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Pharmaceutical Innovations and Market Dynamics: Tracking Effects on Price Indexes for Antidepressant Drugs

THE CONSTRUCTION AND PUBLICATION of measures of price inflation are important tasks carried out by governmental statistical agencies. In the United States the Department of Labor's Bureau of Labor Statistics (BLS) publishes price indexes measured at the point of final consumer demand (the consumer price index, CPI) and at the initial transaction

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point, that is, prices received by producers from whomever makes the first purchase (the producer price index, PPI). These price measurement tasks are difficult ones, particularly because new goods embody scientific discoveries and technological progress; inherent difficulties exist in measuring the output of services that themselves combine goods and time, and dynamic structural and compositional changes occur in the underlying markets for production, distribution, and sale.

The marketplace for health care contains all these features and presents particularly difficult challenges for price measurement. Health care expenditures represent a significant portion of gross domestic product (GDP) and are likely to become increasingly important as the U.S. population ages. The conceptual foundations for a health care–related CPI are clouded, not only because physicians typically act as agents for consumers, but also because insurance plans pay for many, but not all, health care products and services. Thus, for example, the CPI for prescription pharmaceutical products currently weights only cash payment transactions from drugstores and mail-order outlets; it excludes prescription drugs purchased by managed care plans, Medicaid, or other third parties on behalf of an individual.[1]

Here we focus attention on the measurement of a health-care-related PPI, which, while arguably simpler than a CPI, nonetheless presents enormous measurement difficulties and obstacles.[2] A PPI measures changes in selling prices that domestic producers receive for their output. It is frequently used in deflating current dollar expenditures to obtain a measure of real output growth by industry. The reliability and accuracy of PPIs are therefore critical to understanding the substantial growth in health care expenditures during the last ten years. Growth rates in PPIs by industry are also used to assess inflationary pressures and pricing behavior in the health care sectors or to make international comparisons. While the PPI is an output price index for a specific industry, say, pharmaceuticals, it is also an input price index for wholesalers who in turn sell to retail drugstore chains, hospitals, mail-order

1. For further discussion, see Cleeton, Goepfrich, and Weisbrod (1992), and U. S. General Accounting Office (1996).

2. For a recent discussion on problems involved in interpreting various measures of wholesale prices such as the average wholesale price (AWP, also known as "Ain't What's Paid"), see Bill Alpert, "Hooked on Drugs: Why Do Insurers Pay such Outrageous Prices for Pharmaceuticals?" *Barron's*, June 10, 1996, pp. 15–19.

firms, and managed care organizations.[3] Because issues of pharmaceutical pricing and health care cost containment are currently of great importance to public policy analysts, government statisticians, consumers' groups, and industry officials, it is particularly timely to audit closely the accuracy and reliability of one of the BLS health care–related PPIs. That is our purpose in this paper. Although we focus on the PPI, many of the issues we address are also germane to concerns cited by the Advisory Commission To Study the Consumer Price Index in its final report, released in December 1996.

The market on which we focus our audit is that for antidepressant prescription pharmaceuticals sold between January 1980 and February 1996. We have chosen this market segment and time period for several reasons, all relating to the high likelihood of there being substantial challenges here in tracking price changes.[4]

First, several very successful new products have been introduced in the antidepressant drug class, with well-known brand names such as Prozac, Zoloft, and Paxil having combined annual sales of more than $3 billion in the mid-1990s.[5] Eight of the twenty-one currently marketed chemical entities (molecules) are new branded products launched since 1988. Thus, issues concerning the incorporation of new goods into price measurement, as well as adjustments for quality change, could be very important in this market class.

Second, not only has new product entry been substantial, but within the last ten years, seven branded antidepressants lost patent protection, and each has subsequently faced competition from lower-priced generic entrants. Those buyers who regard the branded and generic versions of a chemical entity as more or less perfect substitutes realize a substantial price decline after generic entry. Although the BLS has been making changes in its CPI procedures for several years, until mid-1996 its PPI methods did not adequately link generic products to their patented antecedents and instead generally treated generics as entirely new goods;

3. In the United States, the vast majority of pharmaceutical manufacturer sales are to wholesalers, not to hospitals, drugstore chains, or managed care organizations.

