

# Dominated Options in Health-Insurance Plans

Chenyuan Liu

Justin Sydnor

October 2020

## Abstract

Prior research documents that there are sometimes dominated options in health plan menus, but is that common? We analyze Kaiser Family Foundation data on health plans that firms offer to their employees. For firms offering both a high-deductible and lower-deductible health plan, 62% of the time the high-deductible option has *lower* maximum spending risk for the employee. We estimate that the high-deductible plan dominates at roughly half of firms. We discuss potential mechanisms behind these surprising patterns and find support both for two explanations: widespread adverse-selection pricing and some employers also differentially favoring high-deductible plans.

---

Contact information: Chenyuan Liu, Department of Economics, School of Economics and Management, Tsinghua University, [liuchy3@sem.tsinghua.edu.cn](mailto:liuchy3@sem.tsinghua.edu.cn). Justin Sydnor, Department of Risk and Insurance, Wisconsin School of Business, University of Wisconsin – Madison, [justin.sydnor@wisc.edu](mailto:justin.sydnor@wisc.edu). We thank the Kaiser Family Foundation and the Health Research Educational Trust for access to the data from the Survey of Employer Health Benefits used in this analysis. We thank Keith Ericson, Amy Finkelstein, Ben Handel, Nathaniel Hendren, Nicola Lacetera, Devin Pope, John Mullahy and participants at the American Risk and Insurance Association Meetings and University of Wisconsin Center for Financial Security Household Finance Workshop for comments and suggestions.

Americans increasingly have options about their level of health insurance coverage. For example, while many employers offer limited choice (Dafny et al., 2013), a recent survey found that 65 percent of large employers offer at least one high-deductible health plan in addition to more traditional plans in their employee-health-insurance menu (Miller, 2018).<sup>1</sup> It seems intuitive that people would benefit from being able to express their risk preferences through plan choice. However, the benefits of choice rely both on the value of options available and people's ability to make well-informed choices from the menu they are given (Handel and Kolstad, 2015; Ericson and Sydnor, 2017).

Recent studies have challenged the benefits of plan choice by demonstrating that people often make costly health insurance decisions in situations where some options are poor value (Abaluck and Gruber, 2011; Handel, 2013; Bhargava et al., 2017; Abaluck and Gruber, 2018). In particular, Handel (2013) and Bhargava et al. (2017) analyzed situations where employers offered health-plan menus where higher-deductible plans financially dominated lower-deductible options and found that employees routinely enrolled in dominated plans.<sup>2</sup> These are valuable case studies for understanding individual decision making and suggest that many people are confused when making health insurance choices. However, the existing research leaves open the question of whether these are unique examples or if there are systematic economic forces that make it common for people to have low-value and even dominated options in their choice set.

We explore this question by analyzing detailed data on employer-sponsored health plans from the Kaiser Family Foundation (KFF) and Health Research Educational Trust (HRET) Survey of Employer Health Benefits. We identify firms that offered both a high-deductible (HD) health plan and a second plan with a lower deductible (LD), similar to the situation analyzed in Handel and Kolstad (2015). Under the assumption that the unobservable quality of the provider network of an HD plan offered by an employer is at least as good as the network in the lower-deductible option, we can use the details about the financial plan designs to compare plans.

---

<sup>1</sup> The 2018 Kaiser Family Foundation Employer Health Benefits Survey reports that while the vast majority of firms still offer only one plan type, because large employers typically offer multiple plan options, 59% of covered workers are employed in firms with more than one health plan.

<sup>2</sup> Sinaiko and Hirth (2011) also study a case where employees had a choice with a dominated option, but in that case the domination was not on the financial dimensions but rather that one plan offered easier access to specialists and a few additional medical benefits for the same cost structure.

We find that counter to what most would expect, high-deductible plans offer employees *lower* worst-case spending risk at 62% of the firms. The savings to employees for choosing HD plans, stemming from lower employee premiums and additional contributions firms make to health savings or reimbursement accounts, often exceed the additional out-of-pocket maximums people face in the HD plans. The prevalence of lower worst-case risk with the HD plan has been stable across years, showing nearly the identical rate from 2011 through 2016.

In theory, plans could have lower worst-case spending risk but still expose people to worse distributions of spending. However, we find that when we consider the spending consequences more fully, high-deductible plans often dominate. This analysis requires us to account for the complexities of the full schedule of cost-sharing for each plan. To make this comparison in a tractable way, we use an approach developed by Ericson et al., (forthcoming) that transforms a complex plan with many procedure-specific cost-sharing rules into a simpler approximation of that plan. Using these simplified representations, we find that at one third of firms the employee's total costs for the year with the HD plans strictly dominates the total costs with the LD plan for any level of total medical spending. When we further combine the information on plan schedules with possible ex-ante distributions of total medical spending employees might face, we find that the HD plan second-order stochastically dominates at about half of the firms across a wide range of possible spending distributions.

We estimate across all firms offering both types of plans that employees would save over \$500 per year by selecting the high-deductible option for a wide range of different ex-ante medical-spending distributions the employee might face. At the firms where the high-deductible plan strictly dominates the alternative, the expected savings from selecting the HD plan are frequently over \$1,000 for the year.

These patterns suggest that the menu of options often contain dominated options, but do employees enroll in these plans? While the KFF HRET survey does not have individual-level enrollment data, the firms do report the share of employees enrolling in each of their reported plan types. Consistent with prior studies of individual firms with dominant options (Handel, 2013; Bhargava et al., 2017), the majority of employees are enrolled in LD options, even at firms where we estimate that the HD plan dominates.

There are two types of explanations for why employers would offer menus where the high-deductible option is so financially favorable and often dominating. First, employers may be deliberately favoring the high-deductible option. This could be because firms believe that there are benefits to high-deductible structures, such as reductions in moral hazard and long-run tax benefits to employees, and they want to subsidize these plans to encourage their use. It could also be that firms want to provide higher benefits to the types of employees who tend to choose high deductible plans. The second possibility is that firms are more simply passing through differences in average costs between plan options to their employees. For example, Handel (2013) suggests that dominance arose at the firm in his study because healthier employees chose higher-deductible plans and the large average cost differences caused by these selection patterns were passed onto employees via employee premiums.

We find some evidence consistent with both of these channels, with slightly more support for the adverse-selection-pricing mechanism. One simple piece of evidence that would tend to favor the adverse-selection pricing mechanism is that the likelihood of offering a dominant HD option is similar across firms with very different characteristics, including comparing firms with higher vs. lower unionization rates and different employee-age profiles. Our strongest evidence comes from analyzing the differentials in total premiums and the contributions firms make toward plans between the HD and LD options. We find that on average total reported premiums differ by more than can be explained by the coverage differentials, which is consistent with adverse-selection pricing of plans. We also find that on average, firms contribute approximately the same total dollar amount toward plans of both types. The combination of high premium differentials and roughly equal firm contributions means that on average the data are quite consistent with the pass through of adverse-selection pricing in these markets.

However, when we look more closely at the contributions firms make, we see some evidence that would support a portion of the dominance of HD plans coming from firms directly favoring these options. Some firms contribute more total money toward HD plans than LD plans, often by making strong contribution to the HSA accounts that are linked to HD options. If we take these cases and counterfactually equalize the firm's contributions to HD and LD plans, we can reduce the number of strict dominance cases by a little under half and the second-order stochastic dominance cases by about one third.

These results suggest that the movement toward offering people choice about the level of their health insurance coverage is not helping to facilitate a match between individual risk preferences and insurance coverage. Instead, the expansion of plan choices is creating substantial benefit disparities between groups of employees based on the plan options they select and likely reflects a partial break down in risk pooling. Our results complement a recent study by Abaluck and Gruber (2018) who find that school districts that offered more plan choices typically introduced low-value options and led to greater costs for employees. In our concluding section, we discuss some of the implications these patterns have for the distributional consequences of plan choices.

We also highlight that these results call into question the role of employers in organizing health insurance coverage in the United States. The employer-sponsored health insurance menus we observe are created by a combination of human resources departments and large benefit-consulting firms.<sup>3</sup> The fact that these organizations frequently provide employees plan menus with dominated options suggests either that firms benefit in some way from this arrangement or that the consultants and human resource managers themselves may be unclear about the consequences of the options they provide. In our concluding section we discuss these issues. We also highlight that these patterns may partly reflect a lack of regulatory focus on the nature of plan options in employer-sponsored health insurance. In other health insurance markets, such as the Affordable Care Act Exchanges, there are regulations like single-risk pool pricing requirements that help to prevent the types of plan disparities we document here. To the extent that the plan disparities we document are reflecting a partial breakdown in risk pooling among employees, there may be some value in policy makers considering similar regulatory approaches for employer-sponsored insurance.

