Medicare Part D and the Financial Protection of the Elderly[†]

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We examine the impact of the expansion of public prescription-drug insurance coverage from Medicare Part D and find evidence of substantial crowd-out. Using the 2002–2007 waves of the Medical Expenditure Panel Survey, we estimate the extension of Part D benefits resulted in 75 percent crowd-out of both prescription-drug insurance coverage and expenditures of those 65 and older. Part D is associated with sizeable reductions in out-of-pocket spending, much of which has accrued to a small proportion of the elderly. On average, we estimate a welfare gain from Part D comparable to the deadweight cost of program financing. (JEL H51, I18, J14)

The Medicare Modernization Act of 2003, better known as the legislation that added the Part D prescription-drug benefit to the Medicare program, represents the single most significant expansion of public insurance programs in the United States in the past 40 years. This program increased the costs of the Medicare program by over 10 percent in order to provide, for the first time, prescription-drug coverage to enrollees. After some initial difficulties in getting the program running, it has enrolled a sizeable share of elders, and now pays for a large percentage of all prescriptions nationally.

Despite the size of this new program, however, we know very little about its effectiveness. One measure of program effectiveness is its success in providing financial security to the nation's elders. If Part D covered prescription-drug spending that was putting older Americans at financial risk previously, then there may be large welfare gains from the associated consumption smoothing. But if Part D simply served to "crowd out" existing insurance arrangements, then the welfare gains may be much smaller.

In this paper, we evaluate the gain in financial protection provided by the Part D program. We do so using the 2002–2005 and 2007 waves of the Medical Expenditure Panel Survey (MEPS), before and after the implementation of this program. These

rich survey data contain information not only on insurance coverage, but also prescription-drug expenditures by source of payment, including out-of-pocket. This allows us to carefully model the impact of the Part D program on the distribution of expenditure risk.

We address three separate questions. First, we examine whether the passage of Part D was associated with increased prescription-drug coverage among the elderly, compared to the near-elderly, those just below 65. We find that elderly prescription-drug coverage increased by 10 percentage points, a dramatic rise. However, this figure represents only twenty-five percent of elders who received public coverage. This suggests that Part D to a large extent crowded out of other forms of prescription-drug coverage.

Second, we use the MEPS data to examine the impact of Part D on the prescription-drug spending by payment source among the elderly. We find that expenditure rose dramatically among the elderly; our central estimates suggest that there was an overall increase of $525 per year spent on drugs as a result of Part D. Yet total public expenditure on prescription drugs rose by $2,100, so that crowd-out was once again on the order of 75 percent.

Third, we use the MEPS to examine the impact of Part D on the distribution of out-of-pocket prescription-drug spending among the elderly. We find that Part D led to a sizeable decline in out-of-pocket drug spending, and that this decline was concentrated in the top of the expenditure distribution. There is little evidence that the reduction in out-of-pocket drug spending was offset by increases in other out-of-pocket medical spending. We then follow Martin Feldstein and Gruber (1995) and Amy Finkelstein and Robin McKnight (2008) and compute the certainty equivalent of the increased insurance provided by this program. Although somewhat speculative, our estimates suggest that the welfare gains from the increased insurance provided by Part D were small for most, but large enough for some to yield sizeable overall welfare gains, on the same order of magnitude as the deadweight loss of financing the Part D program.

Our paper proceeds as follows. Section I presents some background on Part D, and reviews the small literature that has emerged on this program. Section II discusses our data and empirical strategy. Section III presents our results on prescription-drug coverage, while Section IV presents our results on prescription-drug expenditures. Section V estimates the welfare gain from the introduction of Part D in terms of reduced out-of-pocket spending risk. There is a brief conclusion.

I. Background

A. *The Medicare Part D Program*

From 1998 through 2003, one of the most heated topics of public policy debate in the United States was the addition of a prescription-drug benefit to the Medicare program. Medicare, which provides universal health insurance coverage to those age 65 and older, as well as to those on the federal disability insurance (DI) program, was established in 1965. The original program covered most medical needs for the elderly and disabled, including hospital and doctor costs, but it excluded

coverage for prescription drugs. This omission was not perceived as a major one in the early years of the program, but in the 1990s the advancement of prescription-drug treatments for common illnesses among the elderly drew attention to this gap in coverage. Medicare recipients, for example, spent an average of $2,500 each on prescription drugs in 2003, more than twice what the average American spent on all health care in 1965, adjusted for inflation.[1]

The debate in Congress over adding this benefit was a contentious one. Advocates viewed the lack of drug coverage as an unnecessary and unfair "hole" in the supposed universal coverage provided to our nation's elderly and disabled. Opponents saw it as an unwarranted expansion of the government's role in the provision of health insurance. Finally, in 2003, the Bush administration and Congress reached an agreement on a far-reaching prescription-drug benefit package at a projected cost to the federal government of $40 billion per year for its first ten years.

This new Medicare benefit is delivered by private insurers under contract with the government. Beneficiaries can choose from three types of insurance plans for coverage of their drug expenditures: stand-alone plans, called Medicare Prescription Drug Plans (PDP), that just offer prescription-drug benefits; Medicare Advantage (MA) plans, which are plans that provide all Medicare benefits (including prescription drugs) such as HMO, PPO, or private FFS plans; or, beneficiaries could retain their current employer/union plan, as long as coverage is "creditable" or at least as generous as (i.e., actuarially equivalent to) the standard Part D plan, for which the plan sponsor would receive a subsidy from the government, known as the Retiree Drug Subsidy (RDS).

Under Part D, recipients were entitled to basic coverage of prescription drugs by a plan with a structure actuarially equivalent to the following in 2006: no coverage of the first $250 in drug costs each year; 75 percent of costs for the next $2,250 of drug spending (up to $2,500 total); 0 percent of costs for the next $3,600 of drug spending (up to $5,100 total, the "donut hole"); and 95 percent of costs above $5,100 of drug spending.[2] Over 90 percent of beneficiaries in 2006, however, were not enrolled in this standard benefit design, but rather in actuarially equivalent plans with low or no deductibles, flat payments for covered drugs following a tiered system, or some form of coverage in the coverage gap. The main requirement for plans is that they must have equal or greater actuarial value than the standard benefit. The government also placed restrictions on the structure of the formularies that plans could use to determine which prescription medications they would insure. Overall, Part D sponsors have great flexibility in terms of plan design.

Enrollment in Part D plans was voluntary for Medicare-eligible citizens, although Medicare recipients not signed up by May 15, 2006, were subject to a financial penalty if they eventually joined the program (to mitigate adverse selection in the choice of joining the program). One group, however, was automatically enrolled: low-income elders who had been receiving their prescription-drug coverage through

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[1] Data for prescription-drug spending comes from the Congressional Budget Office (2002). Data for average Americans' health spending comes from the "National Health Expenditures" section of the Centers for Medicare and Medicaid Services' National Health Accounts.

[2] These thresholds are adjusted for inflation each year.

state Medicaid programs (the "dual eligibles"). These dual eligibles were enrolled in Part D plans by default if they did not choose one on their own. The Part D plans for dual eligibles could charge copayments of only $1 for generics/$3 for name brand drugs for those below the poverty line, and only $2 for generics/$5 for name brand drugs for those above the poverty line, with free coverage above the out-of-pocket threshold of $3,600.[3]

Despite reluctance voiced before the legislation passed, there was enormous interest from insurers in participating in the Part D program. By November 2006, 3,032 plans were being offered to potential Part D enrollees. Every county in the nation had at least 27 plans available; the typical county had 48 plans, while some counties featured more than 70 choices, primarily due to a high number of MA plans (in particular, in Arizona, California, Florida, New York, and Pennsylvania).[4]

Table 1 shows aggregate data on Part D enrollment for selected periods since adoption, the first three rows of which correspond most closely with the timing of our MEPS sample described below. In late 2005 and early 2006, enrollment in the program was fraught with problems, but, in the months that followed, the federal government was able to iron out many of the difficulties that had arisen during the initial transition. Moreover, surveys showed that while only roughly 37 percent of seniors felt they understood the new Medicare program in November, 2005, that number had risen to almost 50 percent by April 2006 (Kaiser Family Foundation 2006).