4. For related studies on issues in the economics of mental health, see Frank and Manning (1992), and Jonsson and Rosenbaum (1993). Keith and Berndt (1994) provide an overview of price measurement issues in the pharmaceutical industry.

5. Ellen Joan Pollock, "Side Effects: Managed Care's Focus on Psychiatric Drugs Alarms Many Doctors," *Wall Street Journal*, December 1, 1995, p. A1.

thus these older PPI methods failed to record price declines realized by some purchasers of generic drugs.

Recently the BLS announced that the May 1996 pharmaceutical PPIs would incorporate linking procedures for generic drugs that treat generics and their branded antecedents as perfect substitutes. The overall implications of this significant change are not yet clear. Our analysis of 1980–96 data in the antidepressant prescription drug marketplace provides important information on what BLS-measured price growth for antidepressants would have been had these changes been introduced earlier. We also assess the sensitivity of measured aggregate price growth to alternative linking and weighting assumptions that the BLS could have employed. Because we report findings for an entire therapeutic class, namely, antidepressants, this research extends that of Griliches and Cockburn, who provided illustrative empirical evidence concerning two systemic anti-infective drugs.[6]

A third reason for focusing on antidepressant drugs is that they are but one component in the treatment of depression, along with psychotherapy and medical management. To some extent, psychotherapy and antidepressant drugs are substitutes for each other; indeed, controversy surrounds the extent to which managed care organizations are substituting prescription drugs for talk therapy.[7] The research findings reported here compose one element of a larger research effort in which we are creating a price index for the treatment of depression that incorporates both drug and talk therapy components.

In this paper we begin with a background discussion on the nature of the medical condition called depression and provide a historical overview on the evolving medical understanding of psychotherapeutic drugs used for the treatment of depression. We then outline data sources and describe the changing marketplace for antidepressant drugs from 1980 to 1996, particularly new product introductions and postpatent expiration entry by generic firms. We review BLS procedures for tracking producer prices in general and antidepressant drugs in particular. We next consider issues from economic theory and then present results

6. Griliches and Cockburn (1994).

7. See, for example, Carol Hymowitz and Ellen Joan Pollock, "Cost-Cutting Firms Monitor Couch Time as Therapists Fret," *Wall Street Journal*, July 13, 1995, p. A1; and Pollock, "Managed Care's Focus on Psychiatric Drugs Alarms Many Doctors," p. A1. For empirical evidence, see Berndt, Frank, and McGuire (forthcoming).

on alternative procedures for measuring price inflation, including those involving hedonic price adjustment. Finally we discuss implications of our results and offer suggestions for further research.

Depression: Diagnosis and Prevalence

Whether depressive disorders are discrete and distinguishable from "subclinical" depressive symptoms is a question clinicians and researchers have long debated; it still has no definitive answer. Almost everyone at some time or another has experienced melancholy or been depressed as a mood, affect, or emotion. To be human is to know about a variety of emotions, including sadness, disappointment, and despondency. Many such affective occurrences are within the normal range of human experience. It is only with greater degrees of severity or longer durations that such affective states come to be viewed clinically as symptomatic of depression.

The American Psychiatric Association has issued and updated clinical guidelines for diagnosing depression.[8] The current guidelines, known as DSM-IV, list nine symptoms of depression: (1) a depressed mood; (2) diminished interest or pleasure in most activities; (3) significant unintentional weight loss or weight gain, or a decrease or increase in appetite; (4) insomnia or hypersomnia nearly every day; (5) psychomotor agitation or retardation nearly every day; (6) fatigue or loss of energy nearly every day; (7) feelings of worthlessness or excessive or inappropriate guilt; (8) diminished ability to think or concentrate, or indecisiveness; and (9) recurrent thoughts of death or suicide. To be diagnosed as having a major depressive episode, a person must show at least five of these symptoms (including either a depressed mood or diminished interest in most activities) for two or more weeks.[9] These symptoms must also represent a change from the individual's previous functioning.

A chronic but milder form of depression is known as dysthymia and is diagnosed when the patient has a depressed mood that persists for at

8. See American Psychiatric Association (1968, 1980, 1987, 1993).

9. It must also be the case that an organic factor cannot be established as initiating and maintaining the disturbance or that the disturbance is not a normal reaction to the death of a loved one.

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