## **2. Data**

Our data come from the Kaiser Family Foundation Employer Health Benefits Survey (KFF EHBS) for the years 2011 through 2016 (Kaiser Family Foundation, 2016). The EHBS is a widely cited annual survey on employer-sponsored health insurance plans covering U.S. private and public employers with three or more workers across ten industry categories and six firm-size categories.<sup>4</sup> Firms provide rich details about the plans they offer to employees, including

---

<sup>3</sup> Unfortunately in this setting we do not observe any information about the company's HR practices or use of benefit consulting firms.

<sup>4</sup> <http://kff.org/health-costs/report/2015-employer-health-benefits-survey/>

information on plan types (e.g., HMO vs. PPO), cost-sharing features, premiums and enrollment. For our initial analysis in Section 3.1 we use data from all available years (2011 through 2016) and then for our primary analysis in Sections 3.2 and beyond we do a deeper dive using the data from 2015.

Throughout, we make several sample restrictions to facilitate our analysis. First, we analyze information for the single-coverage (i.e., employee-only) tier at each firm, because the KFF data do not contain complete plan information for family-level coverage.<sup>5</sup> Second, our analysis focuses on firms in the survey that report data for both a high deductible plan (HD) and exactly one lower-deductible (LD) plan. Plans are classified as HD plans if they have both a deductible for single coverage larger than \$1000 and either a paired health saving account (HSA) or health reimbursement arrangement (HRA) option. The KFF data do not have information on carrier information or plan network, but previous literature indicates that HD plans often have similar networks as LD plans within the same firm (e.g., Handel 2013, Handel and Kolstad 2015, Brot-Goldberg et al., 2017), or have more generous network access since high deductibles can substitute for other forms of cost control (Ellis and Zhu, 2016).<sup>6</sup> Our setting is particularly close to that in Handel and Kolstad (2015) where they studied a firm offering employees both a standard PPO plan and a HD option with HSA that had the same physician network and benefit structure. A key assumption for the analysis to follow is that the non-financial features of the HD and LD plans offered by the same firm are similar enough (or potentially slightly biased in favor of HD plans) so as to make a comparison plans' financial features meaningful.

Finally, it is also important for the relevance of our analysis that employees actually have a choice between these plan options and that plans are not offered to separate subsets of employees. The KFF survey does not explicitly address the issue, but we believe employees typically face a choice. First, the survey excludes any plan that is offered and administered exclusively by a union. Second, Bundorf (2016) reports that large firms generally offer high-deductible options alongside other plans and a recent industry survey confirms that perspective (Miller, 2018). Recent empirical studies have also relied on data from firms offering employees choices between coverage options (e.g., Einav et al., 2010; Handel, 2013; Handel and Kolstad, 2015; Bhargava et al., 2017).

---

<sup>5</sup> In Appendix A we provide partial analyses with family coverage and show that it is consistent with the main analyses.

<sup>6</sup> This does not rule out the possibility that firms offering HD plans may tend to have more restrictive networks than firms that do not offer HD plans, but within firm we expect the HD plans to have a weakly more generous network.

### 3. Results

#### 3.1 Worst-case spending risk

One way to look at the raw plan attributes is to calculate the worst-case risk difference between the HD and LD plans. The worst-case risk is the maximum employees could need to pay over a year. It is the sum of the worker's contribution to premium and the maximum-out-of-pocket (MOOP) limit. For HD plans, firms also tend to contribute to a health savings (HSA) or reimbursement (HRA) account. Firms' contributions to an HSA are fully vested immediately for the employee and can be used to pay for medical spending with pre-tax dollars at any time. HSA money can also be withdrawn for non-medical spending with rules similar to those in tax-advantaged retirement accounts. We abstract from the tax-advantaged savings benefits of HSA for our analysis, which will yield a conservative estimate of the value of HD plans (see Leive, 2018). On the other hand, we may overestimate the benefit of HSA contribution by ignoring the hassle costs of managing such accounts (Handel and Kolstad 2015). We analyze the tax consequences of HSAs in more detail in Section 3.4 and find that our results are robust to these considerations. In our analysis an HSA contribution by the firm is very similar to a reduction in the required employee premium. Contributions firms make to a health reimbursement account (HRA) are used to reimburse employees for uninsured health spending, but unlike an HSA these funds are the property of the employer and unused funds do not follow the employee if the employee leaves the firm. We subtract firm contributions to HRA or HSA from the net premium and MOOP to get the final worst-case risks faced by employees in the HD option.<sup>7</sup>

Table 1 shows average differences in plan features between HD plans and LD plans in the KFF data by year. On average, the difference in deductibles between the plan offerings is around \$1,300, with the difference rising somewhat in more recent years. The average difference in maximum out of pocket limits, though, is more modest, ranging from around \$600 to \$800, with no clear trend. HD plans have around \$600 lower required employee premiums in each year. This means that premium savings for employees alone largely covers the increased maximum out-of-pocket

---

<sup>7</sup> In Section 3.4 we discussed the robustness of our results taking into account the tax-advantaged savings benefits of HSA. For this first analysis of maximum spending risk the distinction between HSA and HRA is not important. Our analysis in the next subsection, however, accounts for the differences in HSA and HRA contributions.

risk in these plans. The firms also on average contribute around \$500 to an HSA or HRA for HD enrollees. Taken together, these premium savings and HSA/HRA contributions cause the HD plans to have substantially lower average worst-case spending, ranging from \$288 lower in 2013 to a high of \$570 in 2016. Across years we consistently find that at over 60% of firms the worst-case spending is *lower* with the HD plan. Across all years, the HD option reduces worst-case spending risk by at least \$1,000 at 34% of firms, while it increases the worst-case spending risk by over \$1,000 at only 16% of firms.

These patterns are consistent with the possibility that the total health spending distributions employees face with HD plans could dominate what they face with LD alternatives at many firms. However, most people will not reach worst-case level spending and assessing the net insurance value of different options requires us to do more to account for the full range of spending consequences an employee could face with each plan.

### **3.2 Analysis of Dominance using Simplified Plan Representations**

We aim to analyze the distribution of total-spending consequences an employee would face under the different plan options. At a basic level, most health insurance plans create a non-linear schedule that maps from total medical bills to the insured's out-of-pocket spending in three segments: 1) the region under the deductible, where medical bills transfer one-for-one to out-of-pocket costs 2) a partial cost-sharing region above the deductible where the individual pays a fraction of each marginal medical bill and 3) a maximum-out-of-pocket region where the limit has been hit and the individual's spending no longer increases with medical bills. The details of most plans are, of course, more complicated, but this basic structure guides the approach for our analysis.

Figure 1 provides an illustration of three different cases that occur when comparing these non-linear mappings from medical bills to out-of-pocket costs. The x-axis is total medical bills for the year and the y-axis shows the employee's costs (premium plus out-of-pocket costs).<sup>8</sup> In the Classic Trade-off Case, the premium is lower for the HD plan, but the higher deductible and MOOP limits for the HD plan cause the schedules to cross for relatively moderate levels of total medical bills. This reflects a classic tradeoff between HD and LD plans and is likely what most people would have in mind when considering HD and LD options. The other two cases, however, show examples

---

<sup>8</sup> We discuss how we incorporate HSA and HRA contributions for HD plans below.



where the worst-case spending risk is lower with the HD option. In Case 2, both best-case (premium only) and worst-case spending are lower with the HD option, but some scenarios result in higher spending with the HD plan. Some of these cases will result in the HD option being second-order stochastically dominating. Case 3 is situations where the HD plan strictly dominates the LD plan, with lower employee spending for any level of medical utilization.

We transform the schedule of complex cost-sharing rules for each plan into simplified schedules that allows us to classify them using the three cases illustrated in Figure 1. We follow a procedure introduced by Ericson et al. (f2020). We first calculate each plan's actuarial value (AV), i.e., share of medical spending covered by insurance, using its full cost-sharing provisions. We estimate the AV using the CMS Actuarial Value Calculator (Centers for Medicare & Medicaid Services, 2015). We then solve for a single co-insurance percentage – i.e., share the individual pays above the annual deductible – that generates a plan with the same AV, holding fixed the deductible and MOOP from the original plan. This generates a simplified plan with only the basic cost-sharing features (deductible, coinsurance, and max out-of-pocket) so that the out-of-pocket consequences of each plan are simply a function of total medical spending for the year. The coinsurance rate for this simplified plan will approximate the average fraction of medical bills paid out-of-pocket under the original plan design at different levels of total health spending.<sup>9</sup> We then calculate the net premium as the total premium minus the firm's contribution to premium. We treat contributions by the firm to HSAs as equivalent to a reduction in the plan's premiums. For HRA contributions, in contrast, the money can only be used to offset out-of-pocket medical spending. This creates an initial section of the employee-cost schedule that is flat under the assumption that medical bills are paid from HRA funds before employee cost-sharing kicks in. Appendix B outlines the steps of our full procedure in detail and provides a table showing that our results are robust to alternative technical assumptions.