As columns 3 and 4 of the table show, as of June 2006, there were 16.5 million people enrolled in stand-alone PDPs, of which 6.1 million were dual eligible and 10.4 million were not dual eligible. In addition, 6 million people were enrolled in MA plans. Overall, 22.5 million or 53 percent of the approximately 43 million Medicare beneficiaries were enrolled in a Part D plan. An additional 15.8 million were not enrolled in Part D, but had some form of creditable coverage (columns 6 and 7). Of these, 6.8 million had employer/union coverage that was subsidized through the RDS part of the Medicare Modernization Act. In all, only 4.4 million or roughly 10 percent of Medicare beneficiaries had no prescription-drug coverage as of June, 2006 (column 8).

Since then, Part D enrollment has grown, up from 53 percent to 60 percent of Medicare beneficiaries by October, 2010. Most of this growth has come from increased participation in Medicare Advantage drug plans. There has been a noticeable recent decline in creditable employer/union coverage, suggesting some medium-term crowd-out effects.

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[3] In addition, two other groups receive substantial subsidies—those found eligible for the Low Income Subsidy (LIS) or for the Partial Subsidy by the SSA. To qualify for LIS, beneficiaries must have income less than 135 percent of the poverty line and resources less than $7,500 per individual or $12,000 per couple. This group received benefits comparable to the dual eligibles with incomes above 100 percent of the poverty line. To qualify for the Partial Subsidy, beneficiaries must have income at 135–150 percent of the poverty line and resources less than $11,500 per individual or $23,000 per couple. This group can enroll in plans with a $50 deductible, a 15 percent copayment up to the out-of-pocket threshold, and $2/$5 copayments above that point. In addition, premiums are fully paid by the government up to 135 percent of the poverty line, and then partially subsidized up to 150 percent of the poverty line.

[4] Details on number of plans in a median county obtained from Prescription Drug Plan Formulary and Pharmacy Network Files for 2006, provided by CMS.

TABLE 1—AGGREGATE DATA ON MEDICARE PART D ENROLLMENT IN MILLIONS FOR SELECTED PERIODS SINCE ADOPTION, AND AS A PERCENT OF ALL MEDICARE BENEFICIARIES (*In parentheses*)

| | Medicare beneficiaries | Enrolled in a Part D plan | | | | Not enrolled in Part D | | |
| | | | Stand-Alone Prescription Drug Plan (PDP) | | Medicare Advantage Drug Plan | Creditable coverage | | |
Month/year	Total (1)	Total (2)	Non-dual eligibles (3)	Dual eligibles (4)	Total (5)	Employer or union (6)	Other (7)	No coverage (8)
June, 2006	43.0	22.5 (53%)	10.4 (24%)	6.1 (14%)	6.0 (14%)	10.4 (24%)	5.4 (13%)	4.4 (10%)
June, 2007	44.0	23.9 (54%)	11.0 (26%)	6.3 (15%)	6.7 (16%)	10.3 (24%)	4.9 (11%)	4.0 (9%)
February, 2008	44.2	25.4 (57%)	11.2 (25%)	6.2 (14%)	8.0 (18%)	10.2 (23%)	4.0 (9%)	4.6 (10%)
March, 2009	45.2	26.7 (59%)	11.2 (25%)	6.3 (14%)	9.2 (20%)	7.9 (18%)	6.2 (14%)	4.5 (10%)
October, 2010	47.0	27.7 (60%)	11.4 (24%)	6.3 (13%)	9.9 (21%)	8.3 (18%)	5.9 (13%)	4.7 (10%)

Notes: Taken from Kaiser Family Foundation's *Medicare Fact Sheet: The Medicare Prescription-Drug Benefit* (various months). Columns 3 and 4 include employer/union only direct contract PDPs, which incorporate or wrap around public coverage. Column 6 includes employer/union plans for retired workers that do and do not receive the Retiree Drug Subsidy (RDS) under Part D, as well as TRICARE and FEHBP coverage. Column 7 includes coverage from state pharmacy assistance programs (SPAP), Indian Health Service, Veterans Affairs (VA), Medigap, multiple sources of creditable coverage, employer/union plans for active workers, and other sources.

B. *Other Research on Part D*

The small literature that has emerged on the Medicare Part D program has investigated primarily two issues, as reviewed in Mark Duggan, Patrick Healy, and Fiona Scott-Morton (2008). The first is the determinants, and efficacy, of decisions to enroll in the program and which plan to choose. Florian Heiss, Daniel McFadden, and Joachim Winter (2006) find that the vast majority of those who would benefit from enrolling in the Part D program did so, but that enrollees did not appear to choose cost-minimizing plans. That latter result is confirmed in Jason Abaluck and Gruber (2011), who undertook a more detailed assessment of plan choice with data on the prescription-drug utilization and plan enrollment decisions of a large sample of elders, for whom they have prescription claims records. They estimated a discrete choice model that highlights three key anomalies in plan choices. First, elders dramatically underweighted their expected out-of-pocket costs across plans relative to their premium costs. Second, elders paid attention to plan characteristics, such as donut-hole coverage, in making plan choices, but only in a general sense and not really as it applies to them. For example, the share of elders who chose donut-hole coverage was largely invariant in the level of prescription-drug spending. Finally, there was very little attention paid to the variance the elders faced in their drug expenditures under different plans. As a result, Abaluck and Gruber (2011) found that the vast majority of elders were not making cost-minimizing plan choices.

The second set of articles on Part D evaluates the impacts of the plan on prescription-drug utilization. These studies all suggest large utilization effects, but the magnitudes differ considerably. Frank Lichtenberg and Shawn Sun (2007) found that Medicare Part D increased utilization of prescription drugs by the elderly by about 13 percent, and raised total US prescription-drug utilization by almost 5 percent. Wesley Yin et al. (2008) estimated a more modest increase in utilization of 5.9 percent, with a decline in out-of-pocket expenditures of over 13 percent. Similarly, Nasreen Khan and Robert Kaestner (2009) estimated a 4–10 percent increase in utilization. Jonathan Ketcham and Kosali Simon (2008) found a decline in out-of-pocket costs for the elderly of 17 percent, and an increase of 8 percent in total prescription-drug spending (from all payment sources).

Duggan and Scott-Morton (2010) found a very large increase of over 50 percent in prescription-drug utilization among the elderly. That article also showed a large reduction in prices for brand-name prescription drugs with close substitutes due to Medicare Part D. This occurred because plans could structure their formularies to drive demand toward generics and preferred brands, yielding substantial bargaining power with pharmaceutical companies.

We are aware of only two studies that address the issue of how Part D has affected financial security. Lichtenberg and Sun (2007) also investigated the source of payments for prescriptions. They found that for every seven new prescriptions paid for by the government, there was a reduction of five prescriptions paid for by the private sector. This implied a very large "crowd-out" of private insurance by this new program, a topic that we explore further below.

Most relevant for our paper is a recent study by Helen Levy and David R. Weir (2010), who used data from the Health and Retirement Study (HRS) to examine Part D enrollment and a limited form of crowd-out. Their results for enrollment are consistent with our findings below, but their definition of crowd-out differs from ours. They define dropped coverage as crowd-out, whereas our definition is broader, encompassing the provision of public coverage that may overlap with private coverage. In addition, they neither investigated in any detail the extent to which Part D coverage provides a net increase in insurance coverage, nor the impacts on financial protection of the program. Our paper focuses on these financial security implications.

C. *Other Related Literature*

Our paper also draws on two other literatures in health economics. The first is the broader literature on the crowd-out of private health coverage by public insurance, mostly focused on expansions of the Medicaid program for low-income families since the mid-1980s. This literature is reviewed in Gruber and Simon (2008). While estimates vary, there is a broad consensus that there was significant crowd-out of private insurance by the Medicaid expansions. Gruber and Simon's (2008) estimate, which is at the high end of the literature, suggests that for every 100 persons gaining public coverage, 60 lost private coverage, or a crowd-out rate of 60 percent.

The second is the literature on the financial protection role of insurance. Our central reference here is Finkelstein and McKnight (2008), who studied the impact of introducing the Medicare program itself in the mid-1960s on both health and out-of-pocket

medical spending. They found few impacts of this program on health, but strikingly large impacts in terms of reducing the risk of out-of-pocket spending. They followed earlier work by Feldstein and Gruber (1995) and undertook a welfare calculation at the end of their paper. That calculation suggested that the reduced financial risk facing elders alone offset more than half of the cost of the Medicare program.

II. Data and Empirical Methods

A. *Data*

We use the 2002–2005 and 2007 waves of the MEPS, which is a nationally representative set of respondents drawn from the National Health Interview Survey (NHIS). The MEPS is a two-year overlapping panel focused on health insurance coverage, health care utilization, and expenditure, and is used to construct data for the National Health Accounts. For each calendar year of the survey, the sample is a combination of individuals in their first year of the panel and individuals in their final year of the panel. Interviews are conducted three times per year (roughly every four months). For our analysis, we use variables measured as of the end of each calendar year (i.e., from the last interview of the year) taken from the Full-Year Consolidated Data Files. We exclude 2006 since that was a transition year between private coverage and public coverage for many, so it is harder to define crowd-out without more precise within-year measures of coverage source.

We begin the empirical analysis by examining the impact of the Part D expansion on prescription-drug coverage from any source. We construct coverage by using data from two sources in the MEPS. The first source is from information in the health insurance component of the survey, which asks about prescription-drug coverage, and, starting with the 2006 wave, includes a question about coverage through Medicare. The second source is the expenditure component of the survey, in which information is provided on prescription-drug expenditures from 12 detailed payment sources: private group and non-group insurance plans, Medicaid, Medicare, Tricare/Champus, VA, out-of-pocket, Worker's Compensation, and other federal, state and local, private, public, and unclassified sources. Because the MEPs does not attempt to reconcile differences in coverage across these three survey components (Agency for Healthcare Research and Quality 2008a), we measure any coverage as having coverage denoted in either of these two survey sources.[5]

Under the Medicare Modernization Act, all Medicaid-Medicare dual-eligibles were automatically enrolled in Part D. As we do not want to treat any re-labeling of Medicaid beneficiaries as Part D beneficiaries as crowd-out, we define the focal explanatory variable in the empirical analysis as whether the individual has "public" prescription-drug coverage, defined as drug coverage either through Medicare or Medicaid in any year.[6]

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[5]For example, about ten percent of the sample reports drug expenditures from covered sources in the expenditure component of the survey, while reporting no source of coverage in the health insurance component of the survey.

[6]Under this definition, some individuals considered as having "public" coverage also could be covered concurrently by a private source. In our sample, about one-fifth of those we measure as having public coverage also have a source of private coverage. In the online appendix, we present crowd-out estimates from alternative definitions

A key feature of our analysis is that we move beyond the crowd-out of coverage and also examine the crowd-out of expenditures. To do so, we use data on expenditures by payment source mentioned above. The MEPS constructed these data in a multi-stage process. First, in the interview, respondents were asked about all prescribed medicines, including the name of the medication, frequency of use, dosage, and the name and address of the pharmacy at which the prescription was filled. Second, respondents were asked permission to release their pharmacy records. For those who consented, the MEPS requested from the pharmacy the date the prescription was filled, the name and dosage of the medication, payments by source, and the national drug code. Finally, MEPS constructed expenditure measures by payment source for each respondent as follows. For those who consented, expenditures are based on the pharmacy records; for those who did not consent, expenditures are based on self-reported expenditures that have been adjusted for outliers and item non-response based on imputations from the pharmacy data (Agency for Healthcare Research and Quality 2008b). We use these data on expenditures, deflated into 2007 dollars using the all-items Consumer Price Index, in our analysis below.

B. *Empirical Methods*

Our basic empirical approach is a difference-in-difference analysis, comparing the prescription-drug insurance coverage and expenditures of those who are Medicare eligible to near-elderly who are not, before versus after 2006. This strategy will identify the impact of Part D as long as there are no other reasons why coverage or expenditures would be changing, relatively, for elders and near-elders at this time. We cannot completely rule out the alternative that there may have been some other shock over this time period that caused a relative shift in insurance coverage or drug expenditures, but it seems highly unlikely given the magnitude of the Part D change. For example, the change in prescription-drug coverage we see for those 65–69 between 2005 and 2007 is more than three times the largest change that we saw over any other two year period since 2000.

We define the near-elderly as those aged 60–64 and exclude from our analysis those under 65 who are eligible for Medicare through DI, although our findings are not materially different if we broaden this group to include the disabled and those in their fifties. We employ two age definitions for Medicare-eligible individuals: 65–70-year-olds, and all individuals 65 and older. The former is a group closest in age to the comparison group of 60–64 years and provides for the cleanest analysis of the adoption of Part D as a quasi-experiment. The latter definition yields results for all Medicare beneficiaries and allows us to make statements about program-wide effects.

Table 2 gives basic descriptive statistics on our outcomes and measure of public prescription-drug coverage by time period for each of these age groups. The sample mean public coverage rate and expenditure after Part D are 68.9 percent and $1,280, respectively. When adjusted by the MEPS sampling weights, these means imply 25.8 million persons receiving public coverage and aggregate program expenditure

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of public coverage, including only coverage from Medicare and Medicaid. Our qualitative findings of substantial crowd-out are robust to these alternate definitions.

TABLE 2—SELECTED SAMPLE MEANS BY AGE GROUP AND TIME PERIOD, IN THE 2002–2005 AND 2007 MEPS
(*Standard deviations in parentheses*)

Variable	Ages 60–64 before Part D	Ages 60–64 after Part D	Ages 65–70 before Part D	Ages 65–70 after Part D	Ages 65 and older before Part D	Ages 65 and older after Part D
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy if any prescription-drug coverage	0.750	0.784	0.722	0.859	0.714	0.870
Dummy if public coverage	0.080	0.076	0.260	0.657	0.286	0.689
Dummy if private coverage	0.676	0.723	0.524	0.449	0.495	0.415
Dummy if public and private coverage	0.005	0.015	0.063	0.248	0.067	0.233
Dummy if only private coverage	0.670	0.708	0.461	0.201	0.428	0.181
Dummy if only public coverage	0.074	0.061	0.198	0.409	0.219	0.456
Total prescription-drug expenditure ($2007)	1,379 (2,238)	1,443 (2,195)	1,734 (2,284)	2,093 (3,647)	1,906 (2,794)	2,178 (3,385)
Out-of-pocket prescription-drug expenditure ($2007)	533 (1,004)	458 (841)	806 (1,258)	538 (1,256)	948 (1,436)	581 (1,060)
Public prescription-drug expenditure ($2007)	180 (944)	140 (811)	423 (1,431)	1,247 (2,929)	451 (1,384)	1,280 (2,691)
Private plan prescription-drug expenditure ($2007)	666 (1,648)	845 (1,618)	505 (1,155)	309 (947)	507 (1,941)	318 (1,062)
Total medical expenditure ($2007)	5,428 (11,593)	6,056 (15,902)	7,402 (13,605)	7,308 (11,972)	8,739 (14,983)	9,184 (15,711)
Number of prescriptions	20 (25)	20 (26)	25 (30)	27 (30)	29 (30)	31 (31)
Sample size	4,759	1,237	5,015	1,231	15,074	3,470

Notes: Authors' calculations from the 2002–2005 and 2007 MEPS for each of the table's groups. Standard deviations for continuous variables in parentheses.

of $43.5B in 2007. These are quite close to the aggregate numbers on Part D tabulated administratively by the Centers for Medicare and Medicaid Services (CMS).

C. *Caveats*

There are two important issues with our definitions of public coverage and expenditure. The first is the proper treatment of prescription-drug coverage through Medicare HMOs. Before the implementation of Part D in 2006, many, but not all, individuals enrolled in Medicare HMO plans received prescription-drug coverage. Such coverage was a mix of private and public coverage. On the one hand, these extra benefits were like Medigap coverage—individuals were paying more to get extra benefits—and, hence, were a form of private coverage. On the other hand, the cost to the individuals of this type of coverage was artificially low because the government was cross-subsidizing risk, just as in Part D.[7] Overall, it is unclear whether such coverage should be labeled private or public. In our analysis, we treat this source of coverage as public in both the pre-Part D period (2002–2005) and after

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[7] Of course, the same could be said for Medigap plan holders as well, since it is well known that Medigap is artificially cheap because the costs of the moral hazard it induces are borne by the Medicare program (e.g., Amitabh Chandra, Gruber, and McKnight 2010).

Part D was introduced (2007). Most of our findings are very similar if we treat Medicare HMOs as private coverage in the pre-Part D period.[8]

The second is that the Medicare Modernization Act that created Part D gives subsidies to employers/unions to keep coverage under the RDS program. Therefore, the federal government is also promoting "private" coverage under our definition, blurring distinctions between public and private. Unfortunately, the MEPS data do not indicate if employer/union coverage is subsidized under the RDS program.

Consequently, in some of the empirical analysis below, we present two sets of estimates. The first are reduced-form estimates, which are the regression-based counterparts to our difference-in-difference analysis and measure program-wide effects, i.e., the net impact of Part D of prescription-drug coverage and expenditures as it operates through all channels, including stand-alone PDP, MA drug plans, and RDS subsidized employer/union coverage. The second are traditional IV estimates of crowd-out based on our definition of public coverage given above, where we implicitly treat employer/union coverage, even if subsidized under the RDS program, as private coverage. Because private coverage likely would have been lower in the absence of the RDS program, our measured crowd-out is likely to be an underestimate of true crowd-out from the Part D expansion.

III. Insurance Coverage Results

A. *Graphical Evidence*

We begin our analysis by showing the evidence on prescription-drug insurance coverage over time for older Americans. Figure 1 shows the age profile of coverage from any source for 50–80-year-olds from the MEPS for before Part D (2002–2005) and after (2007), respectively, as measured on the left-hand axis. Before Part D, prescription-drug coverage rates from any source were constant until age 65, before dropping by about five percentage points. After Part D, the age profile is similar through the early 60s (although noisier since we only have one year of post-Part D data) before diverging sharply at age 65. This is a remarkable shift in only one or two years.

Against the vertical axis on the right-hand side, the graph also illustrates the age profile of public coverage in 2007, where, again, "public" means either through Medicare or Medicaid. The public coverage rate was roughly 15 percent for those under age 65. Public coverage then rose to 80 percent for those 65 and older. This age-related increase in public coverage is much larger than the total shift in insurance coverage (a gap between the before and after lines of roughly 15 percentage points), and suggests that there was significant crowd-out of existing coverage by the Part D expansion.

To formalize this graphical evidence, Table 3 shows data on prescription-drug coverage by age group and time periods. In the first row, there is a very large increase in prescription-drug coverage for those 65–70 years old of 13.7 percentage points,

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[8]Treating coverage through Medicare in the pre-period as private yields similar estimates of crowd-out. These results are discussed in the online Appendix.
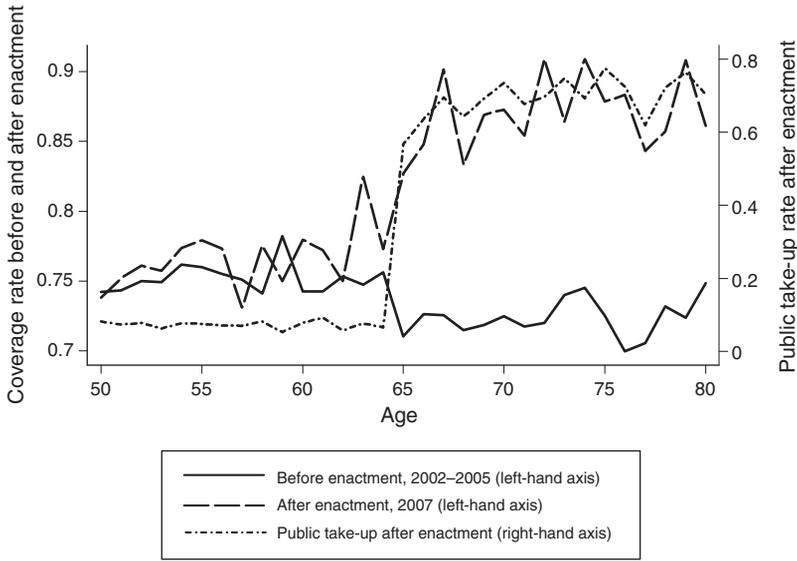
with only a moderate corresponding increase of about 3.4 percentage points for 60–64-year-olds. The difference-in-difference estimate in the fourth row indicates that Part D was associated with a 10.3 percentage point rise in prescription-drug coverage among the elderly.

The bottom panel undertakes a corresponding difference-in-difference calculation for public coverage. Here we find a rise of 40 percent for age 65–70, with no change for the younger group. These estimates of a 40 percent rise in public coverage yet only a 10 percent rise in total coverage imply quite large crowd-out of other insurance sources by Part D, on the order of 75 percent.

B. *Regression Evidence*

Table 4 presents estimates from the following econometric specification:

$$(1) \qquad D_{it}^{AnyCoverage} = \alpha + \beta D_{it}^{PublicCoverage} + \gamma \kappa_{it} + u_{it},$$

where the dependent variable, $D^{AnyCoverage}$, takes on a value of one if the individual had prescription-drug coverage from any source and zero otherwise; the focal explanatory variable is $D^{PublicCoverage}$, which takes on a value of one if the individual had public coverage; κ is a vector of control variables that includes a full set of dummy variables for single year of age and calendar year, respectively; and u is a disturbance term. In (1), β measures the extent to which public coverage raises any coverage, and, therefore, $1 - \beta$ measures crowd-out. Because take-up of public prescription-drug insurance is likely endogenous, we estimate the parameters in (1) by instrumental variable regression, using $D_i^{Age \geq 65} \times D_t^{Year=2007}$ as the instrument,

TABLE 3—DIFFERENCE-IN-DIFFERENCE ESTIMATES OF MEDICARE PART D LAW CHANGE ON
PRESCRIPTION-DRUG COVERAGE FROM ANY SOURCE BY AGE GROUP IN THE 2002–2005 AND
2007 MEPS (*Standard errors in parentheses*)

Group/year	Time difference		
	Before Part D (1)	After Part D (2)	For groups (3)
Panel A. Any coverage			
Age 65–70	0.722 (0.00798)	0.859 (0.0106)	0.137 (0.0132)
Age 60–64	0.750 (0.00795)	0.784 (0.0124)	0.0342 (0.0147)
Difference-in-difference			0.103 (0.0198)
Panel B. Public coverage			
Age 65–70	0.260 (0.00782)	0.657 (0.0144)	0.397 (0.0164)
Age 60–64	0.0796 (0.00499)	0.0760 (0.00781)	−0.00365 (0.00927)
Difference-in-difference			0.401 (0.0188)

Notes: Each cell gives the coverage rate among 60–70 year olds for prescription-drug coverage
from any source for each of the table's groups. Standard errors clustered by household and age
group (under 65 and 65 and older) are shown in parentheses.

where $D_i^{Age \geq 65}$ is a dummy variable that is one if the individual is 65 or older and zero otherwise, and $D_t^{Year=2007}$ is a dummy variable that is one if the calendar year is 2007 (after Part D) and zero otherwise. Because the sample includes person-year observations on individuals from the same families and Medicare eligibility is primarily determined by age, we cluster the standard errors by household and age group (under 65, 65 and over).

Panel A of the table presents results for 60–70-year-olds; panel B for all those 60 and older. Within each panel, three sets of estimates are presented: the reduced-form, first-stage, and IV estimates, respectively. The reduced-form is essentially a regression-based version of the difference-in-difference analysis in panel A of Table 3. The first-stage similarly is a regression-based version of the difference-in-difference analysis in panel B of Table 3.

Column 1 of Table 4 shows the estimation results from (1) with no additional control variables (other than the age and time dummies) in κ. In panel A, the first-stage results show that there is a 40 percent rise in public insurance coverage for those over 65–70 from 2002–2005 to 2007, with a corresponding rise of 10.3 percent in total prescription-drug coverage. Putting the two together, the IV estimate in the third row shows that for each 100 persons covered by public insurance, 25.7 persons gained insurance coverage. This implies very large crowd-out of 75 percent: that is, only one quarter of those who signed up for Part D gained insurance coverage by doing so, while three quarters moved over from another source of coverage. Panel B shows similar results for all elderly.

Column 2 assesses the sensitivity of this result to additional controls in the regression. We add to κ demographic controls in the form of dummy variables for marital

TABLE 4—PARAMETER ESTIMATES OF THE CROWD-OUT EFFECT OF PUBLIC PRESCRIPTION-
DRUG COVERAGE OF THE ELDERLY IN THE 2002–2005 AND 2007 MEPS
(*Standard errors in parentheses*)

Explanatory variable	(1)	(2)
Panel A. 60–70-year-olds		
Reduced-form estimates		
Dummy if 65 or older ×	0.103	0.109
Dummy if post-law-change	(0.0198)	(0.0192)
First-stage estimates		
Dummy if 65 or older ×	0.400	0.398
Dummy if post-law-change	(0.0188)	(0.0181)
IV estimates		
Dummy if public coverage	0.257	0.274
	(0.0467)	(0.0445)
Panel B. 60 and older		
Reduced-form estimates		
Dummy if 65 or older ×	0.123	0.124
Dummy if post-law-change	(0.0167)	(0.0161)
First-stage estimates		
Dummy if 65 or older ×	0.408	0.405
Dummy if post-law-change	(0.0136)	(0.0129)
IV estimates		
Dummy if public coverage	0.303	0.307
	(0.0395)	(0.0372)
Additional controls		
Demographics	No	Yes
Census division	No	Yes
Self-reported health status	No	Yes
Income quintiles	No	Yes

Notes: The dependent variable is a dummy that takes on a value of one if the individual had prescription-drug coverage from any source and zero otherwise. The table shows the crowd-out parameter estimates of Medicare Part D on prescription-drug coverage based on the MEPS samples described in the text. Standard errors clustered by household and age group (under 65 and 65 and older) are shown in parentheses.

status (married, divorced/separated, widowed), race/ethnicity (black, Hispanic, other), education (high school, some college, college degree or higher), and gender (female); dummies for census region; measures of self-reported health status (excellent, very good, good, fair); and dummy variables for household income quintiles (2nd, 3rd, 4th, and 5th quintiles).[9] None of these additional covariates have any meaningful impact on the key results, which is consistent with the notion that there are no other underlying changes between elderly and non-elderly over this period that might confound our analysis.

We performed a large number of robustness checks that are documented in the online Appendix, from which we uncovered some interesting heterogeneity. Crowd-out is much larger for those who are working, the most educated, and in the highest

---

[9] The omitted group is never married, non-Hispanic white, male, with less than a high school education, and household income in the bottom quintile. In principle, self-reported health status could be endogenous with respect to the law change, but, in practice, there is little correlation between the instrument and the dummy variables for self-reported health status.

income groups in our sample. These findings suggest that crowd-out will be highest in the populations with the broadest ex-ante level of private coverage.

IV. Expenditure Results

In this section, we extend our analysis to examine the impact of Part D on prescription-drug spending. This analysis is interesting for two different reasons. First, this allows us to extend our crowd-out analysis in a direction not pursued in the previous literature: to look more specifically at the *dollar reduction* in spending covered by private insurance relative to the *dollar increase* in public spending. Sufficient conditions for the crowd-out in dollar terms to be identical to the crowd-out in coverage are that (a) those who have private coverage but switch to public coverage do not change their spending, and (b) those who switch from uninsured to public coverage increase their spending to the ex-ante average of those with private coverage who switch to public coverage. Therefore, the relationship of crowd-out in dollar terms and crowd-out in coverage terms will depend critically on the generosity of public coverage relative to the private coverage of switchers.

Of course, the welfare implications of this comparison are difficult, because we do not know which type of coverage is closer to optimal insurance. If individuals who are crowded out of private coverage were dramatically under-insured ex ante by the private sector, and appropriately insured ex post by the government, then crowd-out should be smaller in dollar terms than in coverage terms—this would represent a welfare improvement. Unfortunately, however, the exact same conclusion holds if individuals were appropriately insured ex ante and *over*-insured ex post.

The second advantage of using the spending data is that it allows us to directly address the extent to which public insurance programs increase the financial protection of the elderly. Those elderly who were uninsured ex ante are clearly gaining financial protection from Part D, as are elderly who had large out-of-pocket spending burdens despite being insured privately. As Finkelstein and McKnight (2008) emphasize, for evaluating the welfare implications of a program such as Part D, it is critical to consider the overall reduction in out-of-pocket spending risk.

Theoretically, such a calculation requires data on the longitudinal risk facing each individual. In practice, we have instead the cross-sectional distribution of spending on prescription drugs. So, in our calculations, we use this cross-sectional distribution as a proxy for the theoretically appropriate measure. The bias from doing so is unclear. On the one hand, this will overstate the risk facing individuals, because we are ignoring private information that individuals have about their own spending distribution. On the other hand, this will understate the risk facing individuals, because we are measuring only realized spending, not spending risk. This relates to our previous discussion. If individuals were holding off on necessary prescriptions because of limited coverage, and they fill those prescriptions now that they have coverage, then there is an "access" gain that increases welfare beyond any reduced out-of-pocket spending. On the other hand, if individuals were spending appropriately before, and now over-spend on prescription drugs, then the reduction in out-of-pocket spending is the right risk measure.
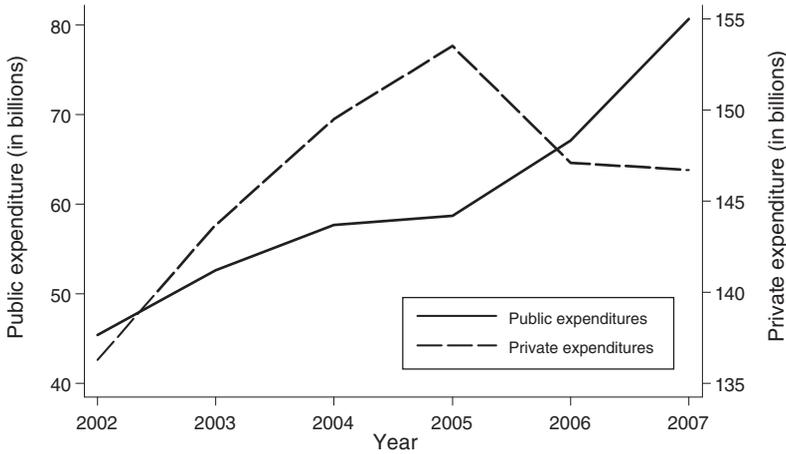
FIGURE 2. NATIONAL PRESCRIPTION-DRUG EXPENDITURE

A. *Aggregate Evidence*

We begin with Figure 2, which shows aggregate public and private prescription-drug expenditure (for individuals of all ages), respectively, in billions of 2007 dollars, taken from the National Health Expenditure Accounts compiled by CMS. Prior to 2006, the rate of growth of both was positive, but slowing. Between 2005 and 2006, private expenditure fell 4.2 percent, while public expenditure rose 29.6 percent. In particular, out-of-pocket spending fell 7 percent. Therefore, the aggregate data in this figure suggest a potentially large role for crowd-out.

Table 5 illustrates the types of prescription drugs underlying the large growth in public expenditures under Part D documented in Figure 2. In particular, the table shows the top ten therapy classes of drugs prescribed under Part D in the first year after adoption, which coincides with the timing of the "post-policy" MEPS data in our sample. Utilization was concentrated among a relative small number of therapeutic classes, most notably antihypertensives, which accounted for 25 percent of all prescriptions. Lipid regulators, such as statins, and antidepressants combined for another 12.5 percent of utilization. Overall, the ten classes shown in the table accounted for 63 percent of all prescriptions under Part D in the initial program year.

B. *Regression Evidence*

Next, we move to a regression model for the elderly only. In Table 6, we explore the increase in prescription-drug utilization in our MEPS data by estimating a specification identical to (1), but with the number of annual prescriptions filled as dependent variable. For 60–70-year-olds in panel A, the number of prescriptions filled per enrollee goes up by 3 scrips per new enrollee. This represents 12 percent of the pre-period mean for those over age 65 (from Table 2), consistent with the

TABLE 5—TOP TEN THERAPY CLASSES OF PRESCRIPTION DRUGS UNDER PART D
IN 2006–2007, BY VOLUME (*In millions of prescriptions*)
AND AS A SHARE OF PART D PRESCRIPTIONS (*In percent*)

Therapy class	Volume of Part D prescriptions (1)	Share of Part D prescriptions (2)
Antihypertensives	122.0	25.0
Lipid regulators	36.0	7.4
Antidepressants	25.0	5.1
Diabetes, non-insulin	24.1	5.0
Analgesic, narcotic	24.0	4.9
Anti-ulcerants	20.3	4.2
Anti-infectives	14.8	3.0
Thyroid hormones	14.5	3.0
Antithrombotics	14.4	2.9
Seizure disorders	12.0	2.5

Source: IMS Health (2007, 4).

findings of a number of previous studies cited above that documented increased utilization.[10]

We then move from utilization to expenditure. Panel A of Table 7 shows the IV estimates of the parameters of the following model:

$$(2) \qquad X_{it}^{Public} = \alpha + \beta D_{it}^{PublicCoverage} + \gamma \kappa_{it} + u_{it},$$

where the dependent variable, X^{Public}, is public expenditure on prescription drugs.[11] Given the similarity of our previous estimates for 60–70 year olds and for the full sample over age 60, we focus on the full sample for the rest of our analysis.

We find that public prescription-drug expenditures rose by \$2,141 per person gaining public coverage. This is an enormous increase, about 100 percent of the mean spending on prescription drugs in the pre-period. Once again, this estimate is not sensitive to the covariates we use across columns 1 and 2.[12]

In panel B, we give the IV estimate from the following specification,

$$(3) \qquad X_{it}^{Total} = \alpha + \beta D_{it}^{PublicCoverage} + \gamma \kappa_{it} + u_{it},$$

where the dependent variable is total drug expenditure paid through all sources. In (3), β measures the extent to which public coverage increases total expenditure. Our

---

[10] We find that there is little change in the odds that individuals fill a prescription. These results are presented in the online Appendix.

[11] We do not repeat the first-stage regressions, which are the same as in Table 4; the reduced-form regression results are shown in the online Appendix.

[12] This increase was larger than that implied by forecasts of program enrollment and expenditure by the Congressional Budget Office done in 2005, prior to the roll-out of the Part D program. Those projections implied an increase in public prescription-drug expenditure of roughly \$1820 per enrollee in 2007, for all enrollees, including those DI (Congressional Budget Office 2003, 2005).

Table 6—Instrumental Variable Parameter Estimates of the Impact of Public Prescription-Drug Coverage on the Number of Prescriptions by the Elderly in the 2002–2005 and 2007 MEPS (*Standard errors in parentheses*)

Explanatory variable	(1)	(2)
Panel A. 60–70-year-olds		
Dummy if public coverage	3.049	3.219
	(3.392)	(3.092)
Panel B. 60 and older		
Dummy if public coverage	4.029	3.911
	(2.660)	(2.466)
Additional controls		
Demographics	No	Yes
Census division	No	Yes
Self-reported health status	No	Yes
Income quintiles	No	Yes

Notes: The dependent variable is the number of prescriptions. The table shows the crowd-out parameter estimates of Medicare Part D on prescription-drug coverage based on the MEPS samples described in the text. Standard errors clustered by household and age group (under 65 and 65 and older) are shown in parentheses.

estimates suggest that total prescription-drug spending only rises by about $524, as shown in the first row of panel B.

The final row of the panel shows IV estimates from a related specification,

$$(4) \qquad X_{it}^{Total} = \theta + \delta X_{it}^{Public} + \varphi \kappa_{it} + \varepsilon_{it},$$

that directly measures expenditure crowd-out. In (4), δ measures the extent to which a one-dollar increase in public prescription-drug expenditure raises total expenditure, and, therefore, $1 - \delta$ measures expenditure crowd-out. The estimates of δ suggest that each dollar of public expenditure raises total expenditure by roughly 25 cents, or that there is about 75 percent crowd-out. This is strikingly similar to the coverage crowd-out estimate above.

The remaining panels of Table 7 show expenditure crowd-out estimates by source of payment. About five-eighths of our estimated expenditure crowd-out is due to reduced privately insured prescription-drug spending, which falls by over 40 cents for every dollar increase in public spending. The remainder is due to reduced out-of-pocket spending by the elderly of $719 per person publicly covered, or about 34 cents per public dollar spent. This is a substantive effect compared to the pre-period mean out-of-pocket expenditure of $948 for those 65 and older (from column 5 of Table 2). Thus, Part D served not only to crowd-out private insurance purchases, it also served to significantly mitigate out-of-pocket prescription-drug spending.

V. Estimating the Welfare Gain from the Reduction in Out-of-Pocket Spending

The IV estimates in Table 7 show the reduction in out-of-pocket spending in dollar terms due to Part D. However, as is well known, the distribution of out-of-pocket

TABLE 7—INSTRUMENTAL VARIABLE PARAMETER ESTIMATES OF THE EFFECT OF PUBLIC
COVERAGE AND EXPENDITURE ON ELDERLY PRESCRIPTION-DRUG EXPENDITURE BY SOURCE,
FOR THOSE 60 AND OLDER, IN THE 2002–2005 AND 2007 MEPS
(*Standard errors in parentheses*)

Explanatory variable	(1)	(2)
Panel A. Public prescription-drug expenditure		
Dummy if public coverage	2,141	2,148
	(127.2)	(127.6)
Panel B. Total prescription-drug expenditure		
Dummy if public coverage	524.3	534.8
	(240.0)	(231.7)
Public prescription-drug expenditure	0.245	0.251
	(0.104)	(0.100)
Panel C. Private group and non-group plan prescription-drug expenditure		
Dummy if public coverage	−897.8	−914.2
	(146.7)	(144.0)
Public prescription-drug expenditure	−0.419	−0.426
	(0.0732)	(0.0714)
Panel D. Out-of-pocket prescription-drug expenditure		
Dummy if public coverage	−718.7	−699.4
	(96.53)	(94.60)
Public prescription-drug expenditure	−0.336	−0.326
	(0.0510)	(0.0494)
Additional controls		
Demographics	No	Yes
Census division	No	Yes
Self-reported health status	No	Yes
Income quintiles	No	Yes

Notes: The dependent variable is real annual personal prescription-drug expenditure from the MEPS. The table shows parameter estimates of Medicare Part D on prescription-drug expenditure based on a sample of 25,886 person-year observations on ages 60 and older from the 2002–2007 MEPS. Standard errors clustered by household and age group (under 65 and 65 and older) are shown in parentheses.

spending is right-skewed, so that a mean estimator might not be well-suited to assess the impact of Part D on out-of-pocket spending.

Therefore, in Table 8, we move to quantile estimation to better assess the impact of Part D. The table shows the change in expenditure at every tenth quantile of the distribution of out-of-pocket spending associated with Part D expansion, by contrasting the change for those over 65 with those under (this is akin to the exercise of Finkelstein and McKnight 2008). Formally, these are estimates of ρ from the following reduced-form specification:

$$(5) \qquad X_{it}^{OOP} \ = \ \omega \ + \ \rho D_i^{Age \geq 65} \ \times \ D_t^{Year=2007} \ + \ \xi \kappa_{it} \ + \ \nu_{it},$$

where the dependent variable is out-of-pocket prescription-drug spending. We find that there is a monotonically increasing reduction in out-of-pocket spending for those over age 65, relative to those below age 65. These differential estimated effects

TABLE 8—SIMPLE ESTIMATES OF THE IMPACT OF MEDICARE PART D AT SELECTED QUANTILES
OF THE DISTRIBUTION OF HOUSEHOLD OUT-OF-POCKET PRESCRIPTION-DRUG EXPENDITURE,
AGE 60 AND OLDER IN THE 2002–2005 AND 2007 MEPS (*Standard errors in parentheses*)

Quantile	Age 60–64 before Part D (1)	Age 60–64 after Part D (2)	Age 65 and older before Part D (3)	Age 65 and older after Part D (4)	Differential effect of being 65 and older after Part D (5)
10th	0 (0)	0 (0)	1 (1)	0 (1)	−1 (2)
20th	5 (3)	5 (3)	73 (4)	45 (3)	−28 (6)
30th	46 (4)	40 (6)	170 (5)	105 (6)	−59 (11)
40th	115 (7)	102 (10)	290 (7)	174 (7)	−103 (14)
50th	210 (10)	188 (13)	453 (10)	267 (10)	−164 (20)
60th	340 (11)	290 (18)	679 (14)	395 (15)	−235 (28)
70th	505 (14)	446 (25)	990 (19)	568 (17)	−363 (38)
80th	765 (24)	648 (34)	1,492 (26)	846 (27)	−529 (55)
90th	1,350 (54)	1,178 (70)	2,494 (55)	1,415 (49)	−907 (117)

Notes: For each quantile shown, each cell gives the real out-of-pocket prescription-drug expenditure among those 60 and older in the 2002–2005 and 2007 MEPS for each of the table's groups. Block-bootstrapped standard errors by household and age group (under 65 and 65 and older) based on 199 replications are shown in parentheses.

are significant from the 20th percentile onward. Even at the 90th percentile, however, they are still only a minority of pre-Part D out-of-pocket spending.

Figure 3 extends this analysis to a richer description of the spending risk using quantile estimation. In particular, the solid line in the figure represents the estimates of β, the impact of public coverage on out-of-pocket expenditure, for those 60 and older from the following econometric specification:

$$(6) \qquad X_{it}^{OOP} = \alpha + \beta D_{it}^{PublicCoverage} + \gamma \kappa_{it} + u_{it},$$

in which the parameters are estimated for each quantile of the out-of-pocket spending distribution using the instrumental variable quantile regression (IVQR) estimator of Victor Chernozhukov and Christian Hansen (2005), using $D_i^{Age \geq 65} \times D_t^{Year=2007}$ as the instrument, and κ contains the richest set of controls from column 2 of Table 7.
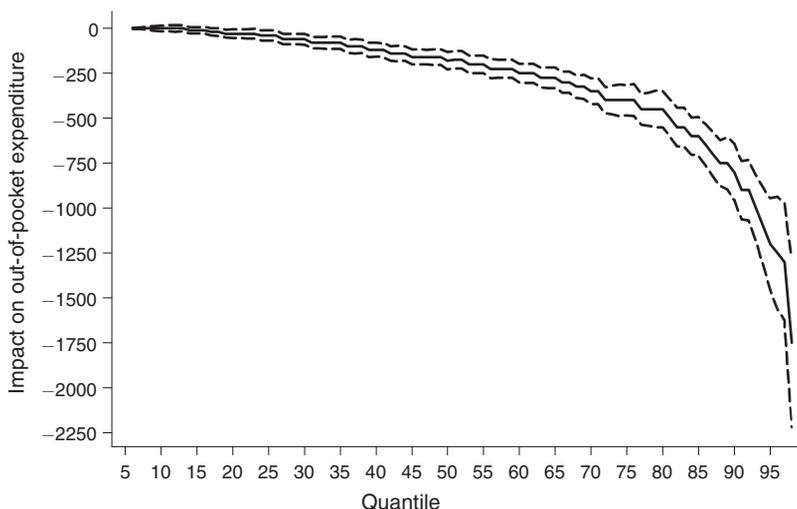
Figure 3. IVQR Estimates of Impact of Public Coverage on Out-of-Pocket Drug Expenditure for Ages 60 and Older in 2002–2005 and 2007

The dashed lines in the figure show the boundaries of the 95 percent confidence intervals based on 99 block-bootstrapped $\left(\text{by household and } D^{Age \geq 65}\right)$ replications.[13]

Public coverage has a small effect at the low quantiles, but it grows consistently with baseline spending. At the median the impact is a reduction of \$180 in out-of-pocket spending; at the 90th quantile it has grown to \$800.

A. *Methodology*

To assess the importance of these reductions in out-of-pocket spending from an insurance perspective, we follow Feldstein and Gruber (1995) and Finkelstein and McKnight (2008) and calculate the change in the risk premium associated with out-of-pocket spending as a measure of the welfare gain from the expansion of public prescription-drug coverage through Part D. Specifically, we assume the individual gets utility from consumption defined by the per-period budget constraint,

$$(7) \qquad\qquad C = Y - X^{OOP},$$

as income, Y, net of out-of-pocket expenditure, X^{OOP}, where the latter is a random variable. Hence, the individual's expected utility is

$$(8) \qquad\qquad \int U\big(Y - X^{OOP}\big) f(X^{OOP}) dX^{oop},$$

---

[13] The estimates for the first five quantiles are centered around and not different from zero, but are very imprecisely estimated and have wide confidence bands. For the purposes of exposition, they are not shown in the figure.

where f is the probability density function of the out-of-pocket expenditure. The risk premium, π, associated with out-of-pocket spending then is defined as

$$
(9) \qquad U(Y - \pi) = \int U(Y - X^{OOP}) f(X^{OOP}) dX^{oop},
$$

and measures the amount a risk-averse individual would be willing to pay to insure against random variation in out-of-pocket spending. We calculate the change in the risk premium associated with the adoption of Part D,

$$
(10) \qquad \Delta\pi = \pi^{WithPartD} - \pi^{WithoutPartD}.
$$

This change will be negative if Part D reduces the risk premium and protects the elderly from out-of-pocket prescription-drug spending risk; the absolute value of this change measures the welfare gain from Part D.

Of course, the introduction of Part D will shift the mean level of out-of-pocket spending as well as its risks. The shift in the mean is simply a transfer from the government to the insured, and so should not enter these risk calculations. We, therefore, subtract the mean reduction in out-of-pocket spending to obtain the risk premium. Similarly, we do not include in these calculations the premiums that individuals pay under either their private insurance or Part D. For most of the sample, these premiums will be small relative to income and, therefore, will not enter the risk calculations.

We measure (10) as follows. First, we use the IVQR estimates of the parameters in (6) to calculate for each individual (i) in the sample the conditional (on that individual's characteristics, κ) quantiles (superscript j) of the out-of-pocket spending distribution with Part D,

$$
(11) \qquad \hat{X}_i^{OOPWithPartD,j} = \hat{\alpha}^j + \hat{\beta}^j + \hat{\gamma}^j\kappa_i,
$$

and without Part D,

$$
(12) \qquad \hat{X}_i^{OOPWithoutPartD,j} = \hat{\alpha}^j + \hat{\gamma}^j\kappa_i,
$$

respectively, for $i = 1,\ldots,N$ and $j = 1,\ldots,99$. Second, we use the fact that the conditional quantiles are the inverse of the conditional cumulative distribution function of out-of-pocket expenditure, so that we can recover the estimated distribution of out-of-pocket spending. Because there are 99 quantile estimates, to guarantee that the sum of the probabilities is one, we set conditional out-of-pocket spending to zero at the very bottom of the distribution, $j = 0$, i.e., $\hat{X}_i^{OOPWithPartD,0} = 0$. This gives us 100 points (of equal probability of occurrence) in the out-of-pocket spending distribution for each person. Third, we draw with replacement 99 times from each person's distribution. Fourth, we directly calculate the risk premium under Part D for each individual by solving

$$
(13) \qquad U\!\left(Y - \pi_i^{WithPartD}\right) = \frac{1}{99} \cdot \sum_{d=1}^{99} U\!\left(Y - \hat{X}_i^{OOPWithPartD,d} - \hat{\beta}^{OOP}\right),
$$

TABLE 9—ESTIMATES OF THE CHANGE IN RISK PREMIUM FOR THOSE WHO TOOK UP MEDICARE PART D
FOR 60–70 YEAR OLDS, IN 2007 DOLLARS, FOR SELECTED MEASURES OF RISK AVERSION

Coefficient of relative risk aversion	Mean	25th Percentile	Median	75th Percentile	90th Percentile	95th Percentile
	(1)	(2)	(3)	(4)	(5)	(6)
Based on IVQR estimates from the age 60 and older full sample						
1	−139	−88	−124	−170	−233	−295
3	−455	−111	−168	−304	−991	−2554
5	−735	−128	−215	−527	−2333	−4191

Note: Risk-premium calculations are based on the IVQR estimates shown in Figure 3 and described in the text.

where d indexes the draw from the distribution, and $\hat{\beta}^{OOP}$ is the IV estimate in Table 7 from (3) that adjusts for the change in the mean of the out-of-pocket expenditure distribution from Part D. In a similar fashion, we calculate the risk premium without Part D by solving

$$(14) \qquad U\big(Y - \pi_i^{WithoutPartD}\big) = \frac{1}{99} \cdot \sum_{d=1}^{99} U\big(Y - \hat{X}_i^{OOPWithoutPartD,d}\big).$$

In calculating (10), we follow Finkelstein and McKnight (2008) and truncate predicted out-of-pocket spending from below at zero and from above at 80 percent of income. We report the calculations only for those in our sample who actually took up Part D.

Table 9 shows selected statistics on the distribution of the change in the risk premium (welfare gain) associated with Part D for selected levels of risk aversion assuming a constant relative risk aversion (CRRA) utility function using the estimates in Figure 3 for all individuals 60 and older. For a typical estimated CRRA of 3, the mean reduction in the risk premium, or welfare gain, for those who took up Part D is $455. However, the median is $168, suggesting the welfare gains were small for most families, yet highly skewed. This is confirmed in the last two columns of the table, which show substantial welfare gains at the 90th the 95th percentiles. The other rows of the table recalculate the change in risk premium for CRRA of 1 (log utility) and 5, respectively. The risk premiums are fairly similar for a CRRA of 1, and much higher for a CRRA of 5.

B. *Implications*

Overall, our results suggest that the risk-reduction gain was modest for most elderly, but fairly sizeable on average due to the protection provided to those at the highest risk of spending. But this is only part of a full welfare evaluation of the Part D program. In this section, we offer some observations on three remaining elements of that evaluation.

The first is the major welfare cost of Part D: the deadweight loss (DWL) of raising the $44.8 billion in net expenditures for Part D in 2007. At a typical estimate of 30 cents of DWL per dollar of revenue raised (Dale W. Jorgenson and

Kun-Young Yun 2001), and with 31.2 million program recipients, this implies a DWL of $430/recipient, roughly equivalent to the reduced out-of-pocket spending risk.

The second is the more ambiguous increase in total prescription-drug expenditures induced by Part D. On the one hand, this increase in spending may represent moral hazard through insurance-induced excess consumption, which in the limit would imply another $524 in welfare loss. On the other hand, one of the major effects of Part D was to induce a sizeable reduction in prescription-drug prices that appears to be caused by both insurer competition and substitution patterns across prescriptions (Duggan, Healy, and Scott-Morton 2008; Duggan and Scott-Morton 2010). Since the cost of prescription drugs to uninsured patients exceeds the marginal cost of drug production (due to patents and other limits on competition in this industry), there may be welfare gains from increased utilization.

Finally, there may be offset effects to other sources of medical spending as drug spending increases. Indeed, a study of the introduction of Part D by Yuting Zhang et al. (2009) found that the costs of increased drug expenditure were fully offset by reduced spending in other areas. This would suggest no aggregate moral hazard effects from the Part D program.

We can investigate this question as well with our MEPS data, and we do so in Table 10. Each cell in this table shows the IV coefficient on public insurance prescription-drug expenditures in our richest model from Table 7, akin to the coefficient of 0.251 in the third row of column 2. There are five rows for total of all spending, public medical spending (Medicare and Medicaid), private medical spending in total, private spending by insurers, and private spending out-of-pocket. In other words, the first row is decomposed into the second and third rows, and the third row is decomposed into the fourth and fifth rows. We divide total medical spending into seven categories: inpatient hospital, outpatient hospital, office-based care, emergency room, home health care, other medical spending and dental care, and prescription drugs.

For total medical spending (the first row), the estimates in Table 10 are consistent with Zhang et al.'s (2009) conclusion that Part D did not raise total medical spending, but the estimates are very imprecise. We find that there are increases in spending on prescription drugs (as seen in Table 7) and on inpatient and outpatient hospital spending. However, there are sizeable reductions in office-based spending and home-health care (although only the latter is significant), and smaller reductions in spending in the other categories. On net, we find that total medical spending fell, but the estimate is highly insignificant; given our standard errors we cannot rule out a very large increase in total medical spending.

The next two rows (panels B and C) show an interesting decomposition of these spending effects into public and private payers. For public payers, the offset is much smaller; on net, reductions in other spending only offset about ten cents of each dollar of increased drug spending. For private payers, however, there is not only the sizeable reduction in prescription-drug spending noted earlier, but also an additional sizeable drop in other spending as well (although once again our estimates are very imprecise, with only the reduction in office-based case being significant). Thus, the general conclusion that Part D represented a large shift from private to public payers for prescription drugs extends as well to the broader set of medical spending categories.

TABLE 10—IV ESTIMATES OF IMPACT OF PUBLIC PRESCRIPTION-DRUG EXPENDITURE ON PUBLIC, NON-PUBLIC,
AND TOTAL MEDICAL SPENDING BY TYPE OF PAYOR AND CATEGORY OF SPENDING
(*Clustered Standard Errors in Parentheses*)

Explanatory variable	Inpatient	Outpatient	Office-based	Emergency room	Home health	Other medical and dental	Pre-scription drugs	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. All payors								
Public prescription-drug	0.197	0.029	−0.302	−0.038	−0.179	−0.056	0.251	−0.146
expenditure	(0.523)	(0.067)	(0.199)	(0.035)	(0.092)	(0.055)	(0.100)	(0.643)
Panel B. Public payors (medicare and medicaid)								
Public prescription-drug	−0.105	0.044	0.099	0.001	−0.161	−0.005	1.000	0.875
expenditure	(0.455)	(0.052)	(0.076)	(0.013)	(0.075)	(0.014)	(0.000)	(0.499)
Panel C. Non-public payors								
Public prescription-drug	0.302	−0.015	−0.401	−0.039	−0.019	−0.051	−0.750	−1.020
expenditure	(0.258)	(0.060)	(0.176)	(0.032)	(0.044)	(0.053)	(0.100)	(0.390)
Panel D. Private group and non-group plans								
Public prescription-drug	0.295	−0.017	−0.406	−0.040	0.009	−0.045	−0.426	−0.678
expenditure	(0.253)	(0.058)	(0.172)	(0.029)	(0.038)	(0.028)	(0.071)	(0.364)
Panel E. Out-of-pocket								
Public prescription-drug	0.007	0.002	0.005	0.001	−0.027	−0.006	−0.324	−0.343
expenditure	(0.021)	(0.011)	(0.026)	(0.008)	(0.019)	(0.039)	(0.049)	(0.082)

Notes: Estimates are for the richest specification in Table 7, which is column 2 of that table. Panel C is the sum of panels D and E.

The next two rows (panels D and E) show that almost all of the offsetting reduction in other spending accrued to insurers. Out-of-pocket spending on other medical care did not much change; the reduction in total out-of-pocket spending is similar to the reduction in prescription-drug spending. These findings suggest that the small insurance gains provided by the program are not augmented by reductions in out-of-pocket spending risk in other areas; the estimated welfare gains above would apply to total medical spending as well as prescription-drug spending.

VI. Conclusion

We examine the impact of the expansion of public prescription-drug insurance coverage on the elderly and find evidence of substantial crowd-out. In particular, there is an estimated 75 percent crowd-out of both prescription-drug coverage and expenditures. Part D is associated with substantive reductions in out-of-pocket spending on average, although the bulk of these accrue to a small proportion of the elderly. This suggests that the welfare gain from protecting the elderly from out-of-pocket spending risk through Part D are typically moderate. Yet a small fraction of the elderly benefitted a great deal from the new program, so much so that the welfare gain on average is comparable to the deadweight loss cost of financing the program.

There are a number of caveats to these findings. On the one hand, the stylized welfare calculations may overstate the gains from the introduction of Part D if there are

other consumption-smoothing mechanisms available to the elderly, such as private income transfers, own savings, or uncompensated medical care. On the other hand, the gains from Part D may be understated because the calculations were based on an annual, rather than lifetime, measure of expenditure risk. In particular, there is some evidence that lifetime medical spending risk is greater than annual risk, because out-of-pocket expenditures are highly persistent over time (Daniel Feenberg and Jonathan Skinner 1994; Eric French and John Bailey Jones 2004).

Finally, the welfare calculations were predicated on the assumption that individuals do not value any improvements in health associated with increased prescription-drug spending, either out-of pocket or from other sources. Yet one of our most important findings was that there were sizeable increases in public drug utilization and spending, focused on the intensive margin. These were associated with a relatively narrow set of therapeutic classes of drugs, namely antihypertensives, lipid regulators, and antidepressants. To the extent there are associated health gains and they are valued, our estimates will understate the true gains from the introduction of Part D. While an analysis of any gains in health from Part D is beyond the scope of the current paper, we might expect to see improvements in measures of cardiovascular and mental health, based on Part D drug utilization. This is clearly an avenue for future research.

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