

**Unhealthy Insurance Markets: Search Frictions
and the Cost and Quality of Health Insurance**

by

Randall D. Cebul

School of Medicine and Center for Health
Care Research and Policy
Case Western Reserve University at
MetroHealth Medical Center

Lowell J. Taylor

H. John Heinz III School of Public
Policy and Management
Carnegie Mellon University

James Rebitzer *

Department of Economics and Center for
Health Care Research and Policy
Case Western Reserve University
and NBER, the Levy Institute, and IZA

Mark E. Votruba

Department of Economics and Center for
Health Care Research and Policy
Case Western Reserve University

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Abstract

Health insurance is a complex, multi-attribute product and this creates search frictions that can distort market outcomes. We study the effect of frictions in the market for employer based health insurance. We find that frictions are most severe in the “fully insured” part of the group health insurance market and we estimate that frictions in this market segment cause a quarter of the consumer surplus to shift from policy-holders to insurers (a transfer of 32.5 billion dollars in 1997). Our analysis also suggests that frictions in insurance markets also reduce incentives to invest in future health.

Key words: health insurance markets; equilibrium price dispersion; chronic disease management

JEL classification: I11 (analysis of health care markets); L13 (oligopoly and other market imperfection)

1. Introduction

In the United States, health insurance for those under age 65 is typically provided through group plans purchased by employers from commercial insurers. Health insurance is a complex multi-attribute service, so employers looking to buy insurance face a difficult shopping problem. Savvy purchasers must consider which of the many drugs their employees might use are in the insurer's formularies, whom among many local physicians are part of the insurer's provider network, and what co-pays and deductibles apply to which pharmaceuticals, providers and services. Comparison shopping is made even more difficult by the fact that many aspects of insurance involve commitments to provide services under hard-to-anticipate contingencies. Medical underwriting by insurers and the great profusion of insurance products offered raises administrative costs and increases the complexity of an employer group's search for health insurance (Hall, 2008).¹

Large and sophisticated employers can avoid many of these difficulties by "self insuring" and hiring insurers simply to administer their plans. Smaller and less sophisticated firms generally do not self insure. Instead they purchase products that provide both administrative services and insurance. These "fully insured" employers face a particularly daunting search process and make up approximately half the market.²

¹ Woolhandler, *et al.* (2003) note that Seattle alone had 757 distinct health insurance products. Our discussions with executives in the insurance industry suggest that this number is not atypical for metropolitan areas and may be conservative. Recent experience with the new market for pharmaceutical insurance under Medicare part D illustrates well the tendency for health insurance markets to proliferate vast numbers of products (Thaler and Sunstein, 2008).

² Fully insured employer groups often rely on brokers to help them navigate the health insurance marketplace, but brokers do not eliminate the difficulties of comparison shopping and complicate it in some ways (Hall, 2000a).

In this paper we analyze the effects of search frictions on the functioning of health insurance markets. Our study has both a theoretical and empirical dimension.

We begin our theoretical discussion in Section 2 by sketching a simple model of the search process for health insurance. In our model the law of one price does not hold. Instead there exists an equilibrium *distribution* of premiums (for identical policies and employer groups), an equilibrium in which the price of insurance exceeds its marginal cost so that some consumer surplus accrues to insurers.³ Our equilibrium is also characterized by excess turnover in insurer-policy holder relationships. In an employer-based health insurance system some turnover is inevitable, of course, owing to individual job loss or change. The distinctive implication of our search framework is that there will be significant additional turnover in which entire groups of employees drop their current insurance because their employers seek (and find) less expensive plans. If the distribution of prices is sufficiently large, high rates of employer group turnover can persist even when there are significant costs to switching insurers.