It is worth clarifying the way in which our simplified plan representations do and do not rely on distributional assumptions. These representations create a mapping between total medical spending levels and an employee's total costs. The mapping works for people who might end up

---

<sup>9</sup> For example, one of the firms in our analysis sample offers a plan with a \$1,500 deductible, \$5,000 MOOP, a 20% employee coinsurance rate on most medical services once the deductible is hit, a \$20 copay per primary-care office visit, and a 25% employee coinsurance rate on most prescription drugs. We calculate an actuarial value for this plan based on the full set of cost-sharing features of 74.1%. We then calculate that a simpler plan design with the same \$1,500 deductible and \$5,000 MOOP would need a single coinsurance rate of 21% to have the same actuarial value.

at different total spending levels and does not rely on assumptions about the distribution over total spending levels. Where the mappings are affected by underlying distributions is that they rely on information on the share of total medical bills going to different medical services. For each level of total medical bills, the CMS continuance tables provide a breakdown of spending by services (e.g., office visits, inpatient, etc...) that is based on the average mix of services used by people with that level of medical bills in the broader population. It is possible, though, for two people to reach a given level of total medical bills with different mixes of services, which means the approach is accurate for people with a typical mix of services given a level of expenditure but will not perfectly represent all situations.

There are a number of reasons that relying on the average mix of services conditional on the level of medical spending is not likely to be a substantial concern for our analysis. First, 22% of all plans start out as simplified plans to begin with and are unaffected by the procedure.

Furthermore, there is strong correlation between the level of cost-sharing for different services within plan designs. Plans with low coverage on one service tend to have low coverage on other services as well, which mutes the potential effects of different services mixes.<sup>10</sup> Finally, using a typical mixture of underlying services for each level of medical spending is likely to be an appropriate approach for analyzing the insurance value of different plan designs for most people. Most people face substantial uncertainty about the level of total medical spending they will incur in a year and it is that uncertainty which drives the first-order differences in insurance value.

For this exercise we focus on data from the 2015 KFF survey with careful sample selection and checking, which we detail in Appendix C. A total of 1,761 firms reported offering at least one health insurance plan to their employees. Among those firms, 417 firms offered 1 HD and 1 LD plans. After dropping firms with incomplete and inconsistent information that we cannot analyze using our approach detailed below, we are left with a match sample of 331 firms offering 662 plans. Appendix Table C2 presents summary statistics of key plan financial features and firm demographics both in the broader sample of surveyed firms in 2015 and for the 331 firms for our

---

<sup>10</sup> For example, we calculate that there is a correlation of 0.72 between a plan's coinsurance rate for outpatient surgery and the effective coinsurance rate on primary-care office visits (transforming copays to coinsurance rates using the average office visit cost in the CMS actuarial value calculator of \$147). There are also positive correlations between spending on different services. Those who have high drug expenditures, for example, are also likely to have high levels of inpatient services and/or specialist visits. This type of positive correlation reduces the amount of variation in service mix for a given level of total medical spending.

analysis sample. The financial features of plans look broadly similar when we compare the full sample and the analysis sample. Key differences are that firms in the analysis sample are somewhat more likely to have self-insured their plans and are somewhat more likely to be large (i.e., 1,000+ employees).

Once each plan is converted into a simplified plan representation, it is straightforward to classify the firms based on which plan has greater worst-case spending risk and whether one plan strictly dominates the other. That is, we create graphs, equivalent to Figure 1, for each of the 331 firms in our analysis sample and map the pairings to these cases.

Table 2 shows this classification and reveals that a substantial share of firms have menus where the HD plan strictly dominates the LD plan based on their simplified plan representations. We find that 32% of firms have HD and LD options that present a classic tradeoff. At 37% of firms, however, the HD plan's simplified plan representation strictly dominates the schedule for the LD plan. At another 25% of firms, the HD plan shows the lower spending for the employee under both best-case and worst-case medical-spending needs, but higher spending for some intermediate ranges of medical spending. A small fraction of firms (6%) show other patterns, including 2% where the LD option appears to strictly dominate.

The survey also reports the share of employees who enroll in the different plan types offered by the firm.<sup>11</sup> Enrollment shares are correlated with the attractiveness of the HD plans but the majority of employees enroll in lower-deductible plans even at firms where the HD plans strictly dominate the LD plans based on our analysis. On average 25% of employees are enrolled in HD options at the firms where there is a classic tradeoff between HD and LD, while the enrollment share in HD plans is 47% on average at firms where the HD plan strictly dominates the LD plans. These patterns are broadly consistent with the results in Handel (2013) and Bhargava et al., (2017) that analyzed individual-level data on plan enrollments for individual firms offering menus with dominant higher-deductible options.

The analysis so far compares the schedules of employee spending as a function of total medical spending and did not require assumptions about the distribution of medical spending. Once we

---

<sup>11</sup> The enrollment data are limited, however, in that they only report aggregate enrollment at the plan-type level and not information about enrollment into specific plans. For example, for a firm that offers multiple HD plans, we only observe the plan details for the HD plan with the highest enrollment but see the share of employees enrolling into HD plans across all HD options.

combine our simplified plan representations with information on the ex-ante distribution of total spending, though, we can quantify the value of different plan options. We report results under the assumption that employees face the ex-ante distribution of total medical spending used in the CMS Actuarial Value Calculator, which is based on claims data for privately insured individuals. This calculator reports medical-spending distributions in continuance tables that are used to regulate the actuarial value of plans offered in the individual health marketplaces. We use the Gold-tier distribution appropriate for plans with actuarial values around 80%. Appendix Figure 1 plots the distribution.

The first insight we gain from incorporating the ex-ante distribution is that we can classify more firms as offering dominant HD plans. At the 25% of firms in the “ambiguous” Case 2 in Table 2, the HD plans are not strictly dominant. Yet they are likely to be preferred by risk averse individuals since they have lower worst-case risk and typically only save money over a narrow range of total-spending scenarios. We take the CMS gold-tier distribution and calculate that for the 25% firms in the “ambiguous” Case 2, 84% of them offer an HD plan that is second-order stochastically dominant. Combining this with the strict-dominance cases, we calculate that at 53% of these firms the HD plan dominates the LD option for any positive level of risk aversion. As we report below in Section 3.3., we find very similar results under a wide range of alternative medical-spending distributions.

Beyond classifying the firms based on measures of dominance, it is instructive to consider how much money an average employee could expect to save by selecting the HD option over the LD option. For this analysis we again use the CMS Gold-tier continuance table for the distribution of ex-ante total medical spending. Table 3 shows the results. We calculate on average across all 331 firms that an employee facing this ex-ante distribution of medical spending could expect to save \$569 by selecting the HD option over the LD option. The 25<sup>th</sup> percentile of expected savings is \$192 and the 75<sup>th</sup> percentile is \$884. At the 37% of firms where the HD option strictly dominates, the HD option would save the representative employee an average of \$1,121.

Of course, when considering insurance options, focusing on expected savings is not entirely appropriate because foregoing some money in expectation for a reduction in risk is the ultimate purpose of insurance. In order to address that point we also analyze risk-adjusted measures of spending. For this analysis we assume that the individual has constant absolute risk aversion

(CARA) utility over total employee spending for the year, which is a common functional form used for utility in studies of health-insurance demand. For different levels of constant absolute risk aversion ( $\gamma$ ), we can then calculate the expected utility for each plan option, again integrating over the distribution of total medical spending from the CMS Gold-tier continuance table. In order to calculate the risk-adjusted savings measure we then simply solve for the minimum sure amount of money that would have to be given to the individual under the LD plan to equate the utility of the LD plan with that of the HD plan.

The second two columns of Table 3 give the risk-adjusted savings results for  $\gamma = 0.0005$  and  $0.002$  respectively. The bottom rows of the table help to benchmark the implications of these levels of risk aversion and show that we can reasonably classify these cases as spanning substantial to extreme levels of risk aversion. Even if we assumed that employees had extreme levels of risk aversion, employees with representative distributions of medical spending would on average experience a risk-adjusted savings of over \$400 for opting into HD plans over LD plans. At the 37% of firms where the HD plan strictly dominates, increasing levels of risk aversion actually lead to greater levels of risk-adjusted savings than expected savings, which relates to the fact that HD plans have lower worst-case spending.

### **3.3 Robustness of Main Results with MEPS Data**

The analysis of second-order-stochastic dominance patterns and (risk adjusted) savings in Section 3.2 used the CMS gold-tier distribution for total medical spending. It is worth considering how our analysis would look for employees facing different distributions of medical spending. The CMS Actuarial Value Calculator actually has four different underlying continuance tables, one for each tier in the ACA exchange market (bronze, silver, gold, and platinum). We find that the results from Section 3.2 are nearly identical using any of these distributions. However, these distributions are all based on large populations and may not represent the idiosyncratic variation in risk within the employee population at a given firm.

