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Imperfect risk adjustment, risk preferences, and sorting in competitive health insurance markets

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ABSTRACT

I develop a model of insurer price-setting and consumer welfare under risk-adjustment, a policy commonly used to combat inefficient sorting due to adverse selection in health insurance markets. I use the model to illustrate graphically that risk-adjustment causes health plan prices to be based on costs not predicted by the risk-adjustment model ("residual costs") rather than total costs, either weakening or exacerbating selection problems depending on the correlation between demand and costs predicted by the risk-adjustment model. I then use a structural model to estimate the welfare consequences of risk-adjustment, finding a welfare gain of over $600 per person-year.

1. Introduction

It is widely known that insurance markets can suffer from market failures caused by adverse selection (Akerlof, 1970; Rothschild and Stiglitz, 1976). Efficiency is achieved when consumers purchase goods that they value more than the social cost of providing those goods. In many markets, competition induces efficiency by ensuring that goods are priced according to their marginal cost. In many health insurance markets, however, adverse selection and pricing regulations work to distort equilibrium prices, causing them to diverge from the first-best (and also the second-best) prices that induce consumers to sort efficiently across health insurance contracts (Einav et al., 2010). In the extreme, adverse selection can cause some types of insurance products to cease to exist (Cutler and Reber, 1998). Due to wider variation in the levels of coverage available to consumers, this adverse selection problem is likely to be more severe in the Health Insurance Marketplaces (Marketplaces) established by the Affordable Care Act (ACA) than in other, more widely studied settings such as the employer and Medicare markets. In fact, recent research suggests the potential for complete market unraveling in a Marketplace-like setting (Handel et al., 2015a).

While adverse selection in insurance markets has been widely studied both empirically and theoretically, the literature on regulations and policies typically used to combat selection problems is less well-developed. With respect to health insurance markets, the literature has largely focused on only three solutions to the sorting problems caused by adverse selection: restricting the contract space, subsidizing adversely selected plans, and allowing premiums to vary by expected cost (Cutler and Reber, 1998; Einav et al., 2010; Bundorf et al., 2012; Geruso, 2017; Handel et al., 2015a). One of the most widely implemented solutions to the adverse selection problem, transfers or subsidies based on enrollee health status typically known as risk adjustment, has received less attention.[1] Risk adjustment is typically viewed as being used to combat supply-side selection problems, known as cream-skimming, where insurers distort insurance contracts to attract healthy enrollees (Glazer and McGuire, 2000; Brown et al., 2014; Newhouse et al., 2015).[2] While these distortions and the power of risk adjustment to combat them are important, in this paper I show that risk adjustment transfers can also have significant effects on sorting and welfare in a fixed contract setting where inefficiency is due to consumers choosing the "wrong" plan rather than cream-skimming insurer behavior. The choice of plan tier in the Marketplaces or the choice between HMO and PPO plans in Medicare Advantage represent such settings.

In the first part of this paper, I present a conceptual framework for evaluating the effect of imperfect risk adjustment transfers on prices and sorting in competitive health insurance markets like the Marketplaces. The framework is based on the model of Einav et al. (2010). The key innovation is to divide health care spending into two dimensions: the risk adjustment transfer payment attached

[1] In the US, risk adjustment is used in some form in Medicare Advantage, Medicare Part D, the new state Health Insurance Marketplaces, and many state Medicaid Managed Care programs. Risk adjustment is also used in some form in the health insurance markets of the Netherlands, Switzerland, Germany, Israel, and Belgium.

[2] See Layton et al. (2017) for a recent review of this literature.

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to the individual ("adjusted costs") and the difference between total spending and the risk adjustment transfer payment ("residual costs"). Risk adjustment transfers are typically based on risk scores calculated for each enrollee using demographics and diagnoses from health insurance claims. The risk scores act as proxies for the enrollees' total expected medical spending in an average health plan. A regulator uses these risk scores to enforce transfers from plans attracting low risk enrollees to plans attracting high risk enrollees. These transfers effectively cause the average level of adjusted costs to be equal across all plans (i.e. flatten the "incremental average adjusted cost curve"), leaving only residual costs to generate any heterogeneity in average net-of-risk adjustment spending across plans. Residual costs are typically practically important: Risk adjustment models used in the Medicare Advantage market explain only about 12% of the variation in spending, and models used in the Marketplaces explain 30–40% of spending. However, in most markets it is unknown how much residual costs vary across plans, the key parameter for determining the extent of the adverse selection problem in a market with risk adjustment.