In Section 3 we examine the empirical predictions of the search model using three data sources: the Household Survey component of the Community Tracking Study (CTS), proprietary information from the enrollment records of a large regional insurer, and the Robert Wood Johnson Foundation Employer Health Insurance Survey (EHIS). We observe that there are high rates of health insurance turnover, roughly 20 percent per year on average, and we find that the rate of turnover is particularly high among fully insured employees, for whom search frictions

³ The idea that search frictions lead to price dispersion is of course familiar, and empirical work has found such dispersion in many markets. One example in the insurance market is Brown and Goolsbee's (2002) study showing significant search frictions in the term life insurance market prior to advent of the internet-based comparison shopping. (Health insurance is, of course, a much more complex product than term life, making search all the more problematic.) Frank and Lamiraud (2008) report evidence of significant price dispersion for homogenous products in Swiss health insurance markets.

are likely to be relatively high. Importantly, from the perspective of our theory, roughly half of this turnover is due to cancellations by entire employer groups.⁴ As for the dispersion in premiums, a considerable amount of price dispersion remains after controlling for variation in product features and employer characteristics. Consistent with the presence of these frictions, the variance in the residual distribution of premiums is greatest in the fully insured market segment where search frictions are likely to be greatest. We estimate that for the average policy in the fully insured market, search frictions are sufficient to transfer approximately one quarter of the consumer surplus from policy holders to insurers. This amounts to a transfer of \$32.5 billion dollars in 1997.

In Section 4 we return to our theoretical analysis to assess the likely implications of search frictions for the *quality* of health care financed by insurance policies. We begin by observing that the management of important chronic diseases such as diabetes requires investments in the present to prevent or delay complications in the future.⁵ The excess turnover induced by search frictions, combined with the market power insurers gain from frictions, serve to reduce the private returns on investments in future health. Our empirical estimates suggest that the magnitude of this distortion may be significant. The likely consequences of sub-optimal incentives for future health investments are reduced expenditures on preventive care of all sorts and an increase in the burden of chronic disease.

The paper concludes with a discussion of policy implications and directions for future research.

⁴ High turnover rates between insurers and their policy holders are common knowledge among brokers and insurance companies, but this issue has received only limited attention from economists and health services researchers. For exceptions see Beaulieu, *et al.* (2007), Fang and Gavazza (2007), Herring (2006) and Cunningham and Kohn (2000).

2. A Simple Model of Search Frictions in the Market for Insurance

Economic analyses of commercial health insurance markets frequently highlight problems arising from imperfect information. Moral hazard between the insurer and health care provider or between the insurer and consumers of health care services can lead to wasteful and inefficient expenditures. Adverse selection can distort markets as insurers seek to avoid employers with employees who are expensive to insure. Our purpose in this paper is to set out an alternative and potentially important source of inefficiency in the market for health insurance—frictions that arise as a consequence of the process by which employer groups search for insurance.⁶

We begin by setting up a baseline model. The purchase of commercial health insurance involves at least four players with distinct roles and interests: insurers, health care providers, employers and employees. Because we abstract from moral hazard and adverse selection, it suffices to focus on two types of agents: *insurance companies* that issue policies and *client employer groups* who make purchases on behalf of their employees. Insurance companies are assumed to provide a homogeneous product to identical clients. Each insurer faces an insurance cost, c , and charges clients a price p . Clients purchase insurance so long as the price of the policy does not exceed an exogenous reservation value, p^R , that is greater than c .

⁵ See, for example, Beulieau, *et al.* (2007) and Gertler and Simcoe (2006).

⁶ In what follows we simply assume an exogenous amount of search frictions. A more complete analysis would model the source of frictions, including the contribution played by adverse selection. Adverse selection can contribute to search frictions by dampening the aggressiveness with which outsiders bid against incumbents (see Li, 2007). In addition, there is some evidence that insurers develop new and more complex products to avoid insuring expensive employer groups (Hall, 2008; Hall, 2000b). To the extent that these avoidance activities increase medical underwriting and marketing costs, they also worsen search frictions.

We introduce search frictions in the insurance market by adapting the well-known model of Burdett and Mortensen (1998).⁷ In this model, each insurer posts a premium (i.e., price), and offers this premium to a number of randomly selected clients. Each client retains their current insurance or accepts the lowest-price offer and pays the agreed-upon price each period for the duration of the insurance relationship. The client exits the relationship in one of two ways. First, there is a probability of exogenous separation, δ .⁸ Second, the client can voluntarily switch to another insurance company if a better deal comes along.

