Online Appendix

"Moral Hazard in Health Insurance: Do Dynamic Incentives Matter?"

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Appendix A: Analysis of Initial Claims in Medicare Part D

In this appendix we provide more details on our analysis of prescription drug claims for new enrollees in Medicare Part D. As described in the main text, we utilize variation in the birth month of beneficiaries, which creates variation in coverage duration during the first year of eligibility, to examine whether individuals respond to the non-linearity of the contract. Specifically, we test for a dynamic response by comparing the pattern of initial prescription drug claim propensity within a plan across newly-enrolled 65 year old beneficiaries who turn 65 at different points in the year. This creates variation in the expected end-of-year price across individuals who face the same initial, spot price for drugs. This allows us to repeat a similar analysis to the one we carry out in the employer-provided context earlier in the paper.

Figure 2 in the main text illustrated our main finding graphically. For the deductible plans, the future price is increasing with enrollment month and initial drug claim propensity is decreasing with enrollment month. For the no-deductible plan the future price is decreasing with enrollment month, and initial claim propensity does not appear to vary systematically with enrollment month. This appendix presents the analysis and its results in more detail.

Data and Summary Statistics Our data comprise a 20% random sample of all Medicare Part D beneficiaries in 2007 through 2009. Given the identification strategy, our analysis is limited to 65 year olds who newly enroll between February and October.[1] We further eliminate individuals who are dually eligible for Medicaid or other low-income subsidies, or are in special plans such as State Pharmaceutical Assistance Programs. Such individuals face a very different budget set with zero, or extremely low consumer cost-sharing. For these individuals the contract design features that are our focus are essentially irrelevant. Finally, we limit our attention to individuals in stand-alone prescription drug plans (PDPs), thereby excluding individuals in Medicare Advantage or other managed care plans which bundle healthcare coverage with prescription drug coverage.

Appendix Table A5 provides some basic summary statistics on our beneficiaries and their plans. We observe 3,575 different plans covering the beneficiaries in our sample of 65 year olds. All plans provide individual coverage; there are no family coverage plans. About one quarter of the plans have a deductible. Once the deductible is reached, average consumer cost-sharing is 0.37 for no-deductible plans and 0.27 for deductible plans. The plans tend to have a "gap" or "donut hole" at

[1] We exclude November and December enrollees because we want to observe our initial utilization measure over a reasonable time horizon. We exclude January enrollees because empirically they turn out to conflate both individuals whose birth month is in January with a reasonable number of people who join in January for other idiosyncratic reasons.

a spending of around $2,500, at which point the consumer price of care increases substantially, to close to 1.[2]

An assumption of our empirical strategy is that individuals face different contract durations depending on which month of the year they were born. Appendix Table A6 corroborates this, showing the relationship between birth month and enrollment month for our sample. The vast majority (over 70%) of our sample enrolls in their birth month. Virtually no one (less than 2%) enrolls prior to their birth month (this 2% presumably reflects measurement error in our data or some idiosyncratic circumstances). About one-quarter enrolls after their birth month (usually shortly thereafter), presumably reflecting some delay in signing up. In the empirical work below we will often instrument for enrollment month with birth month.

Measuring Future Price We define the future price to be the expected end-of-the year price. The expected end-of-year price depends on three elements: the cost-sharing features of the beneficiary's plan, the duration (number of months) of the contract, and the expected spending of individuals.

For illustrative purposes, Appendix Table A7 shows how the fraction of individuals ending up in different cost-sharing arms varies by enrollment month. We show this pattern separately for deductible and no-deductible plans. We see, for example, in the deductible plan that the fraction still in the deductible (high cost sharing) arm at the end of the calendar year is increasing in enrollment month; this is what drives the pattern of increasing future price with enrollment month in the deductible plans. In the no-deductible plans, the fraction in the (high cost sharing) gap at the end of the calendar year is decreasing in enrollment month, which is what drives the pattern of decreasing future price with enrollment month in the no-deductible plan.

