CHOOSE TO LOSE: HEALTH PLAN CHOICES FROM A MENU WITH DOMINATED OPTIONS[*]

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We examine the health plan choices that 23,894 employees at a U.S. firm made from a large menu of options that differed only in financial cost-sharing and premium. These decisions provide a clear test of the predictions of the standard economic model of insurance choice in the absence of choice frictions because plans were priced so that nearly every plan with a lower deductible was financially dominated by an otherwise identical plan with a high deductible. We document that the majority of employees chose dominated plans, which resulted in excess spending equivalent to 24% of chosen plan premiums. Low-income employees were significantly more likely to choose dominated plans, and most employees did not switch into more financially efficient plans in the subsequent year. We show that the choice of dominated plans cannot be rationalized by standard risk preference or any expectations about health risk. Testing alternative explanations with a series of hypothetical-choice experiments, we find that the popularity of dominated plans was not primarily driven by the size and complexity of the plan menu, nor informed preferences for avoiding high deductibles, but by employees' lack of understanding of health insurance. Our findings challenge the standard practice of inferring risk preferences from insurance choices and raise doubts about the

I. INTRODUCTION

Securing health insurance, for most Americans, involves choosing a plan from a menu of diverse options. The exchanges of the Affordable Care Act (ACA) and Medicare Part D, for example, as well as many employer-sponsored benefit programs, require individuals to choose between health plans that often differ on both financial and nonfinancial dimensions. Whether providing a range of plan options to consumers improves their welfare depends on whether they make economically sensible choices between the options they are offered.

Evaluating plan choice is challenging because, in theory, these choices reflect a range of considerations, many of which are not observed by researchers. The standard model of insurance demand assumes that informed consumers select plans based on trade-offs between lower expected wealth (as a result of higher premiums) and a reduction in the variance of wealth (as a result of lower cost-sharing). How consumers negotiate such trade-offs should be informed by beliefs concerning future health care spending and tolerance for financial risk. Plan choice is likely to be further complicated because plans often vary across several nonfinancial dimensions, such as network coverage and the reputation of the insurer.

We circumvent many of these complications by analyzing decisions in a unique setting in which a large U.S. firm asked its employees to "build" their own insurance plan by indicating their preference for cost-sharing across four plan components: deductible, copayment, coinsurance, and out-of-pocket maximum. A distinctive feature of this insurance program was that, besides these differences in cost-sharing, the 48 plans that employees could build were otherwise identical (e.g., each plan was administered by the same insurer, covered the same set of medical services, and involved the same network of providers). The enrollment interface also standardized the visual presentation of plan details and prices. This standardization in plan structure and information display should have allowed employees, at least in principle, to focus purely on considerations of financial risk and cost-sharing in their selection of plans.

A second key feature of the insurance program was that because of how plans were priced, a large share of available options were financially dominated by other plans.[1] Financial dominance emerged because many plans were less expensive (in some cases, substantially so) regardless of how much care the employee required. For nearly every plan with a deductible of $1,000 (the highest deductible available for those seeking single coverage), the additional premiums required to reduce the deductible, fixing all other plan attributes, exceeded the maximum possible out-of-pocket savings provided by the lower deductible. For example, an employee would have had to pay an average of $528 more in annual premiums to reduce her deductible from $1,000 to $750, all else being equal. Because this additional cost exceeds the maximum possible reduction in out-of-pocket spending of $250, no beliefs about health care needs or standard preferences for avoiding risk could rationalize the choice of the low-deductible plan. Of the 36 lower-deductible plans available, 35 were dominated in this fashion. In combination, these features provided a unique opportunity for us to evaluate the economic efficiency of health plan choices without requiring us to make assumptions about consumer preferences for nonfinancial plan features or about their expectations of future medical need.

Our primary finding is that the majority of the 23,894 employees in our sample selected financially dominated plans.[2] More precisely, 61% of employees selected a nominally dominated plan, and an estimated 55% of employees chose a plan that was dominated after adjusting for the difference in tax treatment of premium and out-of-pocket spending. The economic consequences of these choices are significant. We estimate that the average employee opting into a dominated plan could have saved $372 a year by choosing an otherwise equivalent plan with a higher deductible—equivalent to 24% of the employee's original plan premium and 50% of the premium associated with the nondominated

1. While a full discussion of the genesis of plan pricing is beyond the scope of the article, in an earlier working paper, we show that the observed prices appear roughly consistent with what would have been expected from the application of average cost pricing, a common strategy for pricing insurance, to the firm's plan menu given plausible assumptions of employee sorting (Bhargava, Loewenstein, and Sydnor 2015).

2. For tractability, we focus on employees choosing single coverage plans, but we find similar patterns in the choices for the 27,298 benefit-eligible employees who selected plans with coverage for spouses or dependents.

(high-deductible) alternative. We find comparable estimates when we calculate risk-adjusted measures of forgone savings using individual-level estimates of the ex ante distribution of potential medical spending under different assumptions about the level of underlying risk aversion.

Employees differed significantly in their propensity to choose dominated plans. Those earning less than $40,000 were substantially more likely to select dominated plans than their better-compensated counterparts. Groups with higher expected medical utilization, such as female workers, older employees, and employees with chronic health conditions, were also more likely to select dominated plans. While these patterns are consistent with the adverse selection widely documented by health economists, in this setting the choice of a plan with low cost-sharing ensured a higher level of spending on health care with complete certainty. Finally, while 23% of employees switched into different plans in the plan year that followed the period of our analysis, this switching led to only modest gains in overall choice efficiency and, like initial plan choice, differed by employee characteristics. Lower-income employees were less likely to switch plans, and, in the event of a switch, were less likely to switch into the highest deductible plan. These results collectively point to widespread, costly, and regressive departures from the predictions of the standard model of insurance demand.

Our findings contribute to a growing body of research that finds that people make financially inefficient plan choices. Experiments have demonstrated that, in the absence of decision aids, subjects faced with hypothetical plan menus struggle to identify financially efficient plans (e.g., Schram and Sonnemans 2011; Johnson et al. 2013; Kairies-Schwarz et al. 2014; Bhargava, Loewenstein, and Benartzi, forthcoming). In the field, studies examining choices of prescription drug plans in Medicare Part D have found that large numbers of seniors select plans off the financially efficient frontier (Heiss, McFadden, and Winter 2010; Abaluck and Gruber 2011; Zhou and Zhang 2012), and that many consumers modify their choices after receiving simplified information on expected plan costs, suggesting that the initial choices may not have been fully informed (Kling et al. 2012). A study of enrollment in Medicare Advantage plans, conducted during a brief period when private fee-for-service plans offered superior benefits to identically priced alternatives in traditional Medicare, found that few beneficiaries enrolled in the financially dominant plans,

although it is unclear whether these consumers had the price information required for plan comparison (Afendulis, Sinaiko, and Frank 2015). More generally, interpreting evidence on decisions from Medicare is difficult, because such decisions often reflect unobserved differences in medical needs and preferences for nonfinancial plan attributes and are made by consumers who often lack access to standardized plan information.

Only two studies, to the best of our knowledge, have documented clear violations of dominance in health plan choices of working-age individuals. In an analysis of employee decisions from an employer-sponsored health insurance plan, Handel (2013) found that some employees were in plans that, while not dominated at the time of initial enrollment, had become dominated by other plans over time due to relative changes in plan prices. This failure of many employees to switch plans in response to changes in relative plan value provides evidence of costly consumer inertia.[3] Sinaiko and Hirth (2011) also identified employees whose plan choices violated dominance, albeit with respect to nonfinancial plan features. Specifically, some university employees enrolled in a particular health plan when a second plan was available with more attractive terms for specialist referrals and out-of-network care but otherwise identical features (including premiums). Our findings build on these prior studies by documenting economically significant violations of financial dominance in a setting in which employees actively chose plans from a standardized menu.

The implications of our findings for health policy and economic theory depend on why consumers chose financially dominated plans. Toward such an understanding, we identify—and then experimentally test—three broad explanations for employee behavior. These explanations, while not intended to be exhaustive or mutually exclusive, reflect distinct departures from a frictionless benchmark model of consumer demand. First, the complexity of the plan menu might cause individuals to choose suboptimally in a way they would not if the menu were simpler ("menu complexity"). A large or otherwise complicated menu could cause people to limit the set of plans they consider or to suffer more generally from the adverse consequences that researchers have associated with

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3. Handel's work contributes to a broader literature documenting the effects of consumer inertia in health insurance (Strombom, Buchmueller, and Feldstein 2002; Frank and Lamiraud 2009; Sinaiko and Hirth 2011; Ketcham et al. 2012; Ericson 2014; Afendulis, Sinaiko, and Frank 2015).

information and choice overload (e.g., see Chernev, Bockenholt, and Goodman 2015). Second, the demand for dominated plans could simply reflect the informed preferences of consumers willing to spend more, with certainty, to reduce their out-of-pocket spending ("nonstandard preferences"). Although such preferences are not consistent with standard formulations of insurance demand, which assume that utility is derived only from final wealth states, they could emerge from the presence of liquidity constraints or from more psychologically informed considerations such as the hedonic costs of out-of-pocket spending (e.g., Prelec and Loewenstein 1998; Kőszegi and Rabin 2007) or the use of low deductibles as a commitment device to seek care (Baicker, Mullainathan, and Schwartzstein 2015; Brot-Goldberg et al. 2015). Finally, we consider the possibility that the choice of dominated plans reflects at least in part an inability to accurately evaluate and compare plan value ("insurance competence"). The pervasiveness of low insurance competence is suggested by surveys indicating that most consumers do not understand even the basic cost-sharing features of insurance such as a deductible (Winter et al. 2006; Johnson et al. 2013; Loewenstein et al. 2013; Atanasov and Baker 2014; Handel and Kolstad 2015).[4]

We test these explanations by conducting two online experiments, in which we asked several thousand subjects to make hypothetical decisions from simplified representations of the dominated plan menu. While these hypothetical choice studies are subject to standard cautions, the validity of this approach is supported by the finding that our experimental subjects exhibit a double-peaked pattern in deductible choice very similar to that of the employees in our sample. Further, we note that other studies have successfully used this paradigm to examine health insurance decisions (e.g., Kesternich et al. 2013; Ericson and Starc, forthcoming), including one that found that these hypothetical choices were not significantly affected by the introduction of incentives for efficient choice (Johnson et al. 2013).

In a first experiment, we tested whether menu complexity led subjects to choose dominated plans. We randomized subjects across stylized menus in which we varied the number of available plans (from 4 to 12), whether plans were characterized by one or two cost-sharing attributes, and the logistical ease of plan

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4. See also Fang, Keane, and Silverman (2008) on the role of cognitive ability in shaping insurance choices.

comparisons (e.g., by requiring subjects to make a sequence of choices modeled on the idiosyncratic online interface used by employees or a choice from a simultaneous table of options). The results of the experiment point to the limited importance of menu complexity in the demand for dominated plans.[5] Presented with a simple table displaying four plans differing only in their deductible and premium, a majority of subjects persist in choosing dominated plans when such dominance should have been easy for the informed consumer to recognize.

In a second experiment, we tested whether the demand for dominated plans reflects an informed willingness to pay for low deductibles or involves instead at least some misunderstanding of how to evaluate plan value. We randomized subjects to choose from either a simple baseline menu, adapted from the simplest version of the menu in the first experiment, or one that additionally clarified the consequences of plan choice. The design was motivated by the presumption that additional clarification should not sway subjects with an already informed preference but could influence those lacking in insurance understanding. We found that the presence of plan clarifications reduced the share of subjects choosing a dominated plan from 48% to 18%. To further explore the role of consumer understanding in plan choice, we elicited three distinct measures of insurance understanding and observed a strong correlation between each and the choice of dominated plans. In fact, among the nearly one-quarter of subjects who scored high on all three measures, less than 2% chose a dominated plan.

Taken collectively, results from the experiments suggest that the demand for dominated plans does not predominantly reflect the informed preferences of consumers or the consequences of menu complexity, but instead involves a failure of consumers to accurately evaluate and compare plans. This conclusion is underscored by apparent inconsistencies in the preference for cost-sharing revealed by the specific combination of cost-sharing features chosen by many of the employees. It is also supported by the strong correlation between measured insurance literacy and avoidance of dominated choice. While none of these findings rule out the possibility that consumers who chose dominated plans might have had a strong aversion to high deductibles and that

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5. See Ketcham, Lucarelli, and Powers (2015) for complementary results that suggest that large choice sets in Medicare Part D may actually lead to increased switching toward more cost-effective plans.

such aversion may be welfare relevant, the evidence suggests that most dominated plan choices are unlikely to be entirely attributable to a fully informed preference for low deductibles. Further, though we cannot rule out the potential presence of other behavioral mechanisms—such as, for example, inaccurate beliefs regarding differences in plan value that might lead employees to expend less effort to compare plans—we interpret the collective evidence as indicating that such explanations did not, in themselves, generate the observed pattern of plan choice. Ultimately, we conclude that a lack of basic insurance competence played a significant role in the demand for dominated plans.

The finding that a majority of employees choose dominated plans, that such choices are economically consequential, and that these decisions reflect deficits in insurance competence has implications for health policy. For policy makers, if the expansion of plan choice is intended to make it possible for consumers to sort into preferred health plans, our findings raise doubts as to whether consumers, many of whom face plan menus far less standardized than did the employees we studied, are likely to make informed, self-interested decisions.[6] Beyond the direct financial consequences of choice, the presence of a large share of unsophisticated consumers may reduce the likelihood that firms will compete over price and quality—a possibility raised by recent research in behavioral industrial organization (DellaVigna and Malmendier 2004; Gabaix and Laibson 2006; Sandroni and Squintani 2007; Heidhues and Kőszegi 2014; Ho, Hogan, and Morton 2014). One can interpret these findings as strengthening the rationale for efforts to aid consumers through decision aids (e.g., Kling et al. 2012; Johnson et al. 2013) or to encourage the creation of structurally simple and more standardized insurance plans (Ericson and Starc 2012; Loewenstein et al. 2013; Bhargava and Loewenstein 2015).