It is easy to see that the law of one price cannot hold in this setting.⁹ Rather, the equilibrium outcome is a price *distribution*. Let that distribution be characterized by the cumulative distribution function $F(p)$. For $F(p)$ to characterize an equilibrium, it must be the case that expected profit is the same at any price in the distribution. If prices offered conform to $F(p)$, no firm can improve profits by altering its own behavior (i.e., by changing the price it offers). Following Burdett and Mortensen, $F(p)$ is found by solving for the steady state when the time periods are collapsed, i.e., when time is continuous. Let r be the interest rate, δ be the exogenous separation rate, and λ be the rate at which offers arrive to clients. As it turns out, the

⁷ Details of the Burdett-Mortensen model, as they apply it to labor markets, are set out in a clear way in Mortensen (2003), especially pages 35-43. The model we present in this section is intended to highlight key results that we rely upon for our empirical work.

⁸ Exogenous switches could be the result of shocks that cause clients to drop insurance coverage or become self-insured, or changes in client preferences or even miscalculations. Brokers, who receive commissions from insurers for bringing in new business, may also be an exogenous source of switches.

⁹ Intuitively, suppose all firms made the same price offers $p = c$ and so earned zero profit. This cannot be an equilibrium because a maverick firm could earn positive expected profits by charging a discretely higher premium, p , that is less than p^R . This is because the high offer will sometimes be accepted if the contacted client receives no better offer. Similarly, if all firms charged the same price with $p > c$ (but less than p^R) a maverick firm will do better by charging a price slightly less than p , thereby increasing the number of clients while reducing profit per client by a negligible amount.

discounted present value to an insurance company of writing an insurance contract at price p takes an intuitively sensible form,

$$(1) \quad V(c, p) = \frac{p - c}{r + \delta + \lambda F(p)},$$

where $\lambda F(p)$ is the rate at which a policy is terminated due to a raid by a competitor. It is easy to show that the steady state probability a randomly contacted client accepts an insurer's offer price p is

$$(2) \quad h(p) = \frac{\delta}{\delta + \lambda F(p)}.$$

This latter expression is intuitive. For a firm at the bottom of the distribution, $F(p) = 0$, the probability that an offer is accepted will be 1. The probability of acceptance decreases as p increases but even at the maximum price, for which $F(p) = 1$, the acceptance rate exceeds zero.

Given (1) and (2), expected profit per client contacted is $\pi(c, p) = h(p)V(c, p)$. In equilibrium profit must be the same for any offered price, including the highest price that can ever be charged, the common reservation price p^R . Thus $F(p)$ must solve

$$(3) \quad \begin{aligned} \pi(c, p^R) &= \left(\frac{\delta}{\delta + \lambda} \right) \left(\frac{p^R - c}{r + \delta + \lambda} \right) \text{ and} \\ \pi(c, p) &= \left(\frac{\delta}{\delta + \lambda[F(p)]} \right) \left(\frac{p - c}{r + \delta + \lambda[F(p)]} \right). \end{aligned}$$

It simplifies the exposition to set the interest rate to 0. Then it is a matter of algebra to demonstrate that the offer distribution solving (3) is

$$(4) \quad F(p) = 1 - \frac{\delta + \lambda}{\lambda} \left[1 - \left(\frac{p - c}{p^R - c} \right)^{\frac{1}{2}} \right].$$

Using (4) it is straightforward to derive the distribution of accepted offers:

$$(5) \quad G(p) = 1 - \frac{\delta}{\lambda} \left[\left(\frac{p^R - c}{p - c} \right)^{\frac{1}{2}} - 1 \right].$$

Clearly, prices cannot exceed the reservation price, p^R , so at $p = p^R$, $F(p^R) = G(p^R) = 1$.