In practice, we calculate the future price $p^f_{j,m}$ separately for each plan j and enrollment month m in the sample. Let $\Pr(j,m,a)$ denote the probability an individual who enrolls in plan j in month m ends up in the cost sharing arm a at the end of the year, and let $c_{j,a}$ denote the consumer cost-sharing rate for plan j in arm a. We calculate the empirical analog of $\Pr(j,m,a)$ using the data on the fraction of individuals who enrolled in plan j in month m and ended up at the end of the calendar year on each arm a. We calculate $c_{j,a}$ as the average ratio of out-of-pocket spending to total spending for each plan-cost sharing arm; to increase the precision of these estimates, we use individuals 65 and over (increasing our sample size to about 4 million beneficiary-years).[3]

[2] We describe below how we empirically calculate plans' cost-sharing rules. A small share of plans have some gap coverage but even for these plans consumer cost-sharing is about 0.76 in the gap (compared to over 0.95 for those with no gap coverage). In principle, those with no gap coverage should have a consumer cost sharing of 1 (and likewise in the deductible range the deductible consumer coinsurance rate should be 1). In practice, we estimate numbers slightly less than this, reflecting some drug-specific exceptions.

[3] In computing $c_{j,a}$ we make three simplifying abstractions. First, we summarize cost-sharing in each plan-arm in terms of the percent of total claims that must be paid out of pocket by the beneficiary (co-insurance). Although this is how cost-sharing is defined in the standard benefit design, in practice more than three-quarters of enrollees are in plans that specify a fixed dollar amount that must be paid by the beneficiary per claim (co-pays). To analyze the data in a single framework, we convert these co-pays to co-insurance rates for each plan-arm in the data by calculating the average ratio of out-of-pocket spending to total spending across all beneficiaries from our baseline

Thus, we have

$$p^f_{j,m} = \sum_{a \in A} \Pr(j, m, a) \cdot c_{j,a}, \tag{A1}$$

where $A = \{ded; pre\text{-}kink; gap; catastrophic\}$. The future price is the mean of the realized end-of-year cost sharing for each plan j and enrollment month m. We describe below a related variable ("simulated future price") that we use to instrument for the future price in some of our analyses.

Measuring Initial Claim Propensity Following our analysis in the main text, our primary outcome measure is the probability of a claim within the first three months. Over 80% of our sample has a claim within the first three months; not surprisingly, this fraction is lower for those in deductible plans (71%) than those in no-deductible plans (84%).[4]

Results Our empirical approach closely resembles the analysis of employer-provided health insurance in the main text. Appendix Table A8 shows the results. We begin by estimating the relationship between initial utilization and join month separately for deductible plans (column (1)) and no deductible plans (column (2)) based on equation (2) of the main text; we include plan fixed effects as covariates. The plan fixed effects control for any fixed difference in initial claim propensity across plans. Plans differ in, among other things, their cost sharing in the pre-kink arm and in the gap, and standard selection effects (or effects of the spot price for no-deductible plans) could therefore generate differences in initial claiming across plans. Our analysis focuses on whether, within plans, initial claims vary by enrollment month.

Recall that future price is increasing in enrollment month for deductible plans (Figure 2). Therefore, if individuals respond to the dynamic incentives in the insurance contract, we would expect to estimate a negative relationship between initial claims and enrollment month within deductible plans. Column (1) shows that this is the case; a one month increase in enrollment month is associated with a statistically significant 0.9 percentage point decline in the probability of a claim in the first three months. By contrast, the future price is slightly declining in enrollment month for no-deductible plans (Figure 2). Therefore, if individuals respond to dynamic incentives, the relationship between initial claims and enrollment month in no-deductible plans should be less negative than in the deductible plans and, absent any confounding influences of join month on initial claims, positive. Column (2) shows no economically or statistically significant pattern in the relationship between initial claims and enrollment month in the no-deductible plans.

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sample in that plan-arm. Second, since very few individuals reach the catastrophic limit, computing plan-specific cost sharing above this limit is difficult. We therefore caculate the average cost-sharing for all beneficiaries in our baseline sample in this arm across all plans. We note that almost all spending above the catastrophic limit is covered by the government directly, and therefore cost-sharing should be relatively uniform across plans. Third, we assume cost-sharing is uniform within a plan-arm, but actual plans often set cost-sharing within an arm differently by (up to six) drug "tiers"; drug tiers are defined by each plan's formulary and drugs are assigned to tiers based on whether the drug is branded or generic, among other factors.

[4] We don't report results using "initial (three month) spending" as the dependent variable since over one third of individuals in the deductible plan experience a change in the spot price within the first three months. However in practice it produces the same result that a higher future price is associated with less initial medical spending.