Our findings also have implications for studies that use data on insurance decisions and medical claims to estimate risk aversion, study adverse selection, and analyze insurance markets (e.g., Cohen and Einav 2007; Einav, Finkelstein, and Cullen 2010;

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6. As highlighted by Johnson et al. 2013, the idea that health reform has been motivated in part by expanding consumer choice is reflected by statements by Kathleen Sebelius, former Secretary of Health and Human Services, such as: "Exchanges offer Americans competition, choice, and clout. Insurance companies will compete for business on a transparent, level playing field, driving down costs, and Exchanges will give individuals . . . a choice of plans to fit their needs."

Einav, Finkelstein, and Levin 2010; Handel 2013; Handel, Hendel, and Whinston 2015). If consumers do not avoid dominated plans, as we observe in our setting, they are unlikely to make the informed cost-coverage trade-offs that standard models assume but are unable to explicitly test, in settings in which differences in plan prices are less stark. By documenting inefficient decisions in a context in which such decisions cannot be attributed to risk aversion (because they violate dominance), our findings challenge the validity of prior attempts to estimate risk aversion parameters from insurance choices made from menus that do not include dominated options. Another implication of these findings is that if consumers are so insensitive to premiums so as to choose dominated plans, the degree of market unraveling due to adverse selection predicted by structural models such as those in Handel, Hendel, and Whinston (2015) may be overstated. These insights build on prior work (e.g., Sydnor 2010; Barseghyan et al. 2013; Handel 2013; Baicker, Mullainathan, and Schwartzstein 2015; Handel and Kolstad 2015; Spinnewijn, forthcoming) by emphasizing the need for researchers to consider issues of consumer sophistication and literacy when interpreting insurance choices. Finally, the robust and systematic patterns of deductible demand exhibited across experimental and field settings point to the need for new models of insurance demand that move beyond the incorporation of nonsystematic informational frictions (Handel and Kolstad 2015; Spinnewijn, forthcoming) to those that more accurately reflect the psychology that underlies actual plan choices. Beyond accommodating imperfect consumer understanding, such models might also be informed by recent work on nonstandard preferences (Kőszegi and Rabin 2007; Sydnor 2010; Barseghyan et al. 2013), behavioral moral hazard (Baicker, Mullainathan, and Schwartzstein 2015), context dependence and informational salience (Bordalo, Gennaioli, and Shleifer 2012), and menu-based decision heuristics (Kamenica 2008; Ericson and Starc 2012).

II. Background and Institutional Detail

Our main analysis draws on administrative data on plan choice, medical spending, and employee characteristics from 2010 to 2012 for benefit-eligible employees of a Fortune 100 firm whose identity we suppress for confidentiality.

II.A. Structure of the Plan Menu

Prior to 2010, eligible employees in the firm were given a choice between three health insurance plans that varied across plan attributes and providers (Basic, Plus, Premium). For simplicity, we refer to a "plan year" (or PY), as the year in which plan choices were made, although insurance actually covers the period from June 1 of that year to May 31 of the following year (e.g., PY 2010 refers to coverage from mid-2010 to mid-2011). Beginning in PY 2010, the firm instituted a new program in which employees were asked to choose a health insurance plan from a standardized menu of 48 options, all from the same provider. These plans represented the full conjoint of available options across four annual deductibles ($1,000, $750, $500, $350), three levels of maximum-out-of-pocket spending (MOOP) above the deductible ($3,000, $2,500, $1,500), two coinsurance rates on coverage above the deductible and before the out-of-pocket threshold is reached (80%, 90%), and two office copayments ($15 for primary care/$40 for specialist, $25 for primary care/$35 for specialists). Out-of-network, all plans featured a $3,500 deductible, a $7,500 out-of-pocket maximum, and either a 50% or 60% coinsurance rate, depending on the choice of in-network coinsurance. Beyond the described variation in cost-sharing, plans were otherwise identical. In the analyses that follow, we focus on employees who chose single coverage (i.e., to cover only themselves). Table I reports details for the plan menu.[7] In the following year, the set of available plans remained unchanged apart from an increase in prices described below.

II.B. Plan Pricing and Dominated Choice

Given that plans were identical beyond cost-sharing attributes, plan dominance in this setting can be assessed by comparing the difference in plan premiums and plan deductibles, for plans that have an identical copayment, coinsurance, and MOOP. We group plans in this way in Table I. For example, in Plan Group A, Plan 37 in the firm's menu (deductible of $1,000, premium of $930) financially dominates Plan 13

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7. Plan prices feature small differences across geographic area and business units. Prices are averaged across geographies and business units (but not coverage tier) for our analysis. According to the Firm, such price differences are modest and do not meaningfully affect price differences across plans for a given geography and business unit.

TABLE I
PLAN MENU DETAIL AND PRICE DOMINATION

Plan group	Firm's plan number	Plan features and employee demand						Relative to $1k deductible in group		
		Deductible	Coinsurance	MOOP	Copay	Employee premium	Choice share	Premium difference	Dominated by alternative	Dominated plan share after tax adjustment
A	Plan 37	$1,000	90%	$1,500	$15/$40	$930	4.5%	—	—	—
A	Plan 25	$750	90%	$1,500	$15/$40	$1,463	0.4%	$533	Yes	100%
A	Plan 13	$500	90%	$1,500	$15/$40	$1,568	2.9%	$638	Yes	65%
A	Plan 1	$350	90%	$1,500	$15/$40	$2,134	5.3%	$1,204	Yes	100%
B	Plan 38	$1,000	90%	$2,500	$15/$40	$748	1.5%	—	—	—
B	Plan 26	$750	90%	$2,500	$15/$40	$1,333	0.5%	$585	Yes	100%
B	Plan 14	$500	90%	$2,500	$15/$40	$1,455	3.0%	$707	Yes	100%
B	Plan 2	$350	90%	$2,500	$15/$40	$1,983	0.3%	$1,235	Yes	100%
C	Plan 39	$1,000	90%	$3,000	$15/$40	$657	1.0%	—	—	—
C	Plan 27	$750	90%	$3,000	$15/$40	$1,260	0.1%	$603	Yes	100%
C	Plan 15	$500	90%	$3,000	$15/$40	$1,378	0.7%	$722	Yes	100%
C	Plan 3	$350	90%	$3,000	$15/$40	$1,912	0.2%	$1,255	Yes	100%
D	Plan 40	$1,000	90%	$1,500	$25/$35	$761	2.7%	—	—	—
D	Plan 28	$750	90%	$1,500	$25/$35	$1,377	1.0%	$616	Yes	100%
D	Plan 16	$500	90%	$1,500	$25/$35	$1,474	5.9%	$713	Yes	100%
D	Plan 4	$350	90%	$1,500	$25/$35	$2,047	4.9%	$1,286	Yes	100%
E	Plan 41	$1,000	90%	$2,500	$25/$35	$656	1.0%	—	—	—
E	Plan 29	$750	90%	$2,500	$25/$35	$1,235	1.2%	$579	Yes	100%
E	Plan 17	$500	90%	$2,500	$25/$35	$1,372	3.8%	$716	Yes	100%
E	Plan 5	$350	90%	$2,500	$25/$35	$1,862	0.4%	$1,206	Yes	100%

TABLE I
(CONTINUED)

Plan group	Firm's plan number	Plan features and employee demand						Relative to $1k deductible in group		
		Deductible	Coinsurance	MOOP	Copay	Employee premium	Choice share	Premium difference	Dominated by alternative	Dominated plan share after tax adjustment
F	Plan 42	$1,000	90%	$3,000	$25/$35	$654	1.5%	—	—	—
F	Plan 30	$750	90%	$3,000	$25/$35	$1,173	3.2%	$519	Yes	100%
F	Plan 18	$500	90%	$3,000	$25/$35	$1,252	0.8%	$598	Yes	60%
F	Plan 6	$350	90%	$3,000	$25/$35	$1,778	0.2%	$1,124	Yes	100%
G	Plan 43	$1,000	80%	$1,500	$15/$40	$877	2.4%	—	—	—
G	Plan 31	$750	80%	$1,500	$15/$40	$1,408	0.2%	$531	Yes	100%
G	Plan 19	$500	80%	$1,500	$15/$40	$1,497	2.6%	$620	Yes	78%
G	Plan 7	$350	80%	$1,500	$15/$40	$2,037	0.3%	$1,160	Yes	100%
H	Plan 44	$1,000	80%	$2,500	$15/$40	$713	0.5%	—	—	—
H	Plan 32	$750	80%	$2,500	$15/$40	$1,217	1.1%	$505	Yes	100%
H	Plan 20	$500	80%	$2,500	$15/$40	$1,315	0.7%	$602	Yes	74%
H	Plan 8	$350	80%	$2,500	$15/$40	$1,889	0.1%	$1,176	Yes	100%
I	Plan 45	$1,000	80%	$3,000	$15/$40	$641	0.9%	—	—	—
I	Plan 33	$750	80%	$3,000	$15/$40	$1,089	0.2%	$448	Yes	100%
I	Plan 21	$500	80%	$3,000	$15/$40	$1,152	0.2%	$511	Yes	0%
I	Plan 9	$350	80%	$3,000	$15/$40	$1,608	0.1%	$967	Yes	100%
J	Plan 46	$1,000	80%	$1,500	$25/$35	$817	4.2%	—	—	—
J	Plan 34	$750	80%	$1,500	$25/$35	$1,321	0.9%	$504	Yes	100%
J	Plan 22	$500	80%	$1,500	$25/$35	$1,419	3.9%	$602	Yes	64%
J	Plan 10	$350	80%	$1,500	$25/$35	$1,957	1.0%	$1,140	Yes	100%

TABLE I
(CONTINUED)

Plan group	Firm's plan number	Plan features and employee demand						Relative to $1k deductible in group		
		Deductible	Coinsurance	MOOP	Copay	Employee premium	Choice share	Premium difference	Dominated by alternative	Dominated plan share after-tax adjustment
K	Plan 47	$1,000	80%	$2,500	$25/$35	$662	2.5%	—	—	—
K	Plan 35	$750	80%	$2,500	$25/$35	$1,168	2.5%	$506	Yes	100%
K	Plan 23	$500	80%	$2,500	$25/$35	$1,252	9.5%	$590	Yes	71%
K	Plan 11	$350	80%	$2,500	$25/$35	$1,808	1.0%	$1,146	Yes	100%
L	Plan 48	$1,000	80%	$3,000	$25/$35	$634	14.6%	—	—	—
L	Plan 36	$750	80%	$3,000	$25/$35	$1,038	1.6%	$404	Yes	100%
L	Plan 24	$500	80%	$3,000	$25/$35	$1,114	1.5%	$480	No	0%
L	Plan 12	$350	80%	$3,000	$25/$35	$1,605	0.4%	$971	Yes	100%

Notes. This table displays the annual premiums and plan features associated with each of the 48 available plans in PY 2010 for employees with single coverage. Plans are grouped into sets with the same cost-sharing features other than the deductible to simplify comparison. A plan is considered to be financially dominated by a $1,000-deductible plan alternative if the premium difference between the two plans exceeds the difference in plan deductibles. The final column reports the share of the enrollees in that specific plan for whom the plan choice was dominated after discounting plan premiums by each employee's individually estimated federal marginal tax rate.

(deductible of $500, premium of $1,568) because the only differ-
ence across the plans, a $500 difference in deductible, is accom-
panied by a $638 difference in premiums. Table I indicates that
of the 36 low-deductible plans, 35 are financially dominated, with
the premium of the single nondominated plan (Plan 24) falling
only $20 short of being dominated by Plan 48 (even for Plan 24,
costs were higher than with Plan 48 under the vast majority of
scenarios). Given that health insurance premiums are tax de-
ductible, but that out-of-pocket expenses may not be if employees
cannot optimally use available pretax medical flexible spending
accounts, plans that appear to be dominated on a nominal basis
may not be strictly dominated after adjusting for an employee's
marginal tax rate. The final column of Table I shows the share of
employees in each plan for whom the plan was dominated after
adjusting premiums by the employee's marginal tax rate. In the
remainder of the article where feasible we report our analysis of
plan choice after adjusting for estimated taxes. Although the fo-
cus of our analysis is on employee choices in PY 2010, we examine
plan choices for PY 2011 to understand patterns of plan-switching
in year 2 of the regime. While the menu faced by employees for
PY 2011 was identical to the previous year in the number and
structure of plans, it reflected an average price increase, roughly
uniform across deductible, of 31%. This new menu led to even
greater price domination such that before tax adjustment, all 36
low-deductible plans were nominally dominated.