After developing the model, I use a series of graphical representations, building on those presented in Einav et al. (2010) and Einav and Finkelstein (2011), to develop intuition for how risk adjustment affects sorting and welfare. The model and figures provide intuition for an important and novel conceptual point: The effect of risk adjustment on equilibrium prices and sorting is determined by the joint relationship between risk scores (i.e. adjusted costs), spending, *and demand for the adversely selected plan*. This joint relationship differs from the typical metric used to evaluate risk adjustment policies, the relationship between risk scores and spending. Importantly, I show that this implies that if in a market a given health plan is adversely selected on total spending but advantageously selected on the risk score, risk adjustment transfers can result in fewer, rather than more, enrollees choosing the adversely selected plan, effectively exacerbating the problem it is meant to address. Such a setting is possible because risk adjustment is imperfect and only captures certain dimensions of spending and preference heterogeneity causes different dimensions of spending to have different correlations with demand.[3] This is a novel and important conceptual point that to my knowledge has not previously been made in the risk adjustment or adverse selection literatures.[4]

In the second part of this paper, I investigate the efficiency consequences of standard risk adjustment transfer policies empirically using rich administrative health insurance claims and enrollment data from a large employer that includes individual-level medical spending as well as all of the pieces of information necessary to compute the risk scores used in Marketplace risk adjustment policies. I combine the rich claims and enrollment data with a structural model of consumer health plan choice to estimate consumer risk preferences and the correlations between risk preferences, risk scores, and total spending for a sample of employees. I then use this joint distribution of preferences, risk scores, and spending combined with an algorithm developed by Handel et al. (2015a) to simulate equilibrium plan prices and consumer sorting with and without risk adjustment in the context of a Marketplace where consumers are required to enroll in either a less comprehensive Bronze plan or a more comprehensive Platinum plan.[5] I simulate the actual risk adjustment transfer policy being implemented in the Marketplaces along with a few counterfactual policies. I use these simulations to estimate the consequences of risk adjustment for prices, sorting, and, ultimately, welfare in the Marketplaces.

The simulations suggest that there will be significant adverse selection in the Marketplaces. I replicate the result of Handel et al. (2015a) that with no risk adjustment transfers, the market fully unravels, and all consumers enroll in the less comprehensive Bronze plan. I then simulate prices and sorting under the Marketplace risk adjustment policy and find that, despite its imperfection at explaining costs at an individual level, it undoes a significant portion of market unraveling. The equilibrium premiums of the two plans converge, and over 60% of market participants enroll in the more comprehensive Platinum plan. I also test several counterfactual risk adjustment policies, finding that risk adjustment based on demographics only has no effect on market unraveling and that when combined with reinsurance the effects of risk adjustment are augmented, producing Platinum plan enrollment exceeding 80%. Welfare calculations indicate that the welfare consequences of risk adjustment in this setting are far from trivial, with the Marketplace risk adjustment transfer policy improving welfare by $600–$700 per person, per year, or around 20% of total health care costs among employees of the firm I study.[6] These findings are largely robust to various assumptions about the ability of consumers to predict their future health care costs.

This paper provides an important contribution to the literature on regulations used to combat adverse selection problems. Specifically, this paper generalizes previous models of adverse selection with risk adjustment developed by Shi (2014) and Glazer et al. (2014) to allow for preference heterogeneity to cause the relationship between demand and risk scores to differ from the relationship between demand and total costs. This generalization is important as it reveals that risk adjustment does not always increase enrollment in the adversely selected plan as implied by the less-general models. This paper also adds to the growing set of graphical representations of the welfare economics of health insurance markets. The graphical representation introduced by Einav et al. (2010) has proven influential among researchers and policymakers due to its ability to describe a fairly complex theoretical concept in a simple and intuitive framework. Recently, their model has been used to estimate welfare changes due to the reform of Massachusetts' individual health insurance market (Hackmann et al., 2015) and the ACA (Kowalski, 2014). The model has also been generalized to allow for imperfect competition by Mahoney and Weyl (2014) and information frictions by Spinnewijn (2017) and Handel et al. (2015b).

[3] Such a setting is not just a theoretical possibility. Cabral et al. (2014) provide evidence that while on the margin Medicare Advantage is advantageously selected on total costs, it is adversely selected on the demographic risk scores used during the time period of their study. This implies that during their study period, risk adjustment may have implicitly transferred money to rather than from Medicare Advantage plans and further distorted sorting between Traditional Medicare and Medicare Advantage rather than correcting distortions due to adverse selection.

[4] Other papers have considered imperfect risk adjustment when studying adverse selection (Handel et al., 2015b; Mahoney and Weyl, 2014), but they have assumed that the imperfections are equal across individuals and services, effectively eliminating the interaction between preference heterogeneity and risk adjustment imperfections that generates the result I highlight in this paper that risk adjustment can result in transfers *from* the adversely selected plan and *to* the advantageously selected plan.

[5] In the Marketplaces, plans are divided into tiers based on their actuarial value. The tiers are called (from least to most comprehensive) Bronze, Silver, Gold, and Platinum. A Bronze plan has an actuarial value of 60% and a Platinum plan has an actuarial value of 90%.

[6] This is a huge welfare improvement. It is worth noting that it is especially large compared to the calculations of welfare loss from adverse selection found elsewhere in the literature (Cutler and Reber, 1998; Einav et al., 2010; Geruso, 2016). It is important to note, however, that in all of these other settings, the plans consumers were choosing between were quite similar in terms of cost sharing. Here, the plans have large differences in cost sharing, reflecting the large differences in cost sharing found across tiers in the Marketplaces. Simulations with plan options that are more similar to the options available in the settings studied in other papers produced welfare results similar to the results from those papers, suggesting that if the estimated structural demand and cost parameters from those papers were used to study the Bronze–Platinum setting studied here, the results would be similarly large.