Column (3) shows the results from estimating the difference-in-difference equation, analogous to equation (3) in the main text. Not surprisingly given the previous two columns, the difference-in-differences analysis in column (3) shows an effect of enrollment month for deductible plans that is virtually identical to the deductible plan analysis in column (1). In column (4) we re-estimate equation (3), instrumenting for enrollment month with birth month.[5] The effect remains statistically significant although the magnitude attenuates. The point estimates indicate that a one month increase in enrollment month is associated with a 0.5 percentage point decline in the probability of an initial claim for individuals in the deductible plan, relative to the no-deductible plan.

Column (5) shows the relationship between initial claims and the future price, based on estimating an analog to equation (4) of the paper, by OLS. We thus compare initial claims across individuals within the same plan, controlling for a flexible relationship between initial claims and enrollment month that is common across all plans. Variation in the key right-hand-side variable, the future price, comes from variation across individuals in the plans they enrolled in, the month in which they enrolled, and the spending of the group of people who enrolled in that plan during that month. The results indicate that a 10 cent increase in the future price is associated with a 3 percentage point (4 percent) decline in the probability of having a claim in the first three months. Given an average expected end-of-year price for people in our sample who choose the deductible plan of about 60 cents, the 4 percent decline in the probability of an initial claim suggests an elasticity of initial claiming with respect to the future price of about -0.25.

In column (6) we introduce an instrumental variable to address two sets of potential concerns with the OLS analysis in column (5). One class of concerns is that individuals choose when to enroll in a plan. We would prefer to use variation in the future price that comes from birth month rather than enrollment month. A second class of concerns is the same set of issues discussed in the main text concerning potential measurement error in the future price, as well as the fact that the mechanical relationship between initial utilization and future price raises concerns about endogeneity, and reflection bias, and correlated shocks. We instrument for the future price based on a simulated future price. Like the future price, the simulated future price is computed based on the characteristics of the plan chosen. However, unlike the future price, it uses data on monthly spending for a *common sample* of individuals for all calculations, thus "purging" any variation in monthly spending that is correlated with plan or enrollment month, while at the same time addressing reflection bias and common shocks concerns. In addition, for the simulated future price we calculate contract duration (i.e. number of months of spending to draw) based on birth month, not join month; this is designed to address the concern that enrollment month may be endogenous.[6]

[5] Not surprisingly, given the patterns seen in Appendix Table A6, the relationship between birth month and enrollment month is quite strong. For example, a regression of (linear) enrollment month on (linear) birth month (controlling for plan fixed effects) has a coefficient of 0.858 (standard error = 0.002).

[6] Specifically, for every individual in our sample regardless of plan and enrollment month, we compute their monthly spending for all months that we observe them during the year that they enroll in the plan, creating a common monthly spending pool. We then simulate the future price faced by an indivdiual who enrolls in a particular plan in his birth month by drawing (with replacement) 10,000 draws of monthly spending from this common pool, for every month

The IV analysis in column (6), which uses the simulated future price and birth month fixed effects as instruments for the future price and enrollment month fixed effects, indicates that a 10 cent increase in the future price is associated with a statistically significant 2.6 percentage point (~3 percent) decline in the probability of an initial claim. Given an average future price for people in the deductible plan of about 6o cents for every dllar of spending, this suggests an elasticity of initial claiming with respect to the future price of about -0.2.

Identifying Assumption Our key identifying assumption is that conditional on any fixed spending differences by plan and any (flexible) spending pattern by enrollment month, the within year pattern of initial claim propensity by enrollment month does not vary based on which plan the individual enrolled in, except for the dynamic incentives. This strategy allows initial claims to vary across people in different plans due to selection differences (not surprisingly, we see in Figure 2 higher rate of initial claims for individuals in no-deductible plans, as would be expected from plan selection). It also allows for seasonal patterns in initial claims either because of demographic differences in the population by birth month or because of seasonal differences in drug use based on which three-month window is being used to define "initial utilization."

One reason the identifying assumption could be violated is if the same dynamic response that may lead to differential initial claims among people in the same plan with different contract length also leads to differential selection into plans on the basis of enrollment month. A priori, it is not clear if individuals would engage in differential selection into a deductible vs. no-deductible plan based on the month they are enrolling in the plan. In practice, we find that the probability of enrolling in the no-deductible plan is increasing in enrollment month in a statistically significant but economically trivial manner (one extra month is associated with a 0.4 percentage point increase in the probability of choosing a deductible plan, relative to a mean probability of choosing the no-deductible of about 75 percent).