Figure I depicts plan dominance graphically. The figure de-
picts the schedule of health spending (i.e., employee premium plus
out-of-pocket costs) facing an employee as a function of total medi-
cal expenses for four plans with a MOOP of $2,500, coinsurance of
80%, and a copayment of $25/$35. Premiums are normalized rela-
tive to the premium of the $1,000-deductible plan, which is set to
$0. A health plan is dominated by another plan if that plan's cost
schedule lies above the other plan's schedule for the entire range
of medical spending. Within this representative set of plans, which
spans 15.5% of employee choices, the $1,000 deductible dominates
each lower-deductible plan and the $350 deductible is dominated
by each higher deductible plan. The figure also displays the ac-
tual distribution of total medical spending for employees in the
sample. The distribution indicates that most employees spent at
levels for which the excess spending associated with the choice
of a low-deductible plan was especially high. The figure does not,
however, clarify whether employee spending markedly varies by

(Premium for $1,000 Deductible Option Normalized at $0; Employee Distribution of Medical Expenses in Grey Bars)
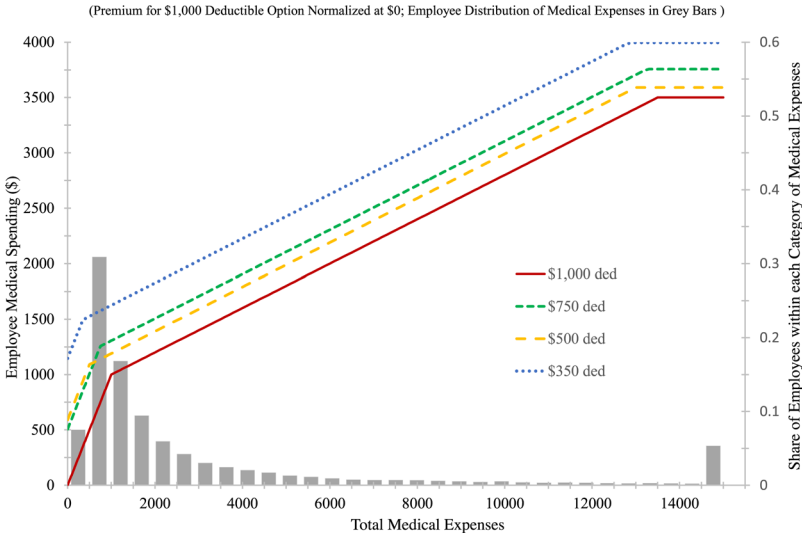

FIGURE I

Employee Spending by Total Medical Expenses

The figure shows the schedule of employee spending as a function of total medical expenses by deductible levels for contracts with $2,500 out-of-pocket max (above the deductible), 80% coinsurance above the deductible, and $25/$35 copayments (which did not count against deductible or out-of-pocket max). Employee spending includes both the out-of-pocket medical expenditures and premium expenses. To facilitate comparison, we norm the annual employee premium for the $1,000-deductible contract to 0 such that the point where the schedules for the other deductible options intersect the *y*-axis reflects the additional yearly premium charge for those plans relative to the $1,000-deductible option. Grey bars show the fraction of employees with single coverage in the sample who had total health bills of that amount in bins of $500 with the range top-coded at $15,000.

deductible choice as might be the case in the presence of adverse selection or moral hazard, issues we discuss in the next section.

II.C. Plan Enrollment

During the one-month open enrollment period in May 2010, eligible employees, excluding new hires, were asked to enroll in a health plan for PY 2010.[8] Eligible new hires were permitted to choose a plan outside the enrollment period, after a three-month

8. Employees could change plans outside of open enrollment only for a "qualifying event" (e.g., birth of a child, marriage).

waiting period, unless the hiring date was proximal to the enroll-
ment period. Given that plan options changed in 2010, employees
were encouraged to make an active choice of a new health plan. If
an employee with existing coverage did not actively select a new
plan, he or she was defaulted into Plan 48, the plan with the lowest
premium and highest degree of cost-sharing. Because the default
plan was not itself dominated, to the extent that those defaulted
into Plan 48 did not make an active decision, our reported esti-
mate of employees who choose a dominated plan underestimates
the degree to which active choices led to dominated plan enroll-
ment. Based on a comparison of the plan choices and demographic
characteristics of new employees who were not subject to a default
to the choices of existing employees who were, we estimate that
98% of the plan choices in our sample were made actively. While
14% of employees in the sample enrolled in Plan 48, our estimates
suggest that only 2% were automatically defaulted.[9] We speculate
that the modest influence of the default may reflect the intensive
marketing undertaken by the firm to encourage active choice.[10]

The online interface through which employees enrolled in a
plan was designed to cultivate the sense that one could "build" a
health plan one feature at a time. Employees were asked to con-
struct candidate plans by sequentially selecting levels within each
of four cost-sharing attributes (e.g., "Which annual deductible
meets your needs?") and were urged to consider the trade-offs
between price and coverage (e.g., "Remember, a lower deductible
means higher annual paycheck costs"). After building a first plan,
employees were shown the monthly plan premium and could ei-
ther enroll in that plan or build a subsequent plan through the
same sequential process. New plans were iteratively added to a
comparison page that displayed each plan alongside that plan's
cost-sharing features and premium. Consequently, the interface
encouraged side-by-side comparisons of plans but did not facili-
tate the comparisons required to understand the marginal costs
associated with different levels of plan attributes. To assess the
marginal cost of more or less coverage on a specific cost-sharing

9. If we estimate the probability of choosing the default plan (Plan 48) control-
ling for age and chronic conditions and an indicator for existing coverage, we find
that those with existing coverage were 2 percentage points more likely to choose
Plan 48 than similar new employees who did not have the default option.

10. See Cronqvist and Thaler (2004) for a description of a setting in which
active discouragement led individuals to not select a default that they would have
been advised to choose.

dimension, holding fixed other features, it would have been necessary for employees to build two plans that were identical but for the cost-sharing dimension of interest. The interface did offer employees access to a web page displaying the entire plan matrix, but the link to the page was not prominently displayed.

III. OVERVIEW OF FIRM DATA

III.A. *Definitions and Summary Statistics*

For benefit-eligible employees in PY 2010, the data include plan choice, medical utilization, and spending (subject to restrictions enumerated below), while for PY 2011, the data include only plan choice. Utilization data summarize employee visits to primary care physicians, specialists, ERs, and for preventive care. Medical spending data reflect total medical expenses for each employee, as well as the decomposition of spending into the share of employee's out-of-pocket expenses and the residual expenses covered by the firm. Importantly, the firm estimated counterfactual medical spending, for both the employee and firm, for each of the 47 plans not chosen by the employee (assuming no change to utilization).[11] We obtained additional employee-level demographic and health characteristics including age range, gender, salary range, location (three-digit zip code), start year of employment, position at the firm, length of firm tenure, and the presence of preexisting chronic medical conditions.

Starting with the universe of benefit-eligible employees, we asked the firm to generate a restricted sample for analysis using three screening criteria chosen for tractability and to ensure data integrity. First, the sample was restricted to employees continuously enrolled for the entirety of the plan year. Second, employees who changed plans outside of open enrollment due to a life-changing event were excluded. Finally, a small number of employees were excluded due to incomplete demographic information.

1. Summary Statistics. After imposing the sample restrictions, the resulting data describe plan choice, utilization, and spending on medical care in PY 2010 for 51,192 employees, of

11. These data reflect averages across small price differences across geographic locations. These differences do not substantively affect the price gradient of the menu we examine nor the overall share of financially dominated plans.

whom 23,894 are employees with single-only coverage—the focus of the present analysis. Table II reports summary statistics for the latter sample. Overall, the sample is diverse demographically apart from being disproportionately female (71%). The employees at the firm had average medical spending (including plan-covered and employee cost share) of $3,567, moderately lower than the $4,547 national per capita average for employer-sponsored plans.[12] Approximately 55% of this spending was covered by employees through employee cost-sharing and premiums. The average premium paid by employees, $1,205, was slightly higher than the estimated $999 paid by employees with single coverage nationally in 2012, but employees at this firm had lower deductibles than their counterparts at comparably sized firms.[13]

IV. Findings on Health Plan Choice and Switching

IV.A. *Employee Health Plan Choices*

Our primary finding is that a majority of employees selected financially dominated plans. After adjusting for differential tax treatment using marginal rates inferred from employee salary, we estimate that 55% of employees selected a plan that was financially dominated by another available plan and 61% of employees chose dominated plans on a nominal basis. Among the four available deductibles, employees were most likely to choose the $1,000 and $500 options, which respectively captured 37% and 36% of total demand. Only 27% of employees chose $350- or $750-deductible plans, possibly because the low price of $500-deductible plans relative to the two other low-deductible options made it seem like a "deal."

Table I depicts the distribution of choice across the 48 plans ordered by the degree of cost-sharing. The diversity in plan choice suggests that the enrollment interface did not privilege the selection of a particular plan or plan attribute and seems to reflect a wide range of consumer preferences and/or choice strategies. The table does reveal nonrandom patterns in the

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12. Comparison is based on figures reported in the Health Care Cost Institute's 2011 annual report, which relies on an analysis of medical claims data for approximately 40 million employees. The report is available at www.healthcostinstitute.org.

13. National averages are reported in the 2013 Kaiser Family Foundation study of Employer Health Benefits.

TABLE II

SUMMARY STATISTICS FOR PLAN CHOICE AND MEDICAL SPENDING (SINGLE-COVERAGE ONLY) DATA FOR PY 2010

Variable	Mean	Std. dev.	Variable	Mean
Total benefit eligible employees with plans	51,192		Plan choice by cost-sharing feature	
Total employees with single coverage plans (study sample)	23,894		Deductible choice	
			$350	0.14
Demographics			$500	0.36
Male (yes = 1)	0.29	—	$750	0.13
Approximate salary (based on salary bands)	$41,465	$31,158	$1,000	0.37
Approximate age (based on age ranges)	39.6	13.7		
Years with firm	7.8	5.1	Maximum out-of-pocket after deductible	
Enrolled in company plan prior to 2010	0.93	—	$1,500	0.43
Chronic condition (yes = 1)	0.28	—	$2,500	0.30
			$3,000	0.27
Medical utilization				
Primary care physician visits	3.1	3.8	Percent covered by plan after deductible	
Specialist visits	3.8	7.4	90%	0.47
Preventive-care visits	0.43	0.57	80%	0.53
ER visits	0.26	0.76	Office copayment	
			$15 primary care/$40 specialist	0.30
			$25 primary care/$35 specialist	0.70

TABLE II
(CONTINUED)

Variable	Mean	Std. dev.	Variable	Mean
Medical spending				
Total medical spending (plan and employee cost-share)	$3,567	$11,752	Final plan was default option	
Employee out-of-pocket medical spending	$741	$689	(Plan 48)	
Plan medical spending (nonemployee portion)	$2,826	$11,385	Employees with existing health insurance	0.15
Annual premium paid by employee	$1,205	$454	Employees enrolling for first time (no default)	0.15
After-tax value of annual premium paid by employee	$980	$378		0.15
Employee total medical spending (premium + out-of-pocket)	$1,946	$811		
Plan spending net of employee premium	$1,621	$11,348		

Notes. This table reports summary statistics on employee demographics, medical utilization and spending, plan choice, and plan value for employees with single-person coverage for Plan Year 2010.

bundling of cost-sharing attributes. One such example is the apparent coherence among some employees in their rank-order preferences within each cost-sharing attribute. Employees choosing the $1,000 deductible most commonly chose the highest MOOP and lowest coinsurance, while employees who chose the $350 deductible frequently opted for generous coverage in their MOOP and coinsurance. Employees choosing mid-range deductibles of $500 and $750 were most likely to select the middle MOOP option of $2,500. We return to these patterns, and what they imply for consistency in the revealed preferences for cost-sharing, in the discussions of mechanisms.

IV.B. *Ex Post Savings Relative to Counterfactual Plan Choice*

To quantify the financial consequences of the dominated plan choices made by a majority of employees, Figure II presents, for employees choosing one of the three lower deductibles, the cumulative distribution of counterfactual savings associated with a switch to a nondominated plan. These calculations of counterfactual spending assume no change in health care utilization due to plan enrollment or equivalently that employees are not subject to moral hazard in their use of care. If present in this setting, moral hazard would cause us to underestimate the savings associated with a switch to nondominated plans since one would expect that employees would be motivated to spend less under a high-deductible plan than they would under their original low-deductible plan. We also assume no change to equilibrium plan prices, an assumption we discuss further later in the article.

The first panel depicts the cumulative distribution of potential after-tax savings for employees currently in a low-deductible plan, relative to a switch to the otherwise equivalent plan with a $1,000 deductible. Overall, these employees could have saved an average of $352 with little risk of losing money. The lines associated with the choice of $350 and $750 deductibles both start above $0, indicating that all employees in such plans would have benefited from the plan switch regardless of their health spending. Employees who chose $350-deductible plans would have saved an average of $590 (with an interquartile range of $439 to $843). while those in plans with a $750 deductible would have saved an average of $343 (IQ range of $229 to $430). Those choosing a $500 deductible would have saved an average of $267 (IQ range of $102 to $502), including 2% of employees who selected $500

Panel A. Switch to equivalent plan with the $1,000 deductible

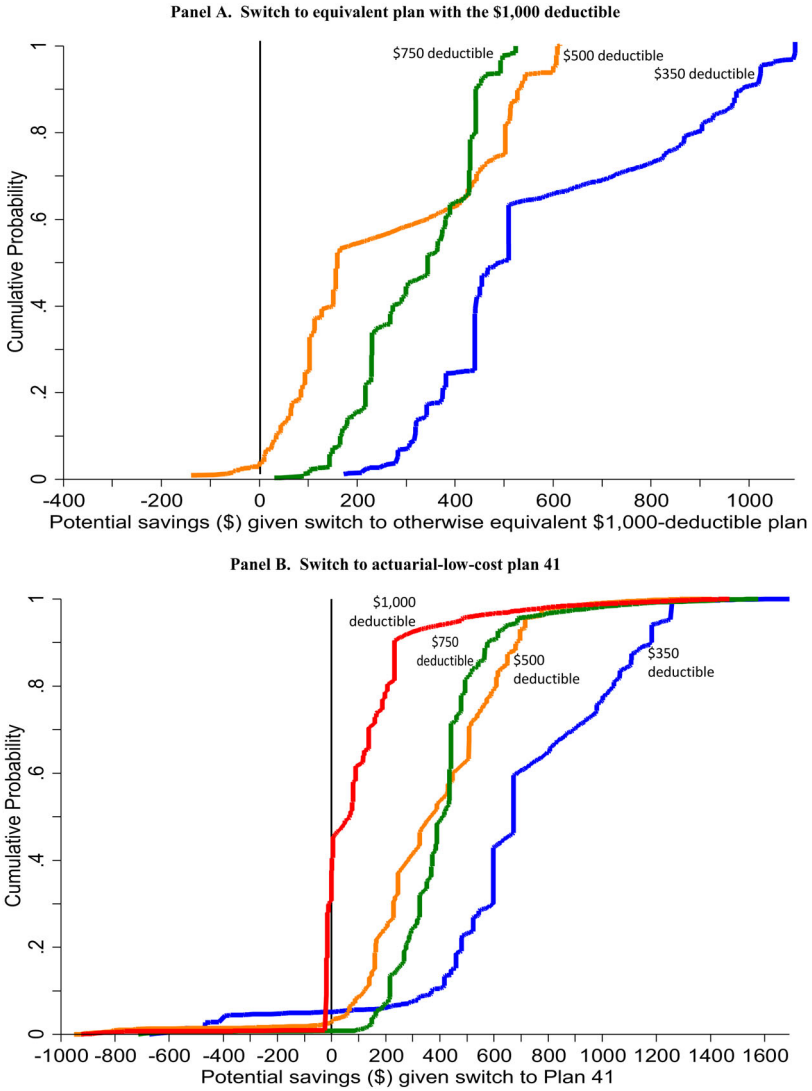**Panel B. Switch to actuarial-low-cost plan 41**