In order to generate additional variation in the medical-spending distributions for our analysis, we turn to data on total medical spending from the 2014 wave of the Medical Expenditure Panel Survey (MEPS) (Agency for Healthcare Research and Quality, 2016). We use data for the population with coverage from an employer or group insurance plan throughout the year. We then regress total medical spending for the year on a cubic polynomial in age, gender, and indicators

for self-reported health status (5-categories) and the interactions of all of those variables.<sup>12</sup> The predicted values from this regression represent the expected total medical spending based on these individual characteristics. We then group the MEPS respondents into two groups based on whether their predicted medical spending is above the median. This yields two representative individuals with different ex-ante medical spending distributions (which match the distribution of ex-post realizations for the MEPS respondents in that group).<sup>13</sup>

Table 4 column 1 shows the fraction of firms offering a menu where the HD plan second-order stochastically dominates the LD plan for the two MEPS distributions. Consistent with our baseline results, we find that approximately 50% of firms have HD plans that second-order stochastically dominate the LD plan across these very different distributions of medical spending risk. Moreover, if one were concerned that our baseline analysis might overstate the dominance of HD plans for those who could reasonably anticipate that they have high medical spending results, these results show that if anything the share of firms with dominant HD plans looks larger for those who can expect to have very high levels of medical spending. This is consistent with the fact that most HD plans offer lower worst-case spending risk.

Table 4 column 2 to 4 show the robustness of the expected-savings and risk-adjusted-expected-savings results across the two medical-spending distributions. Here we see more variation based on the distribution used, but again the basic conclusion that HD plans offer large average and risk-adjusted savings compared to LD plans holds. Specifically, we estimate average savings for HD plans (across all 331 firms) of over \$500 for the year with both medical spending distributions. The risk-adjusted savings for CARA  $\gamma = 0.0005$  are again substantial, over \$400, for both distributions.

### **3.4 Robustness of Main Results to Tax and Investment Considerations**

In the above analysis, we assume that employees treat their employer's HSA contribution as equivalent to a premium deduction and the HRA as a deduction in out-of-pocket spending. Given that the majority of firms in our sample offer FSA accounts, we also assume employees could pay out-of-pocket spending with a pre-tax dollar in both HD and LD plans. These assumptions abstract

---

<sup>12</sup> MEPS respondents evaluate their health status according to 5 categories: excellent, very good, good fair, and poor.

<sup>13</sup> For this analysis we use the sample weights provided in the MEPS in the regression predicting total spending. We also use the weights to calculate discrete probabilities of different total spending levels (84 atoms), consistent with the atoms in the CMS continuance tables used in the primary analysis.

away from the richer tax considerations that arise with HD plans, especially those with HSA accounts. In this section we enrich our estimates to consider these potential tax implications of HD plans. The main conclusion is that the financial dominance of HD plans documented above is robust and likely understates the true differential value of HD plans for those who maximize the potential benefits of these options.

Considering tax implications can both increase and decrease the value of an HD plan relative to an LD alternative. On the one hand, HD plans with HSA accounts provide a savings vehicle that can be used to pay for health-related costs with pre-tax dollars. On the other hand, if an individual does not set aside money in the HSA account (i.e., does not use it fully), then the additional out of pocket spending in an HD plan may be paid with post-tax dollars while the higher premiums in an LD plan would be paid with pre-tax dollars.

To bound these considerations, in Table 5 we redo our baseline calculations (repeated in row 1 of Table 5 for ease of comparison) for two scenarios where we assume that out-of-pocket costs are paid with post-tax dollars except for money available in an HSA. We assume a 25% income tax. The details of our method is in Appendix D. In row (2) of the table we show the results if we assume that the individuals in the HD plan do not make any additional contributions to the HSA account and only have the firm's contribution to the HSA (if any) to cover out-of-pocket expenses. In this case, the share of firms where the HD plan dominates falls modestly. In row (3) we show the opposite case where the individual contributes to the full limit of the HSA.<sup>14</sup> Nearly all of the out-of-pocket spending in the HD plan would be with pre-tax dollars while LD plan out-of-pocket costs are with post-tax dollars. In this scenario, the HD plan strictly dominates at 60% of firms, suggesting that our baseline results understate the favorability of HD plans for sophisticated users.

Besides the potential tax savings, HSAs can also serve as valuable investment channels (Leive 2019). Instead of spending the money on medical services in the current period, enrollees could invest HSA contributions and use them for future medical services. Comparing to other saving accounts, HSA contributions are not subject to income tax or interest tax if eventually paid for medical services. To illustrate the potential benefits of HD plans once one considers tax-preferred savings, we assume that enrollees pay out-of-pocket spending in the current period with post-tax dollars and invest HSA contributions (either from the firm or combined with their own contribution

---

<sup>14</sup> The contribution limit for individual HSAs in 2015 was \$3,350.

up to the limit) for 30 years earning either a 2% or 8% annual interest rate. We discount the investment value back to the present with a 1% discount rate. Enrollees get a tax deduction from premium and their own contribution to HSA (if there is any). Again, we assume a 25% income and interest tax. We detail our method in Appendix D.

Rows (4)-(7) of Table 5 show calculations assuming the HSA contributions are invested for different interest rates and assumptions about individual-level contributions. Investment considerations improve the net value of the HD plan. In particular, the last row highlights that in a situation where the person takes full advantage of the HSA contribution options and invests it long term at 8% interest, the HD plan would strictly dominate at 77% of firms. So again, we see that for a highly sophisticated user of HD plans with savings options, HD plans are an overwhelmingly favorable benefit at the clear majority of firms.<sup>15</sup>

### **3.5 Estimates Accounting for Frictions and Hassle Costs**

In this Section we consider how hassle costs and other frictions would affect the value of HD plans to individuals. Literature has documented that consumers may not fully understand the benefits of HSA / HRA, and incur hassle costs using these accounts (e.g., Handel and Kolstad 2015). To account for the informational friction of using HDHP, we use estimates from Handel and Kolstad (2015) and calculate the value of HD options for consumers with low hassle costs (\$77.8 per year) and high hassle costs (\$1109.6). We also consider the case that enrollees in HSA withdraw firm contributions and spend them on things other than medical services. This way they are faced with a 20% penalty and income tax, which we assume as 25%. So we discount the firm's contribution to the HSA by 45%. Since enrollees in plans with HRAs cannot withdraw firm contributions, we restrict the analyses to the 284 firms offering HSAs. Finally, we consider the case where consumers completely ignore the firm's contribution to the HSA.

Table 6 shows the the existence of hassle costs will reduce the value of HDHPs. Under no hassle costs (our benchmark scenario), 37% of firms offer a strictly dominant HD plan. With low hassle costs, the fraction drops slightly to 31%. With high hassle costs, the fraction drops to only 4%. As such, Handel and Kolstad's (2015) estimates suggest that for those with high perceived

---

<sup>15</sup> See Leive (2018) for a richer discussion of these investment benefits of HSA accounts.



hassle costs, the HD plan would not be a dominant option at very many firms. When we limit the sample to firms offering HSAs (rather than HRA) for the HD plan, 36% have a strictly dominant HD option in our baseline calculations. If enrollees withdraw the contributions their firms make to these accounts and spend them on non-medical services, the fraction of firms where HD strictly dominates falls to 23%. If enrollees completely ignore HSA contribution, the fraction further drops to 12%. Together these results help to show that while the straight financial benefits of HD plans are high at most firms, perceived hassle costs or confusion about the value of firm's contributions to HSA accounts could help rationalize why many people nonetheless select LD plans at these firms.

#### **4. Analysis of Sources of Plan-value Disparities**

Our analysis shows that HD plans typically offer substantial expected savings and frequently dominate. A natural question then is why employers would offer menus of health insurance options for employees where some options dominate.

As a first approach to exploring this question, we note that the likelihood of offering a dominated option does not vary with firm characteristics. We observe little differences in the rate of dominant HD plans across splits by firm size, employee salaries, employee age, unionization status, industry, or whether the firm is self-insured for health benefits. These splits are reported in Table 7. None of these firm characteristics predicts a dominant HD offering in multivariate regressions either. Firms offering HSAs and firms offering HRAs also have similar rates of dominance. Finally, recall that Table 1 showed that the rates of firms offering HD plans with lower worst-case risk were quite stable from 2011 through 2016. The fact that dominated options are widespread across different firm situations and across years suggests that the reasons for dominant HD plans is likely rooted in some process that is common across many firms.

There are two main potential explanations we can identify for why HD plans may dominate at many firms: a) average-cost pricing under adverse selection and b) differential favoring of the HD plan. Prior literature has argued that dominated options arose in particular cases because the benefits consulting firms that help employers design their health plan offerings priced plans based on the average costs of employees who enroll in those plans (Handel, 2013; Bhargava et al., 2017). Under average cost pricing, selection patterns that lead healthier employees to select the higher-

deductible options cause those options to be much cheaper. When HD options are paired with HSA accounts, as is the case for much of our sample, the differential tax and investment benefits of HD plans may be especially attractive to higher income employees and may exacerbate the adverse selection due to positive correlations between income and health status. It may also be the case, though, that some firms are consciously providing extra generous benefits for their HD plans. Such a strategy could be motivated by a desire to offer differentially generous benefits to the types of employees who tend to select into HD plans. Some employers may also be trying to shift all employees into HD plans because they believe (potentially inaccurately) that there are long-run benefits from HD plans, such as inducing people to comparison shop for health services. Giving additional inducements for employees to join the HD plan could be a short-term strategy to get people to voluntarily shift toward these plans.