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we need a monthly spending measure. For the first month we draw from the pool of first month spending (since people may join the plan in the middle of the month, the first month's spending has a different distribution from other months) whereas for all other months in the plan that year we draw from the pool (across plans and months) of non first month spending. For each simulation we then compute the expected end-of-year price based on the draws.

Appendix B: Supplementary Appendix Tables

Appendix Table A1: Additional Plan Details

Employer	Plan	Years offered	Mid-year new enrolees[a]	In-network features						Out-of-network features					
				Deductible ($)		Coins[b]	Copay ($)	Stop loss ($)		Deductible ($)		Coins[b]	Copay ($)	Stop loss ($)	
				Single	Family			Single	Family	Single	Family			Single	Family
Alcoa	A0	2004-07	3,269	0	0	0.10	0	2,500	5,000	250	500	0.3	0	5,000	10,000
	A1	2004-07	3,542	250	500	0.10	0	2,750	5,500	500	1,000	0.3	0	5,500	11,000
Firm B	B0	2001-05	37,759	0	0	0.00	15	0	0	250	500	0.2	0	1,250	2,500
	B1	2001-05	9,553	150	300	??	??	??	1,100	??	??	??	0	??	??
Firm C	C0	1999-05	27,968	0	0	0.00	15	0	0	300	750	0.3	0	3,000	6,000
	C1	1999-00	6,243	200	500	0.10	0	1,000	2,000	??	??	0.3	0	3,750	7,500
	C2	2001-02	8,055	250	625	0.10	0	1,250	2,500	250	625	0.3	0	3,900	7,800
	C3	2004-05	5,633	300	750	0.10	0	1,300	2,600	300	750	0.3	0	3,900	7,800

"??" denotes an unknown feature of a plan.

[a] The sample includes employees who enroll in February through October.

[b] Coinsurance denotes the fraction of medical expenditures the insured must pay out of pocket after hitting the deductible and prior to reaching the "stop loss."

Appendix Table A2: Responsiveness of Different Types of Care to The Future Price

	Dependent variable	Mean of the dep. var.	Coeff. on future price	Std. Error
(1)	Log initial spending	3.32	-0.78	(0.27)
(2)	Log initial outpatient spending	3.29	-0.78	(0.27)
(3)	Initial spending	596.2	-121.1	(182.0)
(4)	Initial outpatient Spending	445.0	-169.5	(96.0)
(5)	Initial inpatient Spending	147.5	45.6	(133.3)
(6)	Any initial claim	0.058	-0.126	(0.039)
(7)	Any initial outpatient claim	0.058	-0.14	(0.04)
(8)	Any initial inpatient claim	0.014	-0.004	(0.009)

Table reports the relationship between different types of initial medical spending and expected end-of-year price ("future price"). All rows show the results from estimating equation (5) by IV (as in Table 4) using different dependent variables; in addition to "future price" the covariates in this regression include plan by coverage tier fixed effects, join month fixed effects and firm by join month fixed effects. Standard errors are clustered on join month by coverage tier by firm. The first row shows the baseline results (see bottom row in Table 4) for the dependent variable log initial spending (plus 1). In row 2 the dependent variable is the log of initial outpatient spending (plus 1). Rows 3 through 5 show results for the level of initial medical spending, the level of initial outpatient spending and the level of initial inpatient spending respectively. The last three rows show results for an indicator of any initial claim, any initial outpatient claim, and any initial inpatient claim. "Initial" spending is defined as spending in the first three months of the plan for all covered members of the plan. N=102,022.