FIGURE II

Distribution of Potential Savings from Counterfactual Plan Choice

The figure depicts the cumulative distribution of potential savings relative to the indicated counterfactual plan after tax-adjustment of premiums, assuming no change in employee utilization of health care. Full-color figure is available in the online version of this article.

deductibles, who we estimate would have lost modest amounts of money had they switched to the equivalent $1,000-deductible plan. Overall, employees in dominated plans could have saved an average of $372 each year, which is, on average, equivalent to 24% of original plan premiums, 50% of the premiums associated with the counterfactual plan, and 2% of annual salary.[14]

The second panel of the figure plots the projected savings for employees in low-deductible plans given a switch to the single plan with the lowest average spending across employees (i.e., Plan 41, which had a $1,000 deductible, $2,500 MOOP, 90% coinsurance, $25 copay).[15] The figure again shows that the substantial majority of employees would have benefited from this plan change, all else equal. While Plan 41 does not fully dominate all other plans, 84% of all employees and 97% of those with lower deductibles would have either benefited or been left no worse off under the contemplated switch. Overall, employees would have counterfactually saved, on average, $323, including savings of $452 for employees in low-deductible plans and $466 in dominated plans. Employees enrolled in a plan with a $1,000 deductible would stand to save $106, suggesting that such employees spent more, on average, on other dimensions of cost-sharing than they might have under the benchmark plan. Fewer than 5% of employees would have suffered losses in excess of $20 if enrolled in Plan 41, with a maximum loss of less than $1,000.

We can also compare the average savings of $323 from switching everyone to Plan 41 (the overall actuarially best plan) to the average savings of $364 that could have been achieved had each employee chosen the single best plan for themselves as judged by ex post spending. This comparison suggests that a simple recommendation to enroll in Plan 41 would have achieved nearly the same aggregate savings as the unrealistic scenario in which

14. One could characterize the financial loss associated with plan choice through a number of alternative strategies. These might include examining risk-adjusted expected savings, or the distribution of the minimum savings associated with a plan switch. As an illustrative example, we estimate that the average plan-level minimum potential savings associated with a switch to a benchmark $1,000-deductible plan, weighted by actual plan choice, is $269 prior to tax adjustment. This figure is larger for employees in plans with $750 and $350 deductibles. The nontrivial average minimum loss suggests that the observed decisions cannot be solely explained through systematically optimistic beliefs regarding one's health risk.

15. Only 1% of employees actually selected this plan, and 26 plans were chosen more frequently.

everyone was able to select their ex post best plan. A third intuitive benchmark is the default plan (Plan 48). While not depicted in the figure, we estimate that a wholesale switch of all employees to this plan would have benefited 85% of employees with an average saving of $182, all else equal. Relative to the other benchmarks, the switch to the highest cost-sharing option would have generated a greater risk of excess spending in that 5% of employees would have seen their total spending rise by $650 or more.

IV.C. *Ex Ante Risk-Adjusted Savings Relative to Counterfactual Plan Choice*

As an alternative approach for quantifying the economic consequences of dominated plan choices, we estimate a risk-adjusted ex ante measure of the expected savings for people in dominated plans if they switched to the dominant alternative. While no level of risk aversion can rationalize the choice of dominated plans for the frictionless consumer, focusing only on the expected reduction in spending, as we did in the previous section, somewhat overstates the welfare loss of choosing a dominated plan. A risk-averse consumer gets some value from the smaller variance in expected health spending associated with a lower deductible, though we demonstrate in this section that adjustment for risk has a relatively small impact on calculations of the welfare losses resulting from the choice of dominated options.

Our strategy for calculating welfare losses uses the empirical distribution of employee health spending to estimate the predicted distributions of out-of-pocket spending for every employee under each available plan.[16] We use these distributions of potential out-of-pocket costs to calculate the risk-adjusted savings for every employee enrolled in a dominated plan under different levels of risk aversion.

We simplify the analysis by discretizing the actual distribution of employee medical spending into 11 categories and characterize each category by the average spending observed within it.[17] Next, we model the spending of employees by estimating a

16. See Cohen and Einav (2007), Handel (2013), and Handel and Kolstad (2015) for discussions and examples of various procedures for estimating continuous distributions of insurance claims at the individual level.

17. The categories of total medical bills we use and the share of employees whose observed spending was in that category are: (i) $0 {7.5%}, (ii) ($0, $150] {8.9%}, (iii) ($150, $350] {13.8%}, (iv) ($350, $500] {8.2%}, (v) ($500, $750] {9.8%},

multinomial logit regression of each employee's observed spending category on employee-specific indicators for salary level, age band, tenure, gender, the presence of a chronic health condition, deductible choice in the present plan year, and plan enrollment in the prior year. We then use the predicted values from these regressions to estimate the categorical probability of medical spending for every employee conditioned on the employee's observed characteristics.[18] The estimates predict, for example, a 10% chance that the typical employee with no chronic condition has $0 of medical spending and a 4% chance of spending in the highest category (characterized by spending of $31,401). The typical employee with a chronic condition, in contrast, has almost no likelihood of $0 in spending and a 13% chance of landing in the highest spending category.

We use these predictions of medical spending to generate the predicted distribution of out-of-pocket costs associated with any plan option for every employee. For those in dominated plans, we can compare the expected spending (i.e., tax-adjusted premiums plus out-of-pocket costs) associated with their chosen plan and the equivalent alternative plan with the $1,000 deductible to generate a measure of "expected net savings" which should approximate the estimates outlined in the preceding section. To generate the risk-adjusted savings measure of interest we use these predicted distributions to calculate an employee's expected utility from each plan using a constant absolute risk aversion (CARA) utility function:

$$EU_i\left(j\right) = \sum_{s=1}^{11} -\pi_{i,s} e^{r_i\left(p_j + \theta_{s,j}\right)},$$

where j denotes plans, i denotes individuals and s denotes the spending category. The employee's predicted probability of spending is given by $\pi_{i,s}$, while p_j denotes the after-tax premium for each

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(vi) ($750, $1,000] {7.0%}, (vii) ($1,000, $2,000] {15.4%}, (viii) ($2,000, $3,000] {7.2%}, (ix) ($3,000, $5,000] {7.4%}, (x) ($5,000, $12,000] {8.2%}, (xi) ($12,000, $+\infty$) {6.5%}. The average level of spending in these categories is: (i) $0, (ii) $94, (iii) $246, (iv) $421, (v) $617, (vi) $868, (vii) $1,422, (viii) $2,447, (ix) $3,863, (x) $7,748, (xi) $31,401. Results are not highly sensitive to the choice of distributional thresholds.

18. While this procedure effectively top-codes possible medical bills at $31,401 for each employee, this simplification does not affect our analysis since this level of spending exceeds the out-of-pocket maximum for every available plan.

plan, $\theta_{s,j}$ is the out-of-pocket medical spending for a given level of spending and plan choice, and r_i indicates the individual's coefficient of absolute risk aversion. For those who chose a dominated plan we define the risk-adjusted net savings, for a given level of risk aversion, as the amount of money the employee would need to be given (with certainty) to equate the employee's expected utility under their chosen plan with the expected utility associated with the otherwise equivalent high-deductible plan.[19]

Table III details the results of these calculations and demonstrates that this method of accounting for risk aversion does not meaningfully change the prior characterization of the economic consequences of suboptimal plan choice. On average, employees in dominated plans could have saved \$375 in expectation with a switch to the otherwise equivalent \$1,000 deductible alternative—nearly equivalent to the \$372 in ex post savings from the analysis detailed in the preceding section. The table also reports the average risk-adjusted net savings for different possible levels of absolute risk aversion. Adjusting for modest risk aversion ($r = 0.0001$)—which implies a willingness to accept \$488 with certainty over a 50% chance of winning \$1,000—nominally reduces average net savings to \$365. Assuming high levels of risk aversion for all employees ($r = 0.001$) implies average savings of \$269. Assuming employees exhibit extreme levels of risk aversion ($r = 0.003$)—which implies a willingness to accept \$215 with certainty over a 50% chance of \$1,000—further reduces average net savings to \$167. However, an assumption more in line with other studies focused on the correlation between risk aversion and selection patterns would be that extreme risk aversion is concentrated among those who paid the highest prices for additional coverage. The table shows that if we focus on those in the top quartile of excess spending, even if these people all had extreme risk aversion ($r = 0.003$), they would on average have risk-adjusted savings of \$363 if they had chosen nondominated alternatives.

IV.D. *Heterogeneity in Plan Choice and Adverse Selection*

While the choice of dominated plans is widespread, the propensity to make such choices, and the resulting economic consequences of these decisions, varies significantly across employee

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19. The formula for risk-adjusted net savings is: $-\frac{1}{r} \ln(\frac{EU(alternative)}{EU(chosen)})$.

TABLE III

AVERAGE EFFECT OF A SWITCH TO THE $1K DEDUCTIBLE ALTERNATIVE WITH AND WITHOUT RISK ADJUSTMENT

Group	Premium savings	Expected out-of-pocket increase	Expected net savings	Risk-adjusted net savings (CARA utility)		
				$r = 0.0001$	$r = 0.001$	$r = 0.003$
All who chose a dominated plan	$632	$257	$375	$365	$269	$167
($n = 13,073$)	($227)	($128)	($151)	($150)	($145)	($138)
By predicted net-savings quartile						
Quartile 1 ($n = 3,270$)	$506	$284	$222	$213	$126	$57
	($80)	($90)	($39)	($39)	($39)	($45)
Quartile 2 ($n = 3,267$)	$486	$184	$302	$293	$198	$99
	($72)	($75)	($19)	($20)	($39)	($67)
Quartile 3 ($n = 3,268$)	$553	$180	$374	$365	$268	$150
	($122)	($116)	($25)	($25)	($45)	($77)
Quartile 4 ($n = 3,268$)	$981	$381	$600	$589	$482	$363
	($120)	($104)	($95)	($94)	($88)	($91)
CARA in context—cert. equiv. for 50% chance at winning $1k with that r:				$488	$380	$215
CARA in context—gain needed to accept 50/50 lose $1k, gain G with that r:				$1,111	∞	∞

Notes. Means with standard deviations in parentheses. For each employee we generate a predicted 11-atom discrete distribution of total medical spending for the year using a multinomial logit regression procedure that controls for individual characteristics. See Section IV.C for a description. We use that distribution to get the ex ante distribution of out-of-pocket costs the employee would face with their chosen plan and with the equivalent alternative plan that has a $1,000 deductible. Combining the expected difference in these out-of-pocket costs with the tax-adjusted premium difference the employee has for those two plans gives the expected net savings from a switch to the alternative plan. The final three columns show the risk-adjusted net savings. For these calculations we calculate the employee's expected utility over the employee's predicted medical spending distribution (premiums + out-of-pocket costs) for both plans using a constant absolute risk aversion utility function with the specified coefficient of absolute risk aversion. For each employee we calculate the risk-adjusted net savings as the amount of money the employee would need to be given to bring the expected utility of their chosen plan up to the expected utility of the equivalent $1,000-deductible plan. The table reports the means of these individual-level risk-adjusted net savings amounts across employees.

subgroups. Figure III depicts heterogeneity in dominated choice across employee salary, a dimension of potentially high importance for policy and welfare. The first panel, which plots dominated choice for each observed salary range, indicates that the 67% of employees in the three bottom ranges were significantly more likely to have chosen dominated plans than their better-compensated counterparts (63% compared to 38%, $p < .01$). The second panel depicts the financial consequences of dominated plan choices, measured in terms of excess spending relative to the high-deductible benchmark plan, as a share of estimated salary. The figure indicates that lower earners are not only more likely to enroll in dominated plans but for such enrollees, the financial consequences of plan choice are regressive relative to salary.

Table IV formally assesses heterogeneity in dominated plan choice and the financial consequences of such choice across employees. The first column reports a regression of a dominated-plan-choice indicator on employee characteristics, while the final two columns report analogous regressions of the potential after-tax savings associated with a switch to a counterfactual plan. The first column of the table corroborates the pattern in Figure III in demonstrating a significant gradient in dominated plan choice by salary. The analysis also finds that employees in groups traditionally associated with higher health risk, such as the elderly, women, and employees with chronic conditions, were significantly more likely to select dominated plans than counterparts. For example, employees in the 60-year-old age range were about 20 percentage points more likely to select a dominated plan, all else equal, than those in their 20s. The preference of employees with greater health risk for plans with low cost-sharing, evidenced by the table, is broadly consistent with documented patterns of adverse selection in other studies of health insurance (e.g., Einav, Finkelstein, and Cullen 2010).