The aggregate average patterns in our data are largely consistent with the adverse-selection pricing mechanism. On average, firms in our sample contribute very similar total amounts toward the HD and LD plans they offer. Figure 2 shows in our 2015 sample, around 13% of firms have total contributions that differ by less than \$50 (after accounting for HSA contributions), and the average difference is only \$16. Across all years we see essentially no difference in average firm contributions to the different plan types. So on average, firms are not favoring HD plans over LD plans in terms of total firm contributions. However, the total premium differences between HD and LD plans appear to reflect adverse selection. Figure 3 plots the average differences in expected out-of-pocket costs (HD – LD) and the difference in reported total premiums between the plans (LD – HD), grouping firms into four sets based on the difference in deductible between HD and LD plans. Differences in total premiums are significantly larger than the expected coverage differences for a constant population. For example, for firms where the average deductible difference is around \$1,000, the average difference in expected out-of-pocket costs for a representative employee based on the CMS Gold-tier distribution is \$407. The total premium difference between the HD and LD option in these cases, however, is more than double that level at \$952.

Large excess premium differentials between HD and LD plans at many firms is consistent with sizeable average cost differences driven by some combination of differential selection by health

status and moral hazard.<sup>16 17</sup> Our data cannot directly address the relative importance of selection versus moral hazard, but Einav et al. (2013) estimate that the selection channel is a bigger driver of average cost differences between health plans, in part because employees who would have larger responses to high cost-sharing are less likely to choose higher-deductible plans. If moral hazard were the primary driver, we might expect larger premium-to-coverage differences when the deductibles (and hence health-access incentives) are very different between plans. Figure 3, however, shows that there is no such rising gap in the deductible difference, which is at least suggestive that selection patterns are the primary driver of large premium differences between HD and LD plans.

Because firms contribute roughly the same amount to both plan types, these differences in average costs between HD and LD plans are fully passed through to employees via premium reductions and contributions to HSAs and HRAs. In cases where the coverage levels are not too different, e.g., smaller deductible differences, these differences cause the HD plans to strictly dominate the LD plans. This adverse-selection pricing mechanism implies that dominant HD plans are a partial-equilibrium effect. That is, if all employees shifted to the HD plans and did not alter their medical utilization, firms likely would change the contributions they make so that these HD plans are not so attractive.<sup>18</sup> This means that HD plans are not dominant options in any absolute sense, but instead are dominant within menus that offer multiple coverage levels as options.

While the patterns on average are quite consistent with adverse-selection pricing, we also cannot rule out that part of the reason HD plans become dominated at some firms is that the firms are favoring the HD plans. While we saw in Figure 2, that firms contribute similar amounts to both plans on average, there are clearly some firms that have higher total contributions (via

---

<sup>16</sup> The passthrough of average cost differences to premiums could occur retrospectively as the firms observe realized selection patterns, as in Handel (2013), or proactively based on actuarial estimates of selection patterns from similar plan offerings, as in Bhargava et al., (2017). For firms in our full sample that we observe in multiple years, the differentials in total premiums between HD and LD plans appear to grow by around \$100 per year, consistent with some evolving adverse selection pricing.

<sup>17</sup> Proportional loading built into premiums to recover administrative costs can also increase the cost differentials between plans with different levels of coverage. Loading is likely, however, to account for only a small portion of the differences. Medical loss ratios (claims pay outs over total premiums) for group policies of this type are typically between .8 and .85, which equates to a loading of 1.18 to 1.25. The ratios of premium differences to expected-coverage differences we observe, however, are generally more than 2 and often over 5.

<sup>18</sup> The premium levels of HD and LD plans at firms that offer only one type of plan are consistent with this point. Unlike at the firms offering both types, the average premium difference between HD and LD plans across firms offering only one type is consistent with the actuarial value between the plans.

premium and HSA/HRA contributions) to the HD plans. We can calculate the share of firms where those excess contributions are the driving force for the HD plans dominating. We generate a counterfactual by replacing firms' contributions to HD plans with the contribution to LD whenever the former is higher within a firm. In this counterfactual simulation, we find that 45% of strict dominance cases and 33% SOSD cases from our baseline calculations are eliminated. For these firms the dominance pattern could be driven by firm preference for HD plans. The remaining 55% of strict dominance cases and 67% of SOSD cases cannot be explained by simple preference for HD options alone. It is difficult to further disentangle the reasons why firms might contribute more to HD plans in cases where they seem to favor it. We can largely rule out, though, that this represents a very short-term strategy to switch all employees to the HD plan. For firms appearing at least two consecutive years in our full sample, we find that firms almost never stop offering an HD plan but also rarely drop the LD plan (8%). More importantly, the rate of dropping LD plans is not elevated at the 65% of these firms that offer an HD plan with lower worst-case risk, which would be the pattern we expect if this represented an attempt to shift people away from LD plans so that they could be eliminated.

## **5. Conclusion and Discussion**

Our findings suggest that the movement toward choice of coverage levels in employer-sponsored health insurance has resulted in a situation where high-coverage options are often dominated by lower-coverage options with high deductibles. These patterns likely have important distribution consequences because prior studies have documented that employees with chronic health conditions, lower incomes and lower education levels are more likely to select costly lower-deductible plans in these situations (Handel, 2013; Bhargava, et al., 2017).

The results also suggest that some of the recent public concern about employees having high insurance deductibles may be exaggerated. Employees who voluntarily opt into high-deductible plans are receiving large benefits that will be missed if one fails to account for the premium reductions and contributions to health savings accounts they receive from employers for making that choice.

An implication of our findings is that there may be a rationale for extending policies in place for publicly-established health exchanges to employer-sponsored insurance. The Affordable Care

Act (ACA) anticipated that health plans with different levels of coverage (e.g., different deductibles) might attract people with different underlying health status. In order to prevent the adverse-selection pricing that could arise in the individual market, the ACA required that insurers use a “single risk pool” when pricing plans with different levels of coverage. This implies that premium differences across plans by an insurer reflect the differences in coverage between plans for a common average population. This requirement, and related policies regarding risk adjustments across plans, has received substantial attention in discussions of health care reform. Interestingly, however, there is no similar requirement in employer-sponsored health insurance. Employers are prohibited from discriminating against employees on the basis of health status in their health insurance programs.<sup>19</sup> However, there is no regulation governing the premium levels and firm contribution levels across different plans the employer offers to employees. In theory, firms could avoid offering dominant options: even if the average costs for HD plans are much lower, they do not need to pass those lower costs fully onto those who select those plans. But in practice it appears the principle of a “single risk pool” may often not hold in employer-sponsored health insurance plans.

More research is needed to better understand the extent to which firms actively establish plan options to weaken risk pooling across employees. There is also a need for research to better understand whether offering health plan options with large disparities in net benefits has spillovers on labor relations relating to the hiring, retention or wage negotiations with employees of different health status. The results of this paper are also limited to comparisons at firms that offer a very particular mix of high-deductible and lower-deductible options. More research is needed to better understand the average level of benefit disparities experienced by employees across firms throughout the U.S. Given that some firms do not offer choices of plans with different coverage levels, our results may over-state the extent to which health plan options create opportunities for benefit disparities between employees. On the other hand, existing research has documented large differentials (and even dominance) between plan options with varying deductibles that would all be considered low-deductible plans within the Kaiser Family Foundation data. As such, it is possible that situations where plan options varying in coverage level create large net benefit disparities are even more widespread than what we see for the set of firms we analyze here.

---

<sup>19</sup> The primary regulations of employer-sponsored health insurance plans comes through the rules imposed by the Employee Retirement and Income Security Act (ERISA).

Finally, we think the results of this study should encourage those who are investing in research on decision aids that help people to better understand and compare health insurance options (Bundorf et al. 2019; Gruber et al., 2020; Samek and Sydnor, 2020). It is quite difficult to compare insurance plan options that differ on the basis of premiums, cost-sharing rules, and even contributions to health savings and reimbursement accounts. Prior to our study one might have reasonably hoped that the ecosystem of human resource departments and benefit consultants at larger employers would have limited the size of financial losses one could incur from not being able to compare plans. Our results show, however, that in employer-sponsored insurance settings being able to make the comparison between plans can often have substantial financial consequences. It may even be that the benefit managers and health-insurance consultants setting up these plan options need aids to help them understand the choice sets they create. In fact, given that there are large benefit consultants who assist many firms and likely establish similar menus across the firms they serve, benefit consulting likely leads to some correlation in the patterns we observe across large employers. It may be, then, that targeted interventions with a few large benefit consulting firms could have a widespread impact on the nature of plan options available for American workers.

