older.

compared to the young could be entirely reversed were quality adjustments taken into account. Adjusting price changes and price differentials for quality changes is therefore an important issue meriting further research.

One clear finding emerging from this research and corroborated in other studies cited by the CPI commission is that the use of a fixed-weight Laspeyres price index procedure, such as that employed by the BLS, yields price indexes whose growth is misleading and distorted. In particular, for all three classes of drugs studied, and for all groups of customers, price growth as measured by the Laspeyres fixed-weight procedure (as employed by the BLS) resulted in greater measured inflation than the market share chain-weighted Divisia index. This finding is consistent with that of other studies cited in the CPI commission's report and emphasizes the importance of their finding concerning the upward bias of the Laspeyres index and their recommendation of moving to a changing-weight index.

Finally, in this chapter we have examined inflation price differentials involving the elderly and the nonelderly, implicitly assuming that the elderly are homogeneous. It is possible, of course, that there are more differences within the elderly than there are between the elderly and the young. Is income or expenditure inequality greater among the elderly than between the young and elderly? Are there more children living in poverty than there are elderly living solely on Social Security? Clearly, formulating appropriate public policy involving the elderly depends in part on the within versus between issue involving the elderly.[37] In a somewhat different context involving other products, Robert Michael (1979) reports greater variation in expenditures within various demographic groups than between them. Examining the variability in health expenditures and in price inflation for health-related items within the elderly demographic group is therefore also a topic worthy of further attention. (See recent unpublished research findings by David Cutler and Elizabeth Richardson (1997) and Angus Deaton and Christina Paxson (1997).

References

Acs, Gregory, and John Sabelhaus. 1995. "Trends in Out-of-Pocket Spending on Health Care, 1980–92." *Monthly Labor Review* 118(12):35–45.

37. For an early discussion of this issue in the Stigler Commission report, see Snyder 1961.

Amble, Nathan, and Ken Stewart. 1994. "Experimental Price Index for Elderly Consumers." *Monthly Labor Review* 117(5):11–6.

Armknecht, Paul A., Brent R. Moulton, and Kenneth J. Stewart. 1994. "Improvements to the Food at Home, Shelter and Prescription Drug Indexes in the U.S. Consumer Price Index." U.S. Department of Labor, Bureau of Labor Statistics, CPI Announcement-Version I, October 20.

Baker, Cathy, and Natalie Kramer. 1991. "Employer-Sponsored Prescription Drug Benefits." *Monthly Labor Review* 114(2):31–5.

Berndt, Ernst R., Iain Cockburn, and Zvi Griliches. 1996. "Pharmaceutical Innovations and Market Dynamics: Tracking Effects on Price Indexes for Antidepressant Drugs." In Martin N. Baily, Peter C. Reiss, and Clifford Winston, eds., *Brookings Papers on Economic Activity: Microeconomics 1996:* 133–88. Washington, D.C.: Brookings Institution.

Berndt, Ernst R., Zvi Griliches, and Joshua G. Rosett. 1993. "Auditing the Producer Price Index: Micro Evidence from Prescription Pharmaceutical Preparations." *Journal of Business and Economic Statistics* 11(3):251–64.

Caves, Richard E., Michael D. Whinston, and Mark A. Hurwitz. 1991. "Patent Expiration, Entry, and Competition in the U.S. Pharmaceutical Industry." In Martin Neil Baily and Clifford Winston, eds., *Brookings Papers on Economic Activity, Microeconomics, 1991,* 1–66. Washington, D.C.: Brookings Institution.

Cleeton, David L., Valy T. Goepfrich, and Burton A. Weisbrod. 1992. "What Does the Consumer Price Index for Prescription Drugs Really Measure?" *Health Care Financing Review* 13(3):45–51.

Cowan, Cathy A., Bradley R. Braden, Patricia A. McDonnell, and Lekha Sivarajan. 1996. "Business, Households, and Government: Health Spending, 1994." *Health Care Financing Review* 17(4):157–78.

Cutler, David M., Mark McClellan, Joseph P. Newhouse, and Dahlia Remler. 1996. "Are Medical Prices Declining?" Working Paper no. 5750, National Bureau of Economic Research, Cambridge, MA.

Cutler, David M., and Ellen Meara. 1997. "The Medical Cost of the Young and Old: A Forty Year Perspective. Paper presented at the National Bureau of Economic Research Conference on Aging, Boulder, CO, April 1997.

Cutler, David M., and Elizabeth Richardson. 1997. "Inequality in Health." Cambridge, MA: National Bureau of Economic Research. Unpublished.

Daugherty, James C. 1964. "Health Insurance in the Revised CPI." *Monthly Labor Review* 87(11):1299–300.

Deaton, Angus M., and Christina Paxson. 1997. "Health, Income and Inequality Over the Life Cycle." Princeton, NJ: Princeton University, Department of Economics. Unpublished.

Fixler, Dennis. 1996. "The Treatment of the Price of Health Insurance in the CPI." U.S. Department of Labor, Bureau of Labor Statistics, Washington, DC. Unpublished.

Ford, Ina Kay, and Philip Sturm. 1988. "CPI Revision Provides More Accuracy in the Medical Care Services Component." *Monthly Labor Review* 111(4):17–26.