The second column of the table estimates the counterfactual savings associated with a switch to the otherwise equivalent high-deductible plan across employees. The analysis indicates that the characteristics that predict dominated plan choice also predict the degree of potential savings with two exceptions—women and employees with chronic conditions. These subgroups were more likely to choose dominated plans but benefited to a lesser degree from switching due to their high comparative levels of health

Panel A. Dominated Plan Choice by Employee Salary

Panel B. Counterfactual Savings Associated with Dominated Plan Choice by Employee Salary
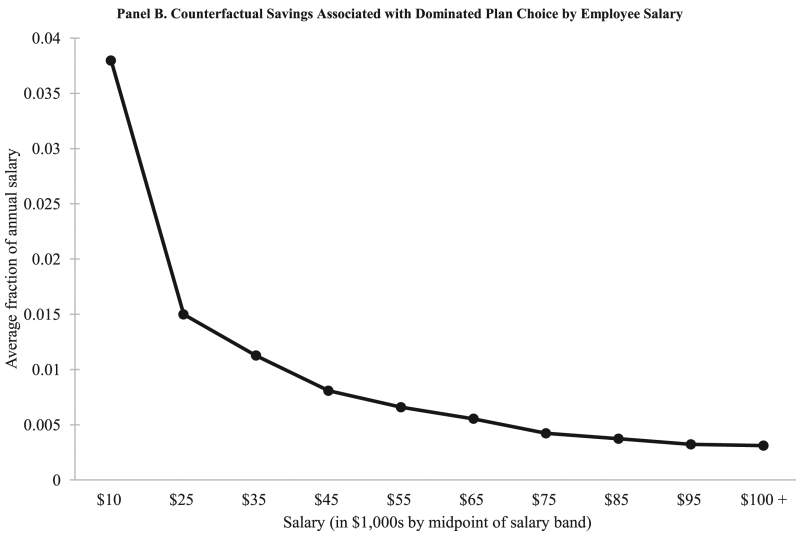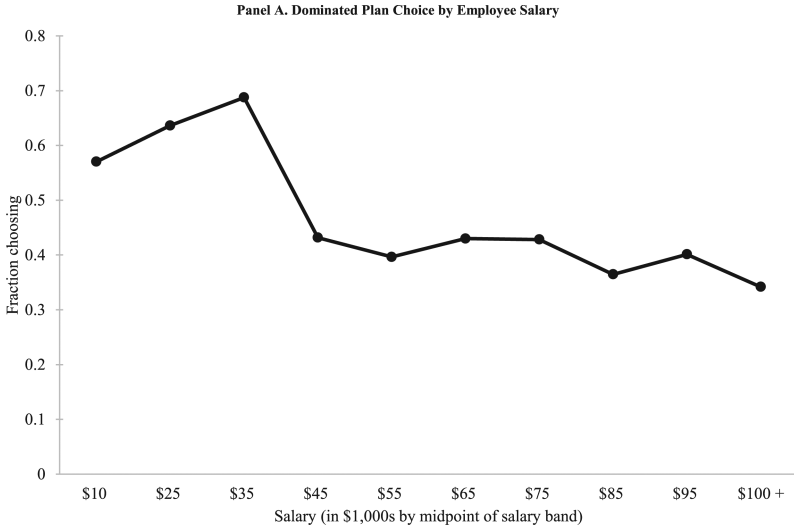

FIGURE III

Dominated Plan Choice and Counterfactual Savings by Salary

Panel A shows the fraction of employees within each salary range choosing a plan dominated by the otherwise equivalent $1,000-deductible plan after adjusting premiums to reflect the federal marginal tax rate associated with each salary range. Panel B shows the ratio of average counterfactual savings and salary for employees in dominated plans.

TABLE IV
PREDICTORS OF CHOOSING A DOMINATED PLAN AND SAVINGS WITH COUNTERFACTUAL ALTERNATIVES

Dependent variable: Mean of the dependent variable:	Chose dominated plan 0.55	Savings from switch to $1k-deductible alternative $221	Savings from switch to Plan 41 alternative $323
Salary band ($100k + omitted)			
<20k	0.24***	81.54***	112.11***
	(0.01)	(5.55)	(7.16)
20k–30k	0.28***	91.49***	113.57***
	(0.01)	(4.88)	(6.24)
30k–40k	0.30***	111.94***	125.78***
	(0.01)	(5.99)	(7.55)
40k–50k	0.07***	46.80***	48.67***
	(0.01)	(6.62)	(8.37)
50k–60k	0.03*	30.92***	36.43***
	(0.02)	(8.67)	(11.12)
60k–70k	0.06**	35.57***	21.95
	(0.02)	(11.42)	(15.16)
70k–80k	0.04	13.69	12.47
	(0.03)	(13.13)	(17.88)
80k–90k	−0.02	−23.46**	−21.43
	(0.03)	(11.56)	(16.18)
90k–100k	0.02	−17.72	−10.73
	(0.03)	(12.06)	(15.43)
Age band (less than 29 omitted)			
30–39	0.04***	26.27***	35.44***
	(0.01)	(4.63)	(5.72)

TABLE IV
(CONTINUED)

Dependent variable:	Chose dominated plan	Savings from switch to $1k deductible alternative	Savings from switch to Plan 41 alternative
40–49	0.08***	40.40***	51.54***
	(0.01)	(5.11)	(6.51)
50–59	0.13***	64.63***	71.01***
	(0.01)	(5.13)	(6.56)
60–69	0.18***	76.22***	78.61***
	(0.01)	(7.11)	(9.66)
70+	0.21***	109.84***	138.47***
	(0.03)	(19.60)	(27.24)
Female	0.06***	-6.09	12.47***
	(0.01)	(3.73)	(4.62)
Chronic condition	0.08***	-33.26***	-15.36***
	(0.01)	(3.66)	(5.03)
Tenure with company (years)	0.005***	2.69**	2.44***
	(0.001)	(0.36)	(0.48)
New enrollee in company plan	-0.05***	-15.59**	-8.65
	(0.01)	(6.71)	(8.27)
N	23,881	23,881	23,881
R-squared	0.10	0.04	0.03

Notes. Heteroskedasticity-robust standard errors in parentheses. Significance at p value $< .01$ denoted by ***, p value $< .05$ by **, p value $< .10$ by *. A dominated plan is indicated when the difference in premium the individual paid for the chosen plan versus the equivalent plan with the $1,000 deductible (adjusted for tax deductibility of premiums using the individual's implied federal marginal tax rate) exceeds the difference between the chosen deductible and $1,000. For the second column, the counterfactual is a switch to the equivalent plan with the $1,000 deductible and is $0 by construction for those who chose plans with $1,000 deductibles. In the third column, the counterfactual is a switch to Plan 41, which we estimate to be the plan with lowest average employee spending (combining premium and out-of-pocket costs) and is $0 by construction for those who chose Plan 41.

spending.[20] The final column presents an analogous analysis for the switch to the Plan 41 benchmark. The effects of such a switch are directionally consistent, but generally larger, than those estimated for the main benchmark, suggesting that the same characteristics that predict the choice of a dominated plan also predict the choice of other plan attributes of low financial value. Collectively the analyses indicate that our employees exhibit typical patterns of sorting into plans based on medical need and plan cost-sharing but in a context in which generosity in plan coverage results in unconditionally higher levels of total spending.

IV.E. Plan Switching in Subsequent Year

The significant costs of dominated plan choice invite the question as to whether employees enrolled in dominated plans switched into actuarially cheaper plans in the subsequent year. Our setting permits a clean test of plan switching because the plan menu presented to employees did not change in size or structure from PY 2010 to PY 2011 and employees continued to enroll in plans using the same "build-your-own" interface. The one significant change in year 2 of the regime was that the firm substantially increased health plan prices. However, the price increases were approximately uniform by plan deductible, which led to a PY 2011 menu in which every low-deductible plan was financially dominated, prior to tax adjustment, by the high-deductible plan equivalent. Employees who had insurance in 2010 but did not actively choose a plan for 2011 were defaulted into the same plan.

Of the 19,126 employees who we observed in both PY 2010 and 2011 and who continued with single-coverage plans, 77% remained in their existing health plan. This is consistent with the high rates of consumer inertia documented by prior studies (e.g., Strombom, Buchmueller, and Feldstein 2002; Frank and Lamiraud 2009; Sydnor 2010; Handel 2013; Ericson 2014). Overall, plan switching increased enrollment in plans with $1,000 deductibles (from 37% to 44%, $p < .01$) and led to a moderate decrease in the share of employees enrolled in dominated plans from

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20. Note that these results do not mean that the lower-deductible plans were not dominated options for these groups, but only that the adverse cost-consequences of choosing lower-deductible plans were, on average, lower for these groups.

63% in PY 2010 to 56% in PY 2011.[21] This decrease was primarily driven by the 15% and 23%, who respectively switched from the $500- and $750-deductible plans. Among those with a $350-deductible plan, who stood to save the most through a switch to the highest deductible, only 7% switched to the $1,000-deductible plan. The overall pattern of switching is in the direction of reduced plan costs, but the net effect of such switches was relatively small.

Switching patterns, like initial choices, differed by salary. Employees in the lower salary ranges were less likely to switch plans (20% compared to 28%, $p < .01$) and less likely to switch into the highest deductible plans (12% compared to 19%, $p < .01$) than those with higher salaries. Overall, while plan switching led to a moderate shift toward the highest deductible plan for all employees, it also exacerbated the existing disparity in dominated plan choice across employee salary.

V. Why Do People Choose Dominated Plans?

Clarifying why many employees choose dominated plans is critical for understanding what these findings imply for health policy and for economic theory. We test three explanations for dominated plan choice which, while not exhaustive or mutually exclusive, correspond to a set of particularly informative departures from the standard model of insurance-demand in the absence of choice frictions: (i) menu complexity: incomplete consideration of plans and/or plan features due to the economic (e.g., increased search costs) and/or psychological (e.g., disengagement due to information overload) consequences of a complex plan menu; (ii) nonstandard preferences: an informed preference for low-deductible plans; and (iii) low insurance competence: failure to accurately assess relative plan value, due at least in part to poor understanding of insurance. We first present a brief theoretical framework to organize these departures and help motivate strategies to test these explanations. We then describe two experiments involving hypothetical insurance decisions and discuss how the

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21. The restricted sample for which switching analysis was conducted was slightly more likely to have been enrolled in a dominated plan in PY 2010 (63% as compared to 61%). The characterization of nominal dominance reflects the change in the status of Plan 24 which was not strictly dominated in PY 2010 but became dominated in the subsequent year.

findings inform our understanding of consumer behavior in light of our framework.

V.A. *Framework to Organize Three Explanations for Dominated Choice*

As a benchmark, we adopt a version of the standard insurance-demand model in which an individual i, with wealth w_i, chooses a health plan p from a set of available plan options Ω. The decision maker maximizes expected utility over final wealth outcomes for the policy term, after accounting for the cost of the policy c_p (i.e., premium) and potential out-of-pocket spending. The benchmark model assumes no frictions of information or search, implying that consumers are aware of all available plan options and the financial consequences associated with each potential plan choice. For simplicity, we assume a discrete distribution of potential total health-spending shocks for the year, denoted by s, and denote the individual-specific probability of such shocks by $\pi_{s,i}$. These shocks translate to out-of-pocket costs $\theta_{s,p}$ for the individual and depend on the plan's cost-sharing features, so that total health spending can be given by $\tau_{s,p} = c_p + \theta_{s,p}$ for each s and p. The expected-utility-maximizing plan choice p^* is given by:

$$p^* = \operatorname*{argmax}_{p \in \Omega} \sum_s \pi_{s,i} u(w_i - \tau_{s,p}).$$

If we denote the plan that gets chosen by X, the standard model assumes that the optimal plan is always chosen regardless of the choice set Ω such that:

$$P(X = p^*) = 1.$$

Within this standard framework we can say plan j financially dominates plan l if

$$\tau_{s,j} < \tau_{s,l} \quad \forall s.$$

Under the baseline model and assumptions, for any standard strictly increasing utility function the individual will never select a dominated plan l.

While the choice of dominated plans cannot be rationalized by the benchmark model, we outline a series of departures from the model that offer possible explanations for the choice of

dominated plans. The departures motivate two experiments that we subsequently conduct to test the candidate explanations.

1. Departure 1: Menu Complexity [$\exists \Omega$ *s.t.* $P(X = p^*) < 1$]. The first departure reflects the possibility that the complexity of the plan menu—characterized by the number of plans, the number of attributes associated with each plan, and the tactical difficulty of comparing plans through a particular interface—contributes to dominated plan choice by reducing plan search and/or comparison. Menu complexity could affect consumer choices by increasing the economic costs of navigating the menu, or by otherwise discouraging or debilitating choice due to the effects of information/choice overload. For tractability, we can represent the effects of menu complexity by asserting that an increase in complexity reduces the likelihood that consumers will make advantageous choices from the menu of health plans they are offered. If we denote the number of plan options in the choice set Ω as N and the number of plan features (e.g., deductibles, coinsurance) that determine $\theta_{s,p}$ as K, menu complexity would imply that the probability the optimal plan is chosen falls as either N or K rises (i.e., $P(X = p^*) \downarrow$ as $N \uparrow$ or $K \uparrow$).

2. Experimental Test of Departure 1. We can experimentally test for the role of menu complexity in the choice of dominated plans by examining the likelihood of such choices across subjects randomized to menus of varying complexity. More precisely, if dominated plan choice is attributable to complex menus, we would expect to see the share of such choices fall as subjects confront menus featuring fewer plans and plan attributes and which require less effort to make plan comparisons.

3. Departure 2: Nonstandard Preferences [$v(w_i, c_p, \theta_{s,p}) \neq u(w_i - \tau_{s,p})$]. A second departure involves the possibility that consumers may have fully informed preferences that do not correspond to the standard expected-utility-of-wealth formulation in which utility is defined over final wealth (i.e., $w_i - \tau_{s,p}$). These individuals may value costs associated with plan premiums differently than those paid (perhaps unexpectedly) out-of-pocket. A preference to avoid out-of-pocket spending could arise from liquidity constraints, a desire for budgeting convenience, or psychologically informed considerations such as reference-dependent utility, or the high hedonic costs associated with out-of-pocket payments. Formally, in the standard model $\tau_{s,j} < \tau_{s,l} \Rightarrow u(w_i - \tau_{s,j}) > u(w_i - \tau_{s,l})$, whereas the relationship with alternative preferences of the

sort described may not hold so that $\tau_{s,j} < \tau_{s,l} \nRightarrow v(w_i, c_j, \theta_{s,j}) > v(w_i, c_l, \theta_{s,l})$.