## References

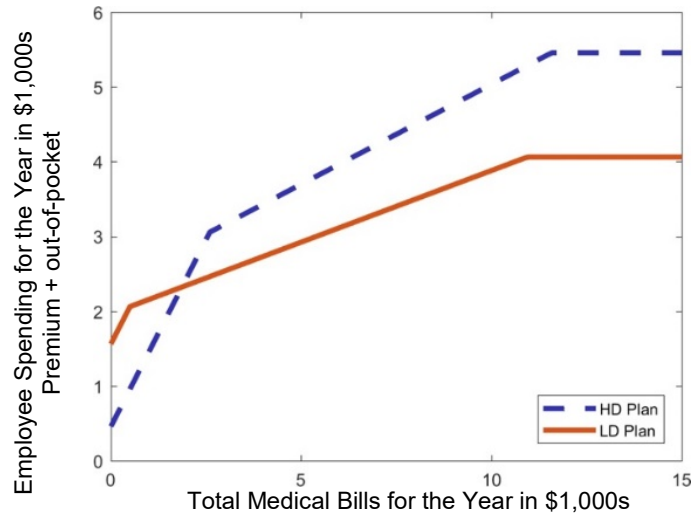
- Abaluck, Jason, and Jonathan Gruber. 2011. "Choice Inconsistencies among the Elderly: Evidence from Plan Choice in the Medicare Part D Program." *American Economic Review*, 101(4): 1180-1210.
- Abaluck, Jason, and Jonathan Gruber. 2018. "Less is More: Improving Choices by Limiting Choices in Health Insurance Markets." Working Paper.
- Agency for Healthcare Research and Quality. 2016. "Medical Expenditure Panel Survey 2014 Full Year Consolidated Data File". (accessed February 10, 2017). [https://www.meps.ahrq.gov/mepsweb/data\\_stats/download\\_data\\_files\\_detail.jsp?cboPufNumber=HC-171](https://www.meps.ahrq.gov/mepsweb/data_stats/download_data_files_detail.jsp?cboPufNumber=HC-171).
- Bhargava, Saurabh, George Loewenstein, and Justin Sydnor. 2017. "Choose to Lose: Health Plan Choices from a Menu with Dominated Options." *The Quarterly Journal of Economics*, 132(3): 1319–1372.
- Brot-Goldberg, Zarek C., Amaitabh Chandra, Benjamin R. Handel, and Jonathan T. Kolstad. 2017. "What Does a Deductible Do? The Impact of Cost-Sharing on Health Care Prices, Quantities, and Spending Dynamics." *Quarterly Journal of Economics*, 132(2): 1261-1318.

- Bundorf, M. Kate. 2016. "Consumer-directed Health Plans: A Review of the Evidence." *Journal of Risk and Insurance*, 83(1): 9-41.
- Bundorf, Kate, Maria Polyakova, and Ming Tai-Seale. 2019. "How do Humans Interact with Algorithms? Experimental Evidence from Health Insurance." National Bureau of Economic Research Working Paper No. w25976.
- Centers for Medicaid & Medicaid Services. 2015. "The Final 2016 Actuarial Value Calculator." United States Department of Health & Human Services, Washington, DC.(accessed June 24, 2016). <https://www.cms.gov/CCIIO/Resources/Regulations-and-Guidance/Downloads/Final-2016-AV-Calculator-011514.xlsm>
- Dafny, Leemore, Kate Ho, and Mauricio Varela. 2013. "Let Them Have Choice: Gains from Shifting Away from Employer-Sponsored Health Insurance and Toward an Individual Exchange." *American Economic Journal: Economic Policy*, 5(1): 32-58.
- Einav, Liran, Amy Finkelstein, and Mark R. Cullen. 2010. "Estimating Welfare in Insurance Markets Using Variation in Prices." *The Quarterly Journal of Economics*, 125(3): 877-921.
- Einav, Liran, Amy Finkelstein, Stephen P. Ryan, Paul Schrimpf, and Mark R. Cullen. 2013. "Selection on Moral Hazard in Health Insurance." *American Economic Review*, 103(1): 178-219.
- Ellis, R. P., & Zhu, W.. 2016. "Health Plan Type Variations in Spells of Health-Care Treatment." *American Journal of Health Economics*, 2(4): 399-430.
- Ericson, Keith Marzilli, Philipp Kircher, Johannes Spinnewijn, and Amanda Starc. 2020. "Inferring Risk Perceptions and Preferences Using Choice from Insurance Menus: Theory and Evidence." *Economic Journal*, <https://doi.org/10.1093/ej/ueaa069>.
- Ericson, Keith Marzilli and Justin Sydnor. 2017. "The Questionable Value of Having a Choice of Levels of Health Insurance Coverage." *Journal of Economic Perspectives*, 31(4): 51-72.
- Gruber, Jonathan, Benjamin R. Handel, Samuel H. Kina, and Jonathan T. Kolstad. 2020. "Managing Intelligence: Skilled Experts and AI in Markets for Complex Products." National Bureau of Economics Working Paper No. w27038.
- Handel, Benjamin R. 2013. "Adverse Selection and Inertia in Health Insurance Markets: When Nudging Hurts," *American Economic Review*, 103(7): 2643-2682.
- Handel, Benjamin R., and Jonathan T. Kolstad. 2015. "Health Insurance for "Humans": Information Frictions, Plan Choice, and Consumer Welfare," *American Economic Review*, 105(8):2449-2500.
- Leive, Adam. 2018. "Health Insurance Design Meets Savings Incentives: Consumer Response to Complex Contracts." Working Paper.
- Miller, Stephen. 2018. "High-Deductible Plans More Common, but So Are Choices." Accessed December 28, <https://www.shrm.org/resourcesandtools/hr-topics/benefits/pages/high-deductible-plans-more-common-but-so-are-choices.aspx>.
- Kaiser Family Foundation. 2016. 2011-2016. "Employer Health Benefits Annual Survey, 2011-2016." Henry J. Kaiser Family Foundation, San Francisco (CA) (accessed October 8, 2016).
- Samek, Anya and Justin Sydnor. 2020. "The Impact of Providing Consequence Information on Insurance Choice." Working paper.
- Sinaiko, Anna D. and Richard A. Hirth. 2011. "Consumers, Health Insurance, and Dominated Choices." *Journal of Health Economics*, 30(2): 450-457.

## Figure 1. Plan Option Classification

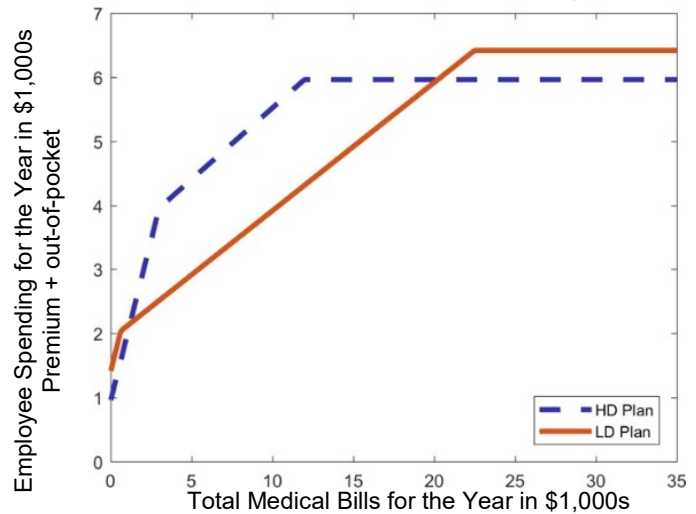
### Case 1: Classic Trade-off

HD plan has lower net premium and higher worst-case spending.



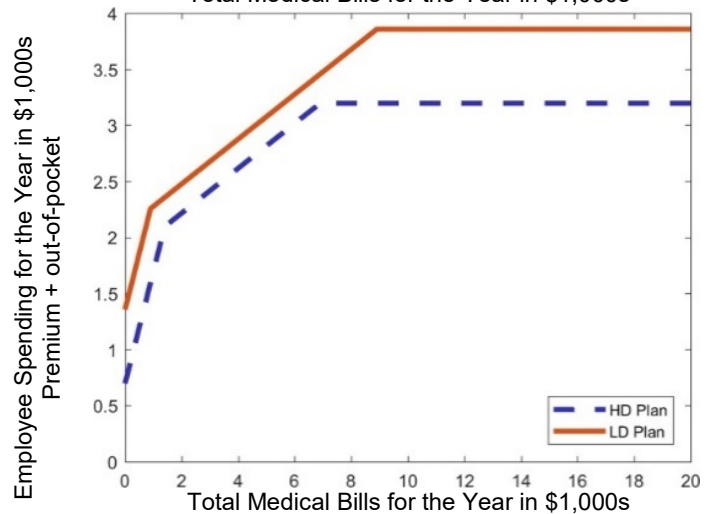
### Case 2: Ambiguous

HD plan has lower net premium and lower worst-case spending, but higher spending in some scenarios.