Appendix Table A3: Additional Robustness Exercises

	Specification	N	Any Initial Claim		Log Initial Spending	
			Coeff on p^f	(S.E.)	Coeff on p^f	(S.E.)
(1)	Baseline	102,022	-0.126	(0.039)	-0.78	(0.27)
	Panel A: Alternative sets of fixed effects					
(2)	Don't limit to within firm	102,022	-0.081	(0.034)	-0.64	(0.25)
(3)	Don't control for Tier	102,022	-1.004	(0.166)	-6.58	(1.10)
(4)	Tier x firm interactions	102,022	-0.059	(0.020)	-0.31	(0.10)
	Panel B: Family vs Single Tier					
(5)	Family Tier	43,358	-0.046	(0.055)	-0.50	(0.44)
(6)	Single Tier	58,664	-0.166	(0.047)	-0.92	(0.32)

Table reports results from alternative analyses of the relationship between initial medical utilization and expected end-of-year price. The first row shows the baseline results (see bottom row in Table 4) from estimating equation (5) by IV (as in Table 4). In addition to the expected end-of-year price, the regressions also include plan by coverage tier fixed effects, join month fixed effects and firm by join month fixed effects. Standard errors are clustered on join month by coverage tier by firm. Alternative rows report single deviations from this baseline specification, all estimated by IV. In Row 2 we remove the firm by join month fixed effects from the baseline. In Row 3 we remove the controls for coverage tier (so that there are plan fixed effects but not plan by coverage tier fixed effects) from the baseline. In row 4 we add firm by coverage tier fixed effects and firm by coverage tier by join month fixed effects to the baseline. In rows 5 and 6 we stratify the sample by coverage tier.

Appendix Table A4: Differences in Observables by Plan and Join Month

Employer	Plan	Deductible (Single/Family) [N = enrollees]	Indicator for Old (>=45) Difference (1)	Indicator for Old (>=45) DD (2)	Indicator for Female Difference (3)	Indicator for Female DD (4)
Alcoa	A0	0 [N = 3,269]	-0.009 (0.004)		-0.011 (0.003)	
	A1	250/500 [N = 3,542]	-0.008 (0.002)	0.0020 (0.0041)	-0.002 (0.003)	0.009 (0.004)
Firm B	B0	0 [N = 37,759]	-0.004 (0.003)		-0.003 (0.002)	
	B1	150/300 [N = 9,553]	-0.010 (0.004)	-0.0059 (0.0026)	-0.004 (0.004)	-0.001 (0.003)
Firm C	C0	0 [N = 27,968]	-0.014 (0.002)		0.009 (0.002)	
	C1-C3	200-300/500-750 [N = 19,931]	-0.019 (0.003)	-0.0045 (0.0032)	0.009 (0.003)	0.000 (0.003)

Table reports coefficients (and standard errors in parentheses) from regressing the dependent variable on join month (which ranges from 2 (February) to 10 (October)). The dependent variables are demographic characteristics (defined in the top row) with overall means for "old" (i.e. age 45+) of 0.27 and for female of 0.48. Columns (1) and (3) report the coefficient on join month separately for each plan, based on estimating equation (2); the regressions also include an indicator variable for coverage tier (single vs. family). Columns (2) and (4) report the difference-in-differences coefficient on the interaction of join month and having a deductible plan, separately for each firm, based on estimating equation (3); the regressions also include plan by coverage tier fixed effects and join month fixed effects. Standard errors are clustered on join month by coverage tier.

Appendix Table A5: Medicare Part D Summary Statistics

Sample	Deductible plans	No Ded. plans
Obs. (beneficiaries)	28,960	108,578
Age	65	65
Female	0.59	0.60
Avg. Deductible Amount	257.1	0
Avg. Deductible Coins. Rate	0.85	--
Avg location of gap[a]	2,516.4	2,534.6
Avg. pre-gap Coins. Rate	0.27	0.37
Pct w/ Some Gap Coverage	0.00	0.12
Avg. Gap Coins. Rate (no gap Coverage)	0.88	0.98
Avg. Gap Coins. Rate (some gap coverage)	--	0.76

Table shows summary statistics for a 20% random sample of 65 year-old Medicare Part D beneficiaries who joined Medicare Part D between February and October. In addition we exclude individuals in Medicare Part D who are dually eligible for Medicare or other low-income subsidies, or not in stand-alone prescription drug plans; see Appendix text for more details. We report results separately for those in deductible and no deductible plans. "Coinsurance" refers to the share of expenditures that the beneficiary pays out of pocket.

[a] Location of gap refers to the amount of total (insurer + out of pocket) drug expenditures at which individuals enter the gap (or donut hole).