4. Departure 3: Low Insurance Competence $[\hat{\tau}_{s,p} \neq \tau_{s,p}]$. A third departure that might lead to dominated plan choice is if consumers suffer from an incomplete understanding of how the financial features of health plans map to expected final wealth consequences. Deficits in understanding could introduce non-systematic errors in plan valuations of the sort implied by the "information frictions" approach of Handel and Kolstad (2015) or could result in more systematic bias if they grew from a more fundamental misunderstanding of cost-sharing. For consumers who lack insurance competence, the maximization can be written as:

$$\max_{p \in \Omega} \sum_s \pi_{s,i} u(w_i - \hat{\tau}_{s,p}).$$

While the definition of a dominated plan ensures that $\tau_{s,k} > \tau_{s,j} \; \forall s$, in this scenario, a dominated plan k could be selected because $\hat{\tau}_{s,j} > \hat{\tau}_{s,k}$ for some states, s.

5. Experimental Test of Departures 2 and 3. We jointly test for the influence of low insurance understanding and informed preferences by examining the sensitivity of hypothetical plan choices to clarification of plan costs as well as other advantages and disadvantages of cost-sharing. If dominated plan choice is attributable to a lack of insurance understanding, one would expect that providing additional clarification should shift $\hat{\tau}_{s,p}$ toward $\tau_{s,p}$ and reduce the demand for dominated plans. If instead plan choice reflects a fully informed preference for low-cost sharing, such choices should not change across informational contexts. As additional evidence to distinguish between nonstandard preferences and insurance competence, we examine whether insurance literacy, measured through a variety of approaches, predicts the choice of dominated plans.

V.B. Overview of Experiments

We designed and conducted two experiments to test the explanations outlined above. In each experiment, subjects were paid to take an online survey in which they were presented with a hypothetical scenario asking them to make a nonincentivized choice of health insurance as if they had recently been hired by an imagined employer. While the structure, size, and informational content of

the plan menus varied by experimental condition, each menu was a highly simplified representation of the menu encountered by employees at the firm we studied. To facilitate comparisons across samples and methodologies, the menus in the experiment incorporated the same deductibles, and plan prices closely approximated those of the plans at the firm we studied, preserving the feature that low-deductible plans were dominated by plans with the highest deductible. We provide examples of experimental interventions in the Appendix.

V.C. Experiment 1: Menu Complexity

1. Subjects. The first experiment involved $n = 2,379$ adult subjects drawn from the Qualtrics online sample in June 2014.[22] The sample, all of whom survived an attention screen, was diverse across gender (57% female; 43% male), age (mean $= 46.5$, std. dev. $= 11.1$), education (48% college graduate; 33% some college; 18% high school), and approximate income (mean $= \$67,700$; std. dev. $= \$26,900$).[23] The sample consisted predominately of full-time employees (91%) with employer-provided insurance (86%; 9% with non–employer-provided insurance; 5% uninsured) but was comparatively older and wealthier than employees in the firm we studied.

2. Research Design. The online study, of approximately 10 minutes, was hosted on the Qualtrics platform. Subjects were first asked a series of background questions on demographics and health. They were then presented with a hypothetical scenario that required them to choose an insurance plan from a health plan menu that varied across several experimental conditions. To mimic the experience of actual employees, prior to any plan choice subjects were shown a table defining the cost-sharing

22. Subjects were paid an unspecified participation fee by Qualtrics. Additional detail regarding the online sample can be found on the Qualtrics website.

23. The attention screen presented subjects with a question and four response options which was preceded by introductory text. The last line of the text asked subjects to proceed to the next question without submitting an answer if they had in fact read the introduction. We did not collect any choice data from subjects who failed the screen. Of the 3,895 subjects who began the survey, 1,516 subjects failed an early attention screen and did not complete the instrument. Income was elicited categorically and the reported summary statistics assume income to be at the mid-point of each range.

features displayed in the menu (i.e., a deductible and, depending on the condition, a MOOP).

The plan menus varied across three dimensions of complexity, resulting in a conjoint, $2 \times 2 \times 2$, between-subject design. A first dimension of variation determined whether plan premiums were expressed monthly, as they were at the actual firm, or annually. We conjectured that annualized, rather than monthly, premiums might facilitate plan evaluation given the annualized display of plan deductibles. A second dimension of variation determined whether menus featured 12 plans differing across two attributes (i.e., four deductibles and three MOOPs), or 4 plans varying across a single attribute (i.e., four deductibles). This was intended to jointly test the role of menu size and attribute complexity on plan choice. Finally, to examine the impact of the firm's particular enrollment interface, subjects either chose a plan through the sequential choice of attribute(s) or from a table in which options and prices were simultaneously displayed.[24] In the sequential-choice condition, which was modeled on the online interface used by actual employees, subjects indicated their preferred level of cost-sharing for each plan attribute, after which they were shown the resulting plan, including its cost and plan features. They were then permitted to finalize their selection or "build" an alternative plan through the same sequential process. For simplicity, and to ensure congruity with the firm setting, the experimental plan prices reflected those in the firm menu, fixing copayments at \$25 and coinsurance at 80%.[25] All told, the choice interfaces ranged from arguably the most complicated—sequential choice from a menu of 12 options differing across two attributes (with incongruent annual deductibles and monthly premiums)—to a sharply simplified presentation in which 4 plans, differing only in deductible and premium (both presented in annual terms), were simultaneously displayed.

3. Experimental Results. An initial result of the study, which speaks to the ecological validity of the paradigm, is the

24. In the menu featuring plans varying across only deductible, subjects were told to assume a \$1,500 MOOP. Across all conditions, subjects were told that a "modest copay" would apply to doctor visits after the deductible was met.

25. Subjects were told that plans were equivalent apart from the attribute variation displayed in the menu, and that each plan included a "modest copay" for doctor visits.
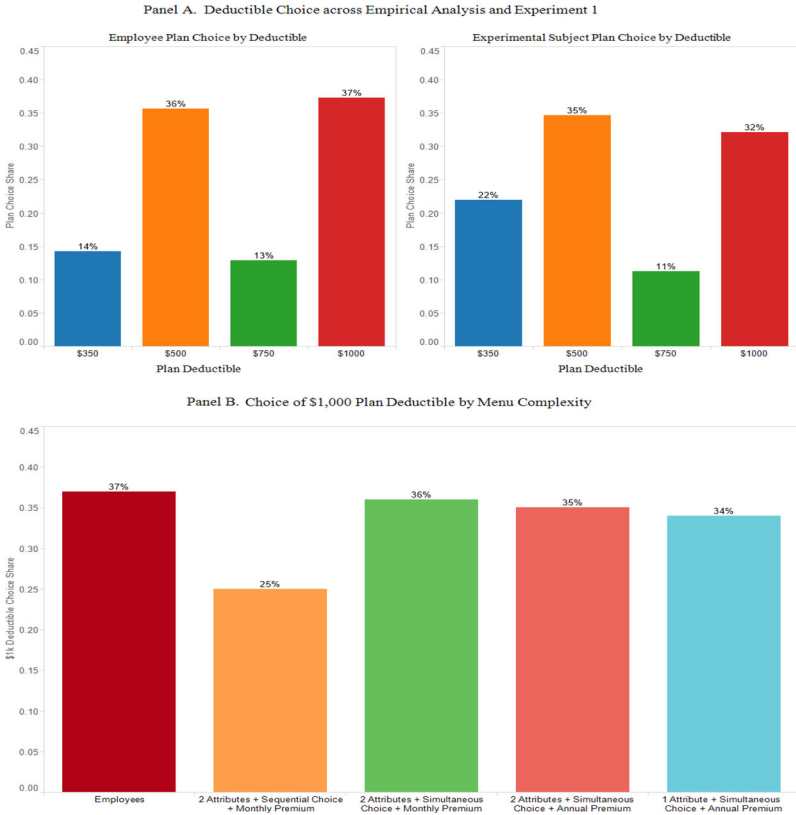
FIGURE IV

Menu Complexity and Plan Choice: Results from Experiment 1

Panel A compares the distribution of deductible choice of employees in the sample to the distribution for subjects from Experiment 1 (across all conditions). Panel B compares the share of $1,000-deductible choice of employees to experimental conditions arranged in decreasing complexity.

double-peaked distribution of deductible choice from pooled subjects, closely resembling that produced by employees (Figure IV). The figure also depicts the relationship between menu complexity and plan choice. While simultaneous display led to significantly higher demand for the dominant plan than sequential-choice ($p < .01$), displaying annualized premiums and reducing the size and attribute complexity of the menu did not result in further increases in the share of

dominant plan choice. In the simplest condition—a menu simultaneously featuring four plans varying only in deductible and premium—66% of subjects chose a financially dominated plan, a rate exceeding that of the employees from the firm.[26]

As was the case in the firm, we observe significant heterogeneity in plan choices by income. Estimates from a linear model of plan choice across the pooled sample indicate an inverse relationship between income and propensity to select a dominated plan, after conditioning on subject gender, age, and employment status. While the majority of subjects within every income category chose a dominated plan, those reporting earnings of less than $50k (the 44% of the sample in the two lowest income categories) chose dominated plans at a rate 9.9 percentage points higher than those earning more than $80k (the 23% of subjects in the two highest income categories; $p < .05$).[27]

V.D. Experiment 2: Nonstandard Preferences and Insurance Competence

The first experiment offers evidence that the choice of dominated plans persists in the face of dramatically simplified menus where plan search and comparison should involve minimal effort. In a second experiment, we investigated whether plan choices solely reflect informed preferences for (costly) low deductibles or emerge from a failure to accurately evaluate and compare the economic value of plans, due at least in part to poor understanding of insurance. Our primary approach for identifying the influence of insurance competence on plan choice is to compare the quality of plan choices made by subjects randomized to one of two menus that varied the clarity with which plan costs and trade-offs were presented. The approach assumes that for fully informed subjects, the distribution of plan choices will be unaffected by the provision of information that clarifies the cost consequences of different plan choices. As a further, nonexperimental test of the importance of low insurance understanding, we defined and elicited three

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26. Part of the small remaining difference may have reflected the fact that there was a default plan for employees, but not for participants in our experiment, and the default plan for employees was not dominated.

27. The estimation model controls for gender, a quadratic in age, indicator variables for each category of employment status, and indicator variables for each treatment arm. The raw average rate of choosing a dominated plan across the five income categories is 0.75 (< $30k), 0.70 ($30k to $50k), 0.66 ($50k to $80k), 0.65 ($80k to $120k), and 0.59 (>$120k).

separate measures of insurance competence and measure the correlation between each with the choice of a dominated plan.

1. Subjects. The second experiment involved $n = 603$ adult subjects recruited from Amazon Mechanical Turk in December 2015.[28] The final sample once again reflected a diversity of gender (46% female, 54% male), age (mean = 35.5, std. dev. = 11.4), education (54% college graduate; 33% some college; 13% high school), and income (mean = $40,600; std. dev. = $27,200), and included mainly individuals who had health insurance (82%) and who passed an attention screen analogous to that used in the first experiment.

2. Research Design. The online study, which took approximately 5 to 10 minutes to complete, was hosted online on the Qualtrics platform. Subjects were first asked questions about demographics, followed by a scenario-based question designed to assess definitional understanding of insurance cost-sharing concepts (described in detail below). After this preliminary series of questions, subjects were asked to make a hypothetical plan choice in the context of a scenario similar to that invoked in the first study. Plan choices were made after random assignment to either a baseline plan menu or a "high-clarity" plan menu, which offered additional information intended to facilitate the evaluation and comparison of plans. Both of the plan menus took the form of a table displaying four plans that varied only in deductible ($350, $500, $750, $1,000) and annual premium ($1,950, $1,400, $1,300, $800). It was made clear that the plans were otherwise identical and, for simplicity, that all medical costs for the year would be covered after the deductible had been reached. Menu prices were comparable to those in the simplest menu in the earlier study but were rounded to the nearest $50 for further simplification (the prices reflected average firm prices for plans with a $25 copayment, 80% coinsurance, and $1,500 MOOP). Once again, the menu provided subjects with a high-deductible plan option that financially dominated the three plans with lower deductibles.

Three features distinguished the baseline and high clarity conditions. First, beyond displaying each plan's deductible and premium, the high clarity condition presented subjects with projected total health costs under a scenario of good health in

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28. Subjects were paid a nominal participation fee for taking the short survey.

which no care was required (i.e., in which costs equaled the premium) and a scenario of poor health in which substantial medical care was required (i.e., in which costs equaled the premium + deductible). This approach highlights the dominance of the high-deductible plan without obscuring the fact that the high-deductible plan has higher variance in spending. Second, the high clarity condition offered a plain-language definition of plan deductibles (e.g., "You pay the first $500, then the plan covers remaining expenses"). Finally, prior to plan choice, as both a comprehension check and an additional prompt to increase the likelihood that subjects paid attention to the information, subjects in the high-clarity condition completed a comprehension question regarding plan costs under different health scenarios (unhealthy, moderately healthy, and very healthy). Regardless of the subject's response, a brief module following this comprehension question explained how plan prices and deductibles mapped to total health costs. To emphasize the potential advantages of low deductibles, and to reduce the possibility of experimental demand, the module communicated that while low-deductible plans result in higher total spending, some consumers might prefer such plans to avoid the "inconvenience, unpredictability or worry of having a higher deductible."

Three assessments of insurance understanding offered further evidence for the role of insurance competence in plan choice. The first assessment was an incentivized literacy test, in which participants were asked, prior to plan choice, to estimate the costs of two simple spending scenarios requiring knowledge of a deductible and premium ("cost estimation").[29] The scenarios required that subjects approximate the total health spending associated with a hypothetical plan (i.e., a plan with a deductible of $1,500 and a premium of $1,000, and all costs covered thereafter) under two scenarios in which medical care cost $750 and $2,000, respectively. Subjects were presented with six response categories and were tagged as competent if both responses were correct. A second assessment was the aforementioned plan comprehension question, which for the baseline group was administered after the plan choice ("comprehension"). The question asked subjects to identify the least costly plan, with respect to total spending, given scenarios requiring no care, an average amount of care, and a lot of

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care (the correct response for each was the $1,000 plan). Finally, a third assessment involved explicitly asking in plain language how much a subject would pay in higher premiums to reduce their deductible by $500, assuming that they had been enrolled in a plan with a $1,000 deductible and $800 premium. The aim of this last question, which for all subjects was asked after the plan choice, was to tag subjects by the consistency of their direct, stated, preference for lowering their deductible with the revealed preference implied by their plan choice ("consistency").

3. Experimental Results. The primary finding of the experiment, depicted in the first panel of Figure V, is that the share choosing a dominated option fell dramatically, from 48% in the baseline condition to 18% in the high-clarity condition ($p < .01$). Comparing the distribution of plan choice across treatments reveals less demand for each of the dominated plans, suggesting that a failure to compare the economic value of plans contributed substantially to the large share of the dominated plan choice.

The assessments of insurance understanding suggested widespread deficits. Pooling across conditions, 49% of subjects failed the test of cost estimation, 65% failed to correctly answer the comprehension question on plan comparisons, and 33% chose plans that implied inconsistencies with their stated preference for reducing their deductible. To tag subjects as exhibiting consistency in their revealed and stated preferences, we assume linearity of preferences over the spending window of interest.[30] For example, subjects choosing the $350-deductible plan were tagged

30. The linearity assumption, by definition, led us to tag all $750-deductible plan choices as inconsistent, regardless of stated preferences, since such a choice simultaneously implies a willingness to pay $2 for each dollar of reduced deductible (i.e., revealed by their plan choice relative to the $1,000-deductible plan) and an unwillingness to pay $0.40 for each dollar of reduced deductible (i.e., revealed by their plan choice relative to the $500-deductible plan). For subjects choosing the $500 deductible, a group for whom a more direct comparison was possible, we tagged subjects as exhibiting preference consistency if their expressed willingness to pay was weakly greater than $600 (i.e., corresponding to the price difference between the $500-deductible and the $1,000-deductible plans) and less than $1,833 (extrapolated from the revealed willingness not to pay $1.8 for each dollar in reduced deductible implied by their plan choice relative to the $350-deductible plan). Finally, subjects choosing the $1,000 deductible were characterized as consistent if their stated willingness to pay was less than $600 (corresponding to the price difference between their chosen plan and the $500-deductible plan, the cheapest plan alternative).
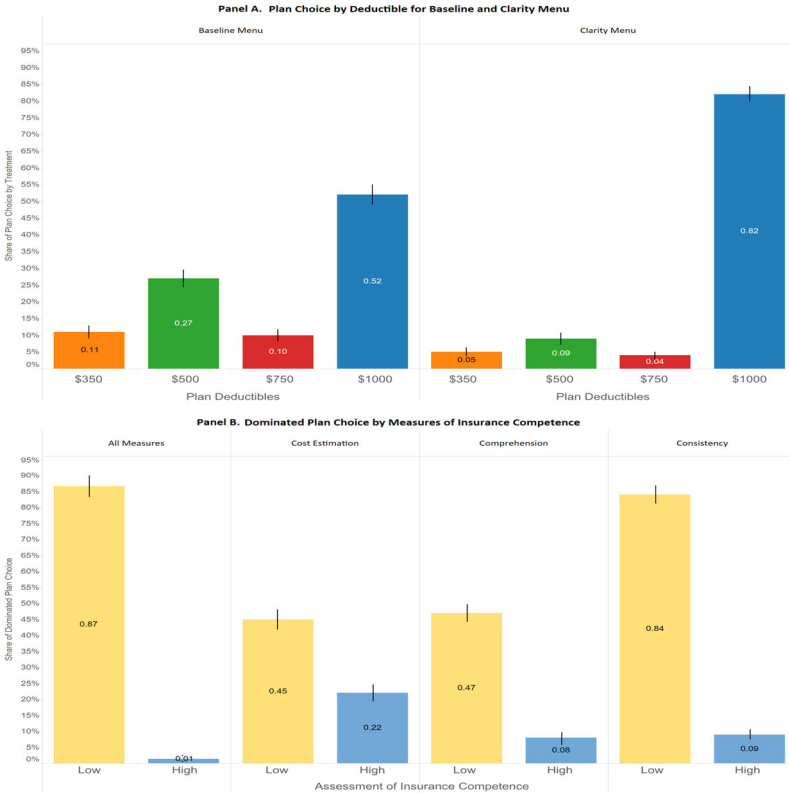
FIGURE V

Menu Clarity, Insurance Competence, and Plan Choice: Results from
Experiment 2

The figure depicts plan choice and the correlation of dominated plan choice
with measures of insurance competence as calculated from Experiment 2. Panel
A depicts the distribution of deductible choice across the two experimental con-
ditions. Panel B displays the share of dominated plan choice, pooled across the
two conditions, among subjects tagged as either low or high for each measure of
insurance competence. The first column reflects the 20% of subjects tagged as low
across all measures and 23% tagged as high across all measures. The remaining
columns reflect data for all subjects. Bars indicate one standard error intervals.

as having consistent preferences if their stated willingness to pay
to reduce a plan deductible by $500 was greater than $885 (extrap-
olated from the revealed willingness to pay $1.8 for each dollar
of reduced deductible implied by their plan choice relative to the
$1,000-deductible plan).

The three measures of insurance competence strongly predicted plan choice. The second panel of the figure reveals significant differences in the propensity to choose a dominated plan based on performance on definitional literacy (not-high: 45%, high: 22%, $p < .01$), plan comprehension (not-high: 47%, high: 8%, $p < .01$), and preference consistency (not-high: 84%, high: 9%, $p < .01$) for all subjects. Though these assessments are highly correlated, it is striking that among the 23% of the sample who scored high on all three competency measures, only 1.4% (two individuals) chose a dominated plan, whereas among the 20% who scored low on all three measures, 86.6% chose a dominated plan.

V.E. *General Discussion of Mechanisms*

The experiments suggest that menu complexity alone was not responsible for the popularity of dominated plans. This might seem surprising in light of research showing adverse effects of complex menus on choice. It is possible, however, that the benefits from simplifying menus may have been limited by subjects' poor understanding of insurance. If the size and structural complexity of the enrollment interface do not explain the widespread violation of dominance, we reasoned that such decisions could reflect the informed (nonstandard) preference for low deductibles, or alternatively, confusion with respect to the relative financial consequences of plans. The second experiment points strongly to the latter possibility. Compared to choice from a simple baseline menu, the share of subjects choosing dominated plans fell from 48% to 18% when insurance definitions, total plan costs, and other plan trade-offs were clarified. The strong negative correlation between choice of dominated plans and three measures of insurance competence provides further support for this interpretation and helps address concerns regarding experimental demand effects. While such evidence is only correlational (and the measures of literacy are not independent), among those scoring highly on all literacy measures the choice of dominated plans is nearly absent.

The explanations we tested are not mutually exclusive (e.g., a moderate preference for low deductibles could be strengthened by an imperfect understanding of plan value) nor exhaustive. One set of explanations for inefficient choice, not addressed in our framework, is the possibility that employees may be subject to biases across decision-relevant expectations, such as those involving future health risk, the difficulty of evaluating plan options, or

the benefits of doing so, with the latter depending on beliefs about the variation in actuarial value associated with plans in a given menu.

While perceived health risk is often important in evaluating insurance choices, by itself it cannot explain the selection of dominated options. Nor, we believe, are the data consistent with the possibility that suboptimal plan choices resulted primarily from employees and subjects who understood how to evaluate plans but who underestimated the extent to which plans differed in value. First, we observe only modest changes in the detection of plan dominance across menus that vary significantly in their complexity. If the choice of dominated options was due to the perception that small differences in the value of plans didn't justify the effort of comparing them carefully, then lowering the costs of comparison, through obvious differences in the complexity of the interface, should have a bigger effect. Second, as noted, the patterns of choice between the employee and experimental samples were strikingly similar, despite the fact that the former group should have been much more strongly motivated economically to make an advantageous choice. Third, an account of dominated choice based on unmotivated subjects does not explain the strong negative correlation between measures of insurance understanding, of which one was incentivized, and such choice. Finally, in a prior version of this article (Bhargava, Loewenstein, and Sydnor 2015, experiment 2), we discussed in detail an earlier experiment we ran that directly addressed the question of whether dominated choices were impacted by wrong beliefs that plans had very similar value. That experiment, which involved hypothetical choices from stylized menus similar to those reported here, measured subject beliefs regarding the equivalence of economic plan values from an employer-provided menu and also experimentally manipulated such beliefs.[31] The experiment revealed a weak correlation between naturalistic beliefs and dominated plan choice and no significant impact of the experimental manipulation on the likelihood of choosing a dominant plan. The finding is consistent with the possibility that, even when highly motivated and fully aware of the value of careful plan choice, low insurance competence may still result in the choice of a dominated plan.

31. The experiment attempted to heighten search motivation by communicating to subjects that the plans on the menu from which they were expected to make their plan choice were not appropriate for everyone and that poor plan choice could result in excess annual spending of nearly $500.

As further evidence for the plausibility of our interpretation, we investigated the consistency of employee preferences for cost-sharing across different plan attributes. A first approach entails testing whether an employee's deductible choice reflects coherent preferences for cost-sharing under the assumption that such preferences are linear over the relevant range of spending. For example, among the 13% of employees who selected plans with a deductible of $750, the rejection of the otherwise equivalent plan with a $1,000 deductible implies an average willingness to pay $528 to avoid a maximum of $250 in out-of-pocket costs, or $2.11/dollar of reduced deductible. These same employees were unwilling to pay an additional $97 to further reduce potential out-of-pocket costs by up to $250 by enrolling in a plan with a $500 deductible, implying a willingness to pay of $0.38/dollar of reduced deductible. While other explanations exist for nonlinear preferences for cost-sharing over this narrow range of spending, these valuations suggest inconsistencies of the sort exhibited by the subjects in the second experiment.

A more general test of preference consistency is to examine cost-sharing preferences beyond those revealed by the choice of deductible. Coinsurance is particularly informative since it is the one cost-sharing dimension for which higher coverage (90%) is sufficiently inexpensive so as to lead to lower expected costs than less coverage (80%), fixing other plan attributes. Yet coinsurance was the one plan component for which a majority of employees, and in particular employees violating dominance by choosing low deductibles, did not choose greater cost-sharing.[32] Collectively, these approaches hint at widespread inconsistencies in preferences among employees in dominated plans and offer further evidence for the role of insurance incompetence in explaining employee behavior.

VI. Conclusion

Our primary contribution is to document widespread and costly violations of dominance in the health insurance decisions

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32. Of employees violating dominance in their deductible choice, 39% selected the less-generous coinsurance, implying an unwillingness to pay an additional $80 in tax-adjusted premiums to save an expected $129 in out-of-pocket spending—a valuation of less than $0.62/dollar of reduced out-of-pocket spending. Yet the same employees paid an average of $529 in tax-adjusted premiums to reduce out-of-pocket spending by $195 through their deductible choice—a valuation of at least $2.71/dollar of reduced out-of-pocket spending.

of a large and diverse sample of U.S. employees. Unlike most prior work, we assess plan choices without assumptions about risk preferences or beliefs by analyzing decisions from a standardized menu with a large share of financially dominated options. For those employees who chose dominated plans—a disproportionate share of whom came from the lower part of the income distribution—the excess spending relative to nondominated alternatives is significant.

We sought to explore why employees selected dominated plans to better understand how to interpret these findings for health policy and economic theory. Through two online experiments in which thousands of subjects made hypothetical choices from stylized, and sharply simplified, menus featuring plans otherwise representative of those offered to employees, we concluded that the complexity of the plan menu played only a modest role in generating plan choices. Even with a simple menu of four plans, where the costs of search should have been transparent and small, we observed significant demand for dominated plans. It was only after clarifying the financial trade-offs involved in plan choice that we saw a substantial shift in preference toward nondominated plans. Considering that, across the lab and field, many of those favoring dominated plans registered low on multiple measures of insurance understanding and exhibited seeming inconsistencies in their preferences for cost-sharing, we interpret the evidence to suggest that the widespread demand for dominated plans is associated with at least some deficit in insurance competence. While an informed preference for low deductibles, or other decision-making frictions, may play larger roles in explaining insurance demand in settings where reduced cost-sharing is less costly, our results, interpreted alongside surveys documenting widespread deficits in insurance understanding, suggest that insurance competence shapes consumer choices of insurance across a range of domains.

Ultimately, the present research challenges the rationale for recent expansions in health plan choice, at least given the current complexity of plans. To the degree that enrollees fail to make informed plan choices, greater choice is unlikely to improve consumer welfare, especially among low-income populations. In a vivid illustration of the limited advantages of greater choice in our setting, assuming no changes to prices, we estimate that the savings generated from employees choosing from the full menu of 48 plans with perfect foresight about their health would only modestly exceed the savings generated by enrolling all employees

into the single actuarially best plan. For policy makers concerned about informed consumer choice, our evidence points to a pressing need for decision aids, smart defaults, or, even more ideally, the development of simpler, and more standardized, insurance products that consumers are able to evaluate and compare.[33]

A question prompted by our analysis is why the firm offered its employees a plan menu with any, let alone a majority of, dominated plans. Our conversations with management suggested that benevolent motives drove the firm to provide its employees such an unusual degree of plan choice and that the pricing of plans was outsourced to a third-party firm, which is, to the best of our knowledge, common practice for large firms. We speculate that the plan menu likely emerged from the standard actuarial practice of average-cost pricing applied in a setting characterized by significant selection into plans based on health risk and only narrow differences in cost-sharing between plans.[34] Handel (2013) argues that this mechanism led to dominated options over time at the firm he studied.