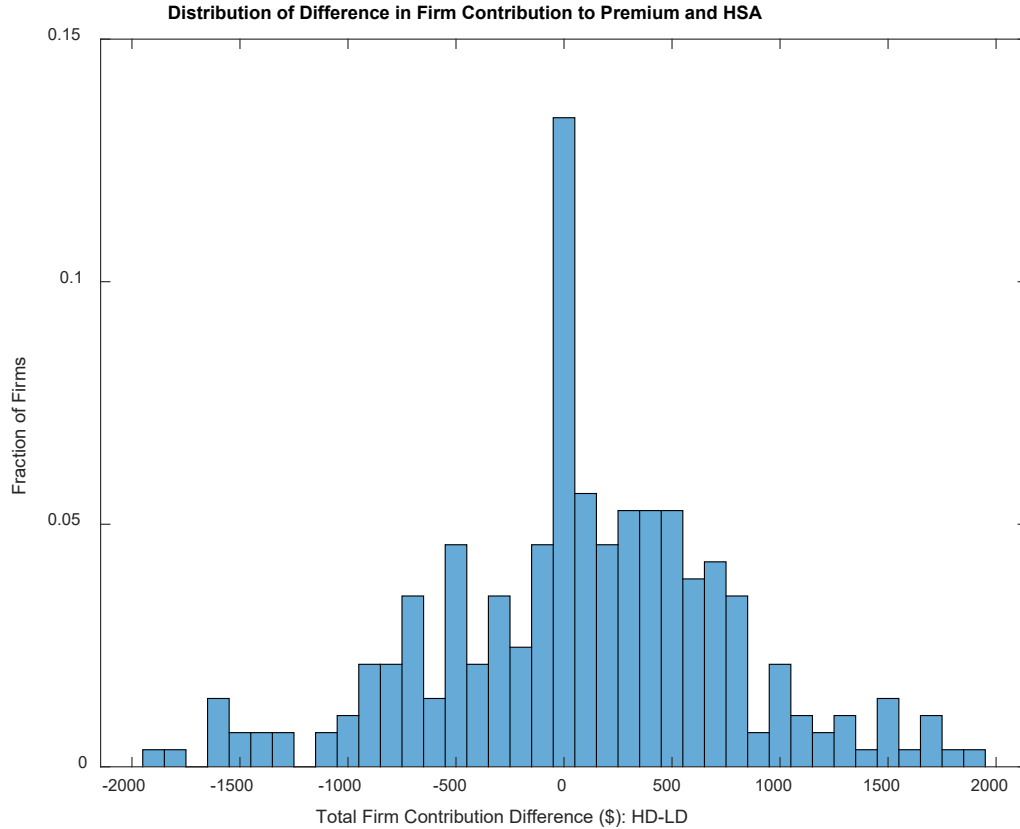
### Case 3: Strict Dominance

HD plan has lower net premium and lower spending in all scenarios.



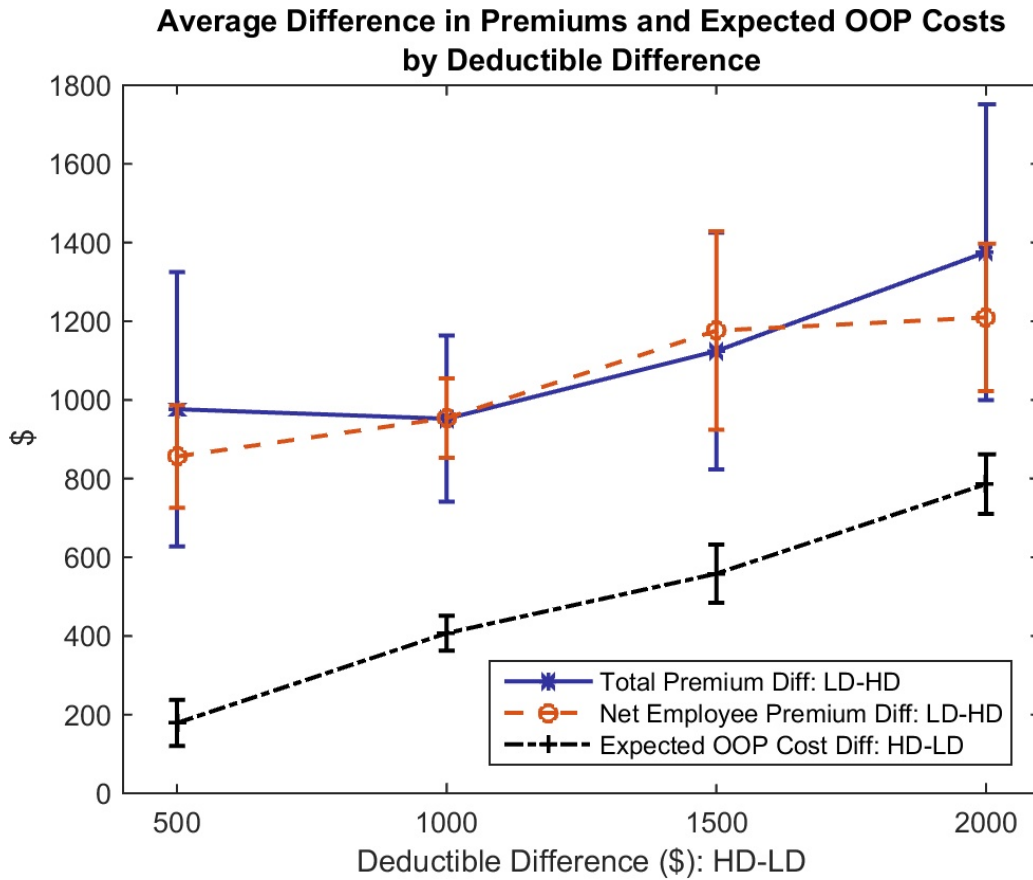


**Figure 2. Distribution of Difference in Total Firm Contributions to Plans**



*Notes:* This graph shows the distribution of the difference in total firm contribution to health plans (HD – LD) for firms in the sample that offer an HD plan with an HSA account (284 firms). For the LD plans this is simply the firm’s contribution toward the premium on the plan. For the HD plan it is the sum of the firm’s contribution to premium and the firm’s contribution to the HSA account. The bin size is set to \$100. So, for example, the bar centered at 0 shows that at just under 15% of these firms the total contribution difference is within \$50.

**Figure 3. Average Differences in Premiums and Expected Out-of-Pocket Costs by Deductible Difference**



*Notes:* Total premium is the annual premium for single coverage, including contribution from the employer and employee. Net premium is the premium paid by employee, minus any HSA contribution from the firm. Expected out-of-pocket costs is the expected enrollee out-of-pocket spending under the CMS Gold distribution. We subtract any HRA contribution by the firm, as long as the out-of-pocket spending is non-negative. We then calculate the difference of the first two variables as LD value minus HD value, and the difference of expected out-of-pocket costs as the HD value minus LD value. For firms where the HD plan has a strictly higher deductible (309 firms), we put them into 4 groups based on deductible difference: (0,\$750],(\$750-\$1250],(\$1250,\$1750],(\$1750,larger). For each group, we plot the mean and also the 95% confidence interval on the mean (the error bar at each data point).

**Table 1. HD vs LD Plan Differences Over Time**

Year	Number of firms	Plan Differences: HD - LD						Fraction of firms with HD lower worst risk
		Deductible	MOOP	Total premium	Employee premium	HRA/HSA contribution	Worst-case spending	
2011	290	\$1262	\$668	-\$959	-\$595	\$512	-\$439	64%
		(\$740)	(\$1429)	(\$1292)	(\$723)	(\$492)	(\$1517)	(48%)
2012	307	\$1307	\$767	-\$988	-\$572	\$497	-\$301	61%
		(\$840)	(\$1704)	(\$1026)	(\$711)	(\$511)	(\$1834)	(49%)
2013	315	\$1317	\$829	-\$1028	-\$585	\$533	-\$288	60%
		(\$822)	(\$1510)	(\$1371)	(\$750)	(\$526)	(\$1602)	(49%)
2014	362	\$1291	\$722	-\$1044	-\$611	\$508	-\$396	62%
		(\$944)	(\$1546)	(\$1257)	(\$767)	(\$457)	(\$1682)	(49%)
2015	405	\$1352	\$588	-\$1049	-\$608	\$539	-\$559	63%
		(\$1085)	(\$1663)	(\$1469)	(\$751)	(\$507)	(\$1782)	(48%)
2016	435	\$1401	\$590	-\$1025	-\$635	\$525	-\$570	63%
		(\$1151)	(\$1681)	(\$1583)	(\$889)	(\$489)	(\$1807)	(48%)
Total	2,114	\$1328	\$684	-\$1019	-\$604	\$520	-\$439	62%
		(\$964)	(\$1601)	(\$1363)	(\$774)	(\$496)	(\$1720)	(49%)

*Notes:* Means with standard deviations in the parentheses. Data from Kaiser Family Foundation Employer Benefits Survey (2011 - 2016).

**Table 2. Strict Dominance Classification for Simplified Plan Representations**

Fig 2. Case	Plan w/ lower net employee premium	Plan w/ lower net premium + max out of pocket	Strictly Dominant Plan	Number of Firms	Fraction of Firms	Avg Enrollment Share in HD Plan
NA	LD	LD	LD	8	2%	46%
NA	LD	LD		3	1%	56%
NA	LD	HD		9	3%	41%
Case 1	HD	LD		106	32%	25%
Case 2	HD	HD		84	25%	32%
Case 3	HD	HD	HD	121	37%	47%
Total				331	100%	36%

*Notes:* The premium is employee paid premium for single coverage of a year, minus firm contribution into HSA account if any. Max out of pocket is the maximum out-of-pocket per enrollee for single coverage of a year, minus firm contribution into HRA account if any. Net premium is the net spending when enrollee uses no medical services (the best-case scenario), and net premium + net max out of pocket is the spending when enrollees uses infinite medical services (the worst-case scenario). HD Strictly Dominant are firms offering an HD plan with lower employee spending under 84 atoms of Gold tier total medical spending distribution from CMS AV Calculator data. The enrollment share is only illustrative: the share is for all HD plans offered by the firm, while we only observe plan information of the one with the largest enrollment. Data from Kaiser Family Foundation Employer Benefits survey (2015).

**Table 3. Average Savings and Risk-Adjusted Savings with the HD Plan**

	Expected Employee Savings	Risk-adjusted Net Savings with CARA utility function	
		$\gamma=0.0005$	$\gamma=0.002$
All plans n=331	\$569 (\$734)	\$471 (\$832)	\$440 (\$1275)
Plans where HD is strictly dominant n=121	\$1121 (\$723)	\$1127 (\$739)	\$1334 (\$936)
Plans where HD is not strictly dominant n=210	\$251 (\$521)	\$93 (\$623)	\$-75 (\$1156)
CARA in context - Cert. Equiv. for 50% chance at winning \$1k with that r:		\$438	\$283
CARA in context - Gain needed to accept 50/50 Lose \$1k, gain G with that r:		\$2092	$\infty$

*Notes:* Means with standard deviations in parentheses. Expected utility calculation is based on constant absolute risk aversion (CARA) model. The risk-adjusted savings numbers show the average equivalent money amount the enrollee would be willing to pay to switch from the LD plan to the HD plan. The underlying health spending distribution is the Gold tier distribution from CMS AV Calculator data. Plan data is from the Kaiser Family Foundation Employer Health Benefits Survey (2015).

**Table 4. Robustness with MEPS Data**

	The fraction of Firms SOSD	Expected Employee Savings	Risk-adjusted Net Savings with CARA utility function	
			$\gamma = 0.0005$	$\gamma = 0.002$
Below median spending	49%	\$708	\$603	\$428
Above median spending	55%	\$506	\$431	\$435
CARA in context - Cert. Equiv. for 50% chance at winning \$1k with that r:			\$438	\$283
CARA in context - Gain needed to accept 50/50 Lose \$1k, gain G with that r:			\$2,092	$\infty$

*Notes:* This table uses data on total spending from the Medical Expenditure Panel Survey (MEPS) in 2014 for the population covered by employer/group insurance throughout the year. We regress total medical spending on a fully interacted model including age, gender, and self-reported health status (as explained in the text) and generate predicted levels of total spending based on those characteristics. We then group MEPS participants into 2 groups based on their predicted level of medical spending from this regression. We then calculate, for each group, the fraction of firms offering a menu where HD second-order stochastically dominates LD, the expected savings or risk-adjusted expected savings from choosing the HD plan over the LD plan for each of the 331 firms. The numbers represent the average values of those savings across the 331 firms. The risk-adjusted savings are created by assuming Constant Absolute Risk Aversion Utility with an  $\gamma = 0.005$  and  $\gamma = 0.002$ . The risk-adjusted savings is then the amount of money a person facing that particular spending distribution would need to be given with certainty to remain in the LD plan and have the same expected utility as instead switching to the HD plan.

**Table 5. Robustness with Tax and Investment Benefits of HD**

	% of Firms: Strict Dominance	% of Firms: SOSD	Expected Employee Savings	Risk-adjusted Net Savings with CARA utility function	
				$\gamma = 0.0005$	$\gamma = 0.002$
(1) Baseline	37%	55%	\$569	\$471	\$440
(2) Tax deduction from HSA/HRA, no investment or extra contribution	28%	47%	\$435	\$335	\$291
(3) Tax deduction from HSA/HRA, no investment, self-contribution up to the limit	60%	70%	\$976	\$908	\$905
(4) Invest HSA with 2% interest rate, no extra contribution	27%	46%	\$537	\$370	\$405
(5) Invest HSA with 8% interest rate, no extra contribution	36%	53%	\$2,505	\$2,392	\$2,790
(6) Invest HSA with 2% interest rate, self-contribution up to the limit	51%	65%	\$1,090	\$972	\$1,035
(7) Invest HSA with 8% interest rate, self-contribution up to the limit	77%	82%	\$8,853	\$9,578	\$10,007
CARA in context - Cert. Equiv. for 50% chance at winning \$1k with that r:				\$438	\$283
CARA in context - Gain needed to accept 50/50 Lose \$1k, gain G with that r:				\$2,092	$\infty$

*Notes:* For these calculations we assume a 25% income tax rate and for cases where contributions are invested, we assume an investment period of 30 years and an annual exponential discount rate of 0.01. The maximum HAS self-contribution limit for 2015 was \$3,350 for an individual account. The risk-adjusted expected savings calculations in the last two columns are based on a constant absolute risk aversion (CARA) utility model with the associated coefficient of absolute risk aversion ( $\gamma$ ) given in the table. The risk-adjusted savings numbers show the average equivalent money amount the enrollee would be willing to pay to switch from the LD plan to the HD plan. The underlying health spending distribution assumed is the Gold tier distribution from CMS AV Calculator data. Plan data is from the Kaiser Family Foundation Employer Health Benefits Survey (2015).

**Table 6. Robustness with Information Friction of HD**

	Number of Firms	% of Firms: Strict Dominance	% of Firms: SOSD	Expected Employee Savings	Risk-adjusted Net Savings with CARA utility function	
					$\gamma = 0.0005$	$\gamma = 0.002$
Baseline	331	37%	55%	\$569	\$471	\$440
Hassle costs: low	331	31%	49%	\$491	\$393	\$362
Hassle costs: high	331	4%	9%	-\$541	-\$639	-\$670
Baseline	284	36%	56%	\$591	\$484	\$455
Withdraw HSA	284	23%	44%	\$378	\$271	\$242
Ignore HSA	284	12%	27%	\$118	\$11	-\$18
CARA in context - Cert. Equiv. for 50% chance at winning \$1k with that r:					\$438	\$283
CARA in context - Gain needed to accept 50/50 Lose \$1k, gain G with that r:					\$2,092	$\infty$

*Notes:* In the low/high hassle costs scenarios in rows two and three, we assume enrollees incur an extra cost of \$77.8 and \$1109.6, respectively, per year using HDHP. In the scenario where employees withdraw the HSA and use it for non-medical services (row 5), we assume those withdrawals are subject to 25% income tax plus a 20% penalty. The risk-adjusted expected savings calculations in the last two columns are based on a constant absolute risk aversion (CARA) utility model with the associated coefficient of absolute risk aversion ( $\gamma$ ) given in the table. The risk-adjusted savings numbers show the average equivalent money amount the enrollee would be willing to pay to switch from the LD plan to the HD plan. The underlying health spending distribution is the Gold tier distribution from CMS AV Calculator data. Plan data is from the Kaiser Family Foundation Employer Health Benefits Survey (2015).



**Table 7. Dominance Pattern and Firm Demographics**

<b>Demographic Split</b>	<b>N</b>	<b>Share with HD Plan Strictly Dominant</b>	<b>Difference</b>
Firm with More Than 1000 Employee	119	0.32	-0.07
Firm with Less Than 1000 Employee	212	0.39	(0.06)
More than 35% Employee Earn \$58k or More	167	0.36	-0.01
Less than 35% Employee Earn \$58k or More	164	0.37	(0.05)
More than 35% Employee Age 50 or More	179	0.38	0.03
Less than 35% Employee Age 50 or More	152	0.35	(0.05)
Have Union Worker	228	0.37	0.02
No Union Worker	103	0.35	(0.06)
HD Self-Insured	87	0.35	-0.03
HD Underwritten by Other Firm	244	0.37	(0.06)
Private For-Profit	121	0.37	0.01
Private Non-Profit/Public	210	0.36	(0.06)
Analysis in Anticipation of Cadillac Tax	222	0.39	0.07
No Analysis in Anticipation of Cadillac Tax	109	0.32	(0.06)
Firms offering HSA	284	0.36	-0.07
Firms offering HRA	47	0.43	(0.08)
Industry - Agriculture/Mining/Construction	73	0.40	
Industry - Wholesale/Retail/Finance	71	0.41	
Industry - Service	120	0.28	
Industry - Government/Healthcare	67	0.43	

*Notes:* Standard error of the difference in parentheses.