Appendix Table A6: Relationship between Birth Month and Enrollment Month

Birth Month	Join Month									Total N
	2	3	4	5	6	7	8	9	10	
1	37.7	17.9	19.2	9.6	3.5	4.3	2.6	2.6	2.8	4,947
2	68.5	11.9	7.0	5.1	3.4	1.4	1.0	1.0	0.8	14,861
3	1.8	67.1	13.7	6.0	4.8	3.7	1.1	1.0	0.8	15,878
4	0.0	1.9	69.8	11.9	6.1	5.0	3.2	1.2	1.0	14,640
5	0.0	0.0	1.8	70.2	12.3	6.7	4.6	3.4	1.0	14,674
6	0.0	0.0	0.0	2.1	70.4	12.4	6.5	5.0	3.6	14,754
7	0.0	0.0	0.0	0.0	1.9	72.3	13.2	7.2	5.5	16,247
8	0.0	0.0	0.0	0.0	0.0	2.2	76.6	14.4	6.8	15,359
9	0.0	0.0	0.0	0.0	0.0	0.0	2.2	83.5	14.3	14,058
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	97.3	11,823
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	297
Total (%)	8.9	9.9	10.7	10.6	10.8	12.1	12.2	12.6	12.3	137,538

Table shows the relationship between birth month and enrollment month for our 65-year old sub-sample. Specifically, it indicates the percent of beneficiaries born in each birth month who enrolled in each month. The last column shows the sample size for each birth month.

Appendix Table A7: Relationship between Enrollment Month and Final Cost Sharing Phase

Enrollment Month	Deductible	Pre-kink	Gap	Catastrophic	N
			Deductible Plans		
2	34.0	50.0	14.1	1.9	2,840
3	35.3	51.5	11.7	1.5	3,035
4	39.3	48.7	10.5	1.5	3,235
5	42.2	48.6	8.3	1.0	3,147
6	45.8	46.7	6.8	0.7	3,185
7	49.2	45.9	4.4	0.6	3,518
8	54.7	42.6	2.6	0.2	3,314
9	60.9	37.6	1.4	0.2	3,352
10	70.3	28.6	1.1	0.0	3,334
Total	48.4	44.2	6.5	0.8	28,960
			No-Deductible Plans		
2	0.0	81.2	17.1	1.8	9,496
3	0.0	83.8	14.9	1.4	10,543
4	0.0	86.7	12.2	1.2	11,411
5	0.0	88.9	10.4	0.7	11,387
6	0.0	91.9	7.6	0.5	11,646
7	0.0	94.5	5.0	0.6	13,106
8	0.0	96.0	3.8	0.2	13,449
9	0.0	97.9	1.9	0.2	13,931
10	0.0	98.9	1.0	0.1	13,609
Total	0.0	91.8	7.6	0.7	108,578

Table shows the relationship between enrollment month and the final (end of year) cost sharing phase the employee ends up in. Specifically, it shows the percent of beneficiaries, for each enrollment month, who end up in each cost-sharing arm. We show results separately for deductible and no-deductible plans for our 65-year-old sub sample (N=137,538).

Appendix Table A8: Relationship between Initial Drug Use, Enrollment Month, and Future Price

	Dependent Variable: Any initial claims					
Sample	Deductible plans	No-deduct. plans	All	All	All	All
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS (DD)	IV (DD)	OLS	IV
Enrollment month	-0.009***	< 0.0001				
	(0.001)	(< 0.0001)				
Deductible*Enrollment month			-0.009***	-0.005***		
			(0.001)	(0.001)		
Future price					-0.297***	-0.257***
					(0.016)	(0.043)
N	28,627	108,236	136,863	136,863	136,863	136,863

Table shows the relationship between initial drug use and enrollment month. Throughout our measure of initial drug use (the dependent variable) is an indicator for at least one claim over the first three months. Column (1) shows the coefficient on join month from estimating the relationship between the initial claim indicator and enrollment month, controlling for plan fixed effects (equation (2)) for deductible plans (for which the future price on average increases with enrollment month). Column (2) shows the coefficient on enrollment month from estimating the same equation (2) for no-deductible plans (for which the future price on average decreases with enrollment month). Column (3) shows the coefficient on the interaction of enrollment month and a deductible dummy from estimating the "difference in difference" equation (3), which controls for plan fixed effects and enrollment month fixed effects, on the combined sample of individuals in all plans. Column (4) shows the instrumental variables estimation of the difference in difference equation (3) shown in column (3), where we instrument for enrollment month fixed effects and the enrollment month variable interacted with a deductible dummy using birth month fixed effects and a birth month variable interacted with a deductible dummy; F-statistics for the first stage models are all above 2,000. Standard errors are clustered at the plan level in all specifications. Columns (5) and (6) show the relationship between the initial claim indicator and future price. Column (5) shows the coefficient on future price from estimating the relationship between initial claim and future price, controlling for plan fixed effects and enrollment month fixed effects (equation (4)). Column (6) shows the instrumental variables estimation of equation (4), where we instrument for the future price and enrollment month fixed effects with the simulated future price and birth month fixed effects; F-statistics for the first stage models are all above 200. Standard errors are clustered at the plan level in all specifications.