Our findings have relevance for multiple threads of economic research on insurance. The literature on adverse selection commonly discusses the possibility health insurance markets can unravel, especially in markets where small differences in coverage distinguish plans. Our results suggest that the likelihood, and speed, of this unraveling may be overstated. While the pattern of plan choice by employees is consistent with adverse selection, consumers, in the absence of decision aids, may not be nearly as sensitive to high premiums as standard insurance choice models would predict. Our findings imply that the prospect of market unraveling will depend, instead, on the share of consumers in that market who lack sophistication in their ability to evaluate and compare plans.

Finally, the present work speaks to an influential literature in economics that estimates risk preferences and welfare implications from analyses of insurance choices. Our findings offer perhaps the strongest evidence to date that insurance choices

33. A caveat is that because plan choices may be highly sensitive to the provision of clarification or guidance, the introduction of an effective decision aid could lead to sharp changes in demand, and potential market unraveling, in settings with many consumer choices (Handel 2013).

34. In our earlier working paper, we describe analysis indicating strong similarity between observed plan prices and those predicted by the application of average-cost pricing.

reveal as much or more about consumer understanding than about actual health-related risk preferences. In this sense, our setting provides a rare opportunity to conduct a specification check on the standard insurance demand model absent search frictions. The widespread violation of dominance we document points to a fundamental misspecification of that model. Employees and experimental subjects do not choose their plans randomly, however. The choices we observe reflect (i) systematic peaks in demand for the two relatively most cost-effective deductibles, (ii) sorting by health risk, and (iii) coherent bundling of plan features (that nevertheless do not reflect consistent preferences for cost-sharing). These patterns suggest that a natural direction for future work is to develop alternative models of insurance demand that recognize the limitations of the standard approach and more accurately reflect the complicated psychology that governs consumer decisions.

APPENDIX

Panel A. Plan menus faced by subjects in comparison choice conditions
(menus vary by number of attribute combinations and time-horizon of premium display)
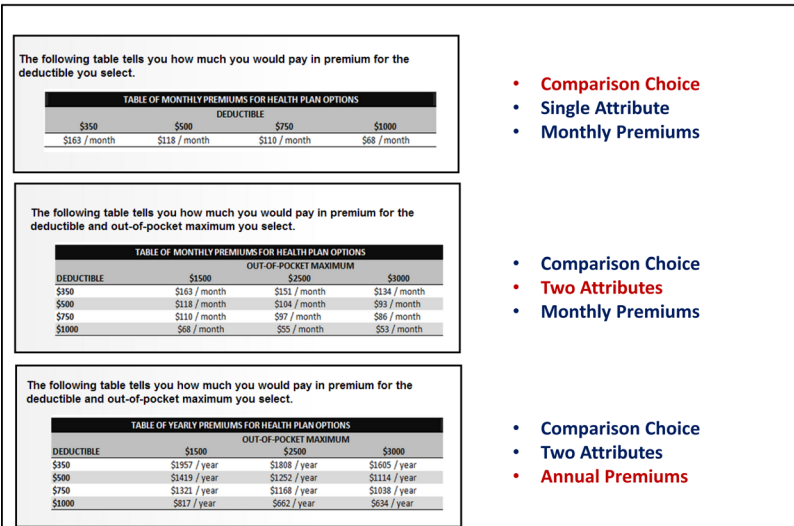
FIGURE A.1

Hypothetical Plan Menus and Choice Interface from Experiment 1

Panel B. Baseline plan menu faced by subjects in sequential choice condition

FIGURE A.1

(CONTINUED)

Appendix Figure A.2 – Experiment 2 (Preference vs. Competence)

FIGURE A.2

Hypothetical Plan Menus from Experiment 2

CARNEGIE MELLON UNIVERSITY
CARNEGIE MELLON UNIVERSITY
WISCONSIN SCHOOL OF BUSINESS

REFERENCES

Abaluck, Jason, and Jonathan Gruber, "Choice Inconsistencies among the Elderly: Evidence from Plan Choice in the Medicare Part D Program," *American Economic Review*, 101 (2011), 1180–1210.

Afendulis, Chistopher C, Anna D. Sinaiko, and Richard G. Frank, "Dominated Choices and Medicare Advantage Enrollment," *Journal of Economic Behavior and Organization*, 119 (2015), 72–83.

Atanasov, Pavel, and Tom Baker, "Putting Health Back into Health Insurance Choice," *Medical Care Research and Review*, 71 (2014), 337–355.

Baicker, Katherine, Sendhil Mullainathan, and Joshua Schwartzstein, "Behavioral Hazard in Health Insurance," *Quarterly Journal of Economics*, 130 (2015), 1623–1667.

Barseghyan, Levon, Francesca Molinari, Ted O'Donoghue, and Joshua C. Teitelbaum, "The Nature of Risk Preferences: Evidence from Insurance Choices," *American Economic Review*, 103 (2013), 2499–2529.

Bhargava, Saurabh, and George Loewenstein, "Choosing a Health Insurance Plan, Complexity and Consequences," *Journal of the American Medical Association*, 314 (2015), 2505–2506.

Bhargava, Saurabh, George Loewenstein, and Shlomo Benartzi, "The Costs of Poor Health Plan Choice and Prescriptions for Reform," *Behavioral Science and Policy*, forthcoming.

Bhargava, Saurabh, George Loewenstein, and Justin Sydnor, "Do Individuals Make Sensible Health Insurance Decisions? Evidence from a Menu with Dominated Options," National Bureau of Economics Working Paper 21160, 2015.

Bordalo, Pedro, Nicola Gennaioli, and Andrei Shleifer, "Salience Theory of Choice under Risk," *Quarterly Journal of Economics*, 127 (2012), 1243–1285.

Brot-Goldberg, Zarek C., Amaitabh Chandra, Benjamin R. Handel, and Jonathan T. Kolstad, "What Does a Deductible Do? The Impact of Cost-Sharing on Health Care Prices, Quantities, and Spending Dynamics," National Bureau of Economics Working Paper 21632, 2015.

Chernev, Alexander, Ulf Böckenholt, and Joseph Goodman, "Choice Overload: A Conceptual Review and Meta-analysis," *Journal of Consumer Psychology*, 25 (2015), 333–358.

Cohen, Alma, and Liran Einav, "Estimating Risk Preference from Deductible Choice," *American Economic Review*, 97 (2007), 745–788.

Cronqvist, Henrik, and Richard H. Thaler, "Design Choices in Privatized Social-Security Systems: Learning from the Swedish Experience," *American Economic Review*, 94 (2004), 424–428.

DellaVigna, Stefano, and Ulrike Malmendier, "Contract Design and Self-Control: Theory and Evidence," *Quarterly Journal of Economics*, 119 (2004), 353–402.

Einav, Liran, Finkelstein Amy, and Levin Jonathan, "Beyond Testing: Empirical Models of Insurance Markets," *Annual Review of Economics*, 2 (2010), 311–336.

Einav, Liran, Amy Finkelstein, and Mark R. Cullen, "Estimating Welfare in Insurance Markets Using Variation in Prices," *Quarterly Journal of Economics*, 125 (2010), 877–921.

Ericson, Keith Marzilli, "Consumer Inertia and Firm Pricing in the Medicare Part D Prescription Drug Insurance Exchange," *American Economic Journal: Economic Policy*, 6 (2014), 38–64.

Ericson, Keith Marzilli, and Amanda Starc, "Heuristics and Heterogeneity in Health Insurance Exchanges: Evidence from the Massachusetts Connector," *American Economic Review Papers and Proceedings*, 102 (2012), 493–497.

———, "How Product Standardization Affects Choice: Evidence from the Massachusetts Health Insurance Exchange," *Journal of Health Economics*, forthcoming.

Fang, Hanming, Michael P. Keane, and Dan Silverman, "Sources of Advantageous Selection: Evidence from the Medigap Insurance Market," *Journal of Political Economy*, 116 (2008), 303–350.

Frank, Richard G., and Karine Lamiraud, "Choice, Price Competition and Complexity in Markets for Health Insurance," *Journal of Economic Behavior and Organizaion*, 71 (2009), 550–562.

Gabaix, Xavier, and David Laibson, "Shrouded Attributes, Consumer Myopia, and Information Suppression in Competitive Markets," *Quarterly Journal of Economics*, 121 (2006), 505–540.

Handel, Benjamin R., "Adverse Selection and Inertia in Health Insurance Markets: When Nudging Hurts," *American Economic Review*, 103 (2013), 2643–2682.

Handel, Benjamin R., Igal Hendel, and Michael D. Whinston, "Equilibria in Health Exchanges: Adverse Selection versus Reclassification Risk," *Econometrica*, 83 (2015), 1261–1313.

Handel, Benjamin R., and Jonathan T. Kolstad. "Health Insurance for 'Humans': Information Frictions, Plan Choice, and Consumer Welfare," *American Economic Review*, 105 (2015), 2449–2500.

Heidhues, Paul, and Botond Kőszegi. "Using Information about Naivete to Price Discriminate," Mimeo, ESMT, 2014.

Heiss, Florian, Daniel L. McFadden, and Joachim K. Winter. "Mind the Gap! Consumer Perceptions and Choices of Medicare Part D Prescription Drug Plans," in *Research Findings in the Economics of Aging*, David A. Wise, ed. (Chicago: University of Chicago Press, 2010).

Ho, Kate, Joseph Hogan, and Fiona Scott Morton, "The Impact of Consumer Inattention on Insurer Pricing in the Medicare Part D Program," Mimeo, Columbia University, 2014.

Johnson, Eric J., Ran Hassin, Tom Baker, Allison T. Bajger, and Galen Treuer, "Can Consumers Make Affordable Care Affordable? The Value of Choice Architecture," *PLoS One*, 8 (2013), e81521, doi:10.1371/journal.pone.0081521.

Kairies-Schwarz, Nadja, Johanna Kokot, Markus Vomhof, and Jens Wessling, "How Do Consumers Choose Health Insurance? An Experiment on Heterogeneity in Attribute Tastes and Risk Preferences," RURH Economic Papers 537, 2014.

Kamenica, Emir, "Contextual Inference in Markets: On the Information Content of Product Lines," *American Economic Review*, 98 (2008), 2127–2149.

Kesternich, Iris, Florian Heiss, Daniel McFadden, and Joachim Winter, "Suit the Action to the Word, the Word to the Action: Hypothetical Choices and Real Decisions in Medicare Part D," *Journal of Health Economics*, 32 (2013), 1313–1324.

Ketcham, Jonathan D., Claudio Lucarelli, Eugenio J. Miravete, and M. Christopher Roebuck, "Sinking, Swimming, or Learning to Swim in Medicare Part D?," *American Economic Review*, 102 (2012), 2639–2673.

Ketcham, Jonathan D., Claudio Lucarelli, and Christopher A. Powers, "Paying Attention or Paying Too Much in Medicare Part D," *American Economic Review*, 105 (2015), 204–233.

Kling, Jeffrey R., Sendhil Mullainathan, Eldar Shafir, Lee Vermeulen, and Marian Wrobel, "Comparison Friction: Experimental Evidence from Medicare Drug Plans," *Quarterly Journal of Economics*, 127 (2012), 199–235.

Kőszegi, Botond, and Matthew Rabin, "Reference-Dependent Risk Attitudes," *American Economic Review*, 97 (2007), 1047–1073.

Loewenstein, George, Joelle Y. Friedman, Barbara McGill, Sarah Ahmad, Suzanne Linck, Stacey Sinkula, John Beshears, James J. Choi, Jonathan Kolstad,

David Laibson, Brigitte C. Madrin, John A. List, and Kevin G. Volpp, "Consumers' Misunderstanding of Health Insurance," *Journal of Health Economics*, 32 (2013), 850–862.

Prelec, Drazen, and George Loewenstein, "The Red and the Black: Mental Accounting of Savings and Debt," *Marketing Science*, 17 (1998), 4–28.

Sandroni, Alvaro, and Francesco Squintani, "Overconfidence, Insurance, and Paternalism," *American Economic Review*, 97 (2007), 1994–2004.

Schram, Arthur, and Joep Sonnemans, "How Individuals Choose Health Insurance: An Experimental Analysis," *European Economic Review*, 55 (2011), 799–819.

Sinaiko, Anna D., and Richard A. Hirth, "Consumers, Health Insurance and Dominated Choices," *Journal of Health Economics*, 30 (2011), 450–457.

Spinnewijn, Johannes, "Heterogeneity, Demand for Insurance and Adverse Selection," *American Economic Journal: Economic Policy*, forthcoming.

Strombom, Bruce A., Thomas C. Buchmueller, and Paul J. Feldstein, "Switching Costs, Price Sensitive and Health Plan Choice," *Journal of Health Economics*, 21 (2002), 89–116.

Sydnor, Justin, "(Over)insuring Modest Risks," *American Economic Journal: Applied Economics*, 2 (2010), 177–199.

Winter, Joachim, Rowilma Balza, Frank Caro, Florian Heiss, Byung-hill Jun, Rosa Matzkin, and Daniel McFadden, "Medicare Prescription Drug Coverage: Consumer Information and Preference," *Proceedings of the National Academy of Sciences*, 103 (2006), 7929–7934.

Zhou, Chao, and Yuting Zhang, "The Vast Majority of Medicare Part D Beneficiaries Still Don't Choose the Cheapest Plans That Meet Their Medication Needs," *Health Affairs*, 31 (2012), 2259–2265.