Garner, Thesia I., David S. Johnson, and Mary F. Kokoski. 1996. "An Experimental Consumer Price Index for the Poor." *Monthly Labor Review* 119(9):32–42.

Gephardt, Richard A. 1997. "Budget Gimmick." *Washington Post*, 1 May, p. A23.

Getzen, Thomas E. 1992. "Medical Care Price Indexes: Theory, Construction and Empirical Analysis of the US Series, 1927–1990." In Richard M. Scheffler and Louis F. Rossiter, eds., *Advances in Health Economics and Health Services Research*, vol. 13: 83–128. Greenwich, CT: JAI Press.

Griliches, Zvi, and Iain Cockburn. 1994. "Generics and New Goods in Pharmaceutical Price Indexes." *American Economic Review* 84(5):1213–32.

Hitschler, Pamela B. 1993. "Spending by Older Consumers: 1980 and 1990 Compared." *Monthly Labor Review* 116(5):3–13.

IMS America. 1996. *Information Services Manual*. Plymouth Meeting, PA: IMS.

Kanoza, Douglas. 1996. "Supplemental Sampling in the PPI Pharmaceuticals Index." *Producer Price Indexes Detailed Price Report*, January, pp. 8–10.

Kuttner, Robert. 1997. "The CPI Fix." *Boston Globe*, March 10, p. A15.

Lane, Walter. 1996. "Changing the Item Structure of the Consumer Price Index." *Monthly Labor Review* 119(12):18–25.

Langford, Elizabeth. 1957. "Medical Care in the Consumer Price Index, 1935–56." *Monthly Labor Review* 80(9):1053–8.

Levit, Katharine R., Helen C. Lazenby, Bradley R. Braden, Cathy A. Cowan, Patricia A. McDonnell, Lekha Sivarajan, Jean M. Stiller, Darleen K. Won, Carolyn S. Donham, Anna M. Long, and Madie W. Stewart. 1996. "National Health Expenditures, 1995." *Health Care Financing Review* 18(1):175–214.

Lu, John, and William S. Comanor. 1996. "Strategic Pricing of New Pharmaceuticals." Working paper no. 96-1, UCLA School of Public Health, Research Program in Pharmaceutical Economics and Policy, Los Angeles, CA. (Forthcoming, *Review of Economics and Statistics*.)

Mason, Charles C. 1988. "An Analysis of the Rates of Inflation Affecting Older Americans Based on an Experimental Reweighted Consumer Price Index." Report presented to the U.S. Congress, June.

Masson, Alison, and Robert L. Steiner. 1985. *Generic Substitution and Prescription Prices: The Economic Effects of State Drug Laws*. Washington DC: Bureau of Economics, Federal Trade Commission.

Michael, Robert T. 1979. "Variation across Households in the Rate of Inflation." *Journal of Money, Credit and Banking* 11(1):32–44.

Moulton, Brent R., and Kenneth J. Stewart. 1997. "An Overview of Experimental U.S. Consumer Price Indexes." Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics. Unpublished.

Pharmaceutical Research and Manufacturers of America. 1997. *1997 Industry Profile*. Washington, DC: Pharmaceutical Research and Manufacturers of America.

Rice, Dorothy P., and Loucele A. Horowitz. 1967. "Trends in Medical Care Prices." *Social Security Bulletin* 30(7):13–28.

Ristow, William. 1996. "IMS Presentation to the BLS." IMS America, Plymouth Meeting, PA, July. Mimeographed.

Rubin, Rose M., and Kenneth Koelin. 1996. "Elderly and Nonelderly Expenditures on Necessities in the 1980s." *Monthly Labor Review* 119(9):24–31.

Shapiro, Matthew D., and David W. Wilcox. 1996. "Mismeasurement in the Consumer Price Index: An Evaluation." Working paper no. 5590, National Bureau of Economic Research, Cambridge, MA. (Forthcoming, *NBER Macroeconomics Annual 1996.*)

Snyder, Eleanore M. 1961. "Cost of Living Indexes for Special Classes of Consumers." Staff Paper 7, in United States Congress, Committee on Joint Economic Activity, *Government Price Statistics*, Hearings before the Subcommittee on Economic Statistics of the Joint Economic Committee, Congress of the United States, 87th Congress, 1st Session, Pursuant to Sec. 5(a) of Public Law 304 (79th Congress), Part 1, January 24, 337–72.

Triplett, Jack E. 1997. "What's Different About Health? Human Repair and Car Repair in National Accounts." National Bureau of Economic Research, Cambridge, MA. Unpublished draft manuscript.

United States Department of Health, Education and Welfare. 1967. *Report to the President on Medical Care Prices.* Washington, DC: U.S. Government Printing Office.

United States Department of Labor, Bureau of Labor Statistics. Various years/issues. *CPI Detailed Report.* Washington, DC: U.S. Government Printing Office.

United States Department of Labor, Bureau of Labor Statistics. 1996. *Producer Price Indexes.* Washington, DC: U.S. Government Printing Office.

United States Department of Labor, Bureau of Labor Statistics. 1992. *Handbook of Methods.* Bulletin 2414. Washington, DC: U.S. Government Printing Office.

United States Senate Finance Committee. 1996. *Final Report from the Advisory Commission To Study The Consumer Price Index.* Washington DC: U.S. Government Printing Office.