From equation (5) it is easy to demonstrate that the premium at any quantile, θ , of the price distribution $G(p)$ is

$$(6) \quad p_\theta = [1 - \alpha]c + \alpha p^R = c + (p^R - c)\alpha \text{ with } \gamma \equiv \frac{\delta}{\lambda} \text{ and } \alpha = \left(\frac{\gamma}{\gamma + (1 - \theta)} \right)^2.$$

The median premium is found by setting $\theta = 0.5$ and the minimum premium is found by setting $\theta = 0$. Notice that so long as δ/λ is positive, the minimum premium exceeds cost, so insurers earn positive surplus.¹⁰ The expression for the maximum premium is determined by setting $\theta = 1$. In our empirical work in Section 3 below, we will make use of the result from (6) that the maximum observed premium equals the client's maximum willingness to pay for insurance. This result follows from the reasonable assumption that the efficacy of search for insurance is unrelated to current insurance status.¹¹

Integrating $G(p)$ over the entire price range the average price is

¹⁰ Of course, profits might still be zero for insurance companies if there are additional costs such as marketing expenses, or costs for screening or making specialized contract arrangements with clients, client-screening costs, etc.

¹¹ To understand the importance of this assumption, consider the Burdett-Mortensen model in its original labor market context. If it is more effective for workers to search when employed, then some employees will accept a wage less than their reservation wage in order to gain access to a more efficient search process. In this case, the lowest observed wage will be less than the reservation wage. Conversely if it is more effective to search when one isn't employed, some employees will pass up jobs with wages above reservation wages in order to gain access to more efficient search processes. If job search is as efficient for employed and unemployed workers, the minimum observed wage is the reservation wage. (Hornstein, Krusell, and Violante, 2007, establish this and related results for a wide variety of labor market search models.) Analogously in our insurance context, if we assume that the efficiency of insurance search is independent of insurance status, then it follows that the maximum observed price is equal to p^R .

$$(7) \quad \bar{p} = \left(\frac{\lambda}{\delta + \lambda} \right) c + \left(\frac{\delta}{\delta + \lambda} \right) p^R = c + (p^R - c) \left(\frac{\gamma}{\gamma + 1} \right).$$

From (6) we see that all premiums except the maximum, p^R , increase as $\gamma = \delta/\lambda$ increases. As a result, the average premium in equation (7) also increases with γ . Mortensen (2003) refers to parameter γ as the “market friction parameter.” At low values of γ , outside offers arrive rapidly relative to the exogenous shocks that terminate insurer-client relationships, so markets are relatively competitive. As γ approaches 0 the average and minimum prices collapse to marginal cost, c . Conversely, as γ goes to infinity, the distribution collapses around the reservation price for insurance, p^R . Comparing equation (7) to (6), one sees that the mean premium in the distribution exceeds the median premium except when γ is 0 or infinity.¹² Thus as long as markets are neither completely frictionless nor completely frozen by frictions, the distribution of premiums will be skewed right.

An important empirical implication of our model concerns insurance turnover. It is generally accepted that changing health insurers entails significant costs.¹³ If market frictions

¹² From (6), the median premium is $c + (p^R - c) \left(\frac{2\gamma}{1 + 2\gamma} \right)^2$.

¹³ Insurers must update their computer systems to accommodate new members and match them with the terms of their policies, a surprisingly difficult task made more complex by the continuous movement of employees in and out of firms and by the very large variety of offered plans (see, e.g., Cebul, Rebitzer, Taylor, and Votruba, 2008, and Hall, 2008). In addition, it takes insurers time to learn about the conditions and expenditure patterns of new members. For example, one insurance industry executive with whom we spoke said it can take up to a year to accumulate enough billing data to identify a diabetic. Employees whose employer switches insurers may have to find new primary care physicians, new specialists and new hospitals. Because the U.S. lacks a portable electronic medical records system, it is often the job of individual patients themselves to transfer information to new providers. Of course the job of searching for a new insurance policy also consumes employer time, attention and (if a broker is hired) money.

were quite small (γ close to zero) or, for that matter, sufficiently large (γ approaching infinity), the distribution of premiums would be narrow and