Appendix Table A9: Summary Statistics of The RAND Data

Coinsurance Rate	Maximum Dollar Expenditure (MDE)	Number of family years (Number of families in year 1)	Average MDE (Adjusted[a])	Share of family-years who hit the MDE	Expected End-of-Year Price[b]
(1)	(2)	(3)	(4)	(5)	(6)
100%	5% of income up to $1,000	33 (33)	$533	0.33	0.67
	10% of income up to $1,000	29 (29)	$801	0.21	0.79
	15% of income up to $1,000	33 (33)	$794	0.21	0.79
95%	5% of income up to $1,000	418 (84)	$559	0.40	0.57
	10% of income up to $1,000	342 (80)	$746	0.34	0.63
	15% of income up to $1,000	470 (101)	$817	0.33	0.63
50%	5% of income up to $1,000	111 (26)	$535	0.28	0.36
	10% of income up to $1,000	76 (17)	$779	0.16	0.42
	15% of income up to $1,000	308 (84)	$847	0.19	0.40
"Mixed" (50% for dental & mental health; 25% for all other)	5% of income up to $750	189 (41)	$499	0.28	0.22
	10% of income up to $750	226 (44)	$584	0.31	0.22
	15% of income up to $750	159 (30)	$689	0.16	0.26
	5% of income up to $1,000	18 (18)	$523	0.28	0.23
	10% of income up to $1,000	19 (19)	$600	0.16	0.26
	15% of income up to $1,000	13 (13)	$837	0.08	0.29
25%	5% of income up to $750	192 (22)	$518	0.17	0.21
	10% of income up to $750	208 (31)	$617	0.17	0.21
	15% of income up to $750	207 (26)	$683	0.18	0.21
	5% of income up to $1,000	86 (52)	$535	0.14	0.22
	10% of income up to $1,000	70 (43)	$818	0.11	0.22
	15% of income up to $1,000	70 (44)	$816	0.16	0.21
0%	--	2,376(620)	--	1.00	0.00

[a] Regression adjusted for differences in site, start month, and year across plans (see Newhouse et al. 1993, Appendix B) for more details).

[b] Expected end-of-year price equals the share of families not hitting the MDE (in the given plan) times the coinsurance rate. For the mixed coinsurance rates plans, we weight the two coinsurance rates based on their shares of initial claims in the full sample; 25% of initial claims are for mental/dental.

Appendix Table A10: Experimental Treatment Effects from The RAND Experiment

		Maximum Dollar Expenditure (MDE)[a]		
		5%	10%	15%
A. Spending average[b]				
Coinsurance Rate	100%	741	698	570
	95%	1,061	1,189	1,287
	50%	1,254	1,751	1,271
	"Mixed"[d]	1,434	1,816	1,287
	25%[d]	1,200	1,164	1,564
	0%		1,897	
B. Spending geometric average[c]				
Coinsurance Rate	100%	188	163	196
	95%	229	235	202
	50%	355	241	302
	"Mixed"[d]	368	507	445
	25%[d]	343	436	538
	0%		749	

Table shows average annual spending for the 5,653 family-years in the RAND Health Insurance Experiment randomized into the combination of coinsurance rates and MDEs shown in the table.

[a] As seen in Appendix Table A9, the MDEs are specified as a percent of family income, up to a cap of either $1,000 or $750.

[b] Top panel reports average annual spending by cell.

[c] In the bottom panel, we report the geometric average of annual spending by cell. Specifically, for each cell we average the log of annual spending (plus 1) and then exponentiate (and subtract 1).

[d] As seen in Appendix Table A9, these coinsurance rates have two sets of MDE dollar caps ($1,000 and $750) for each MDE specified as a percent of family income. We report the average spending across both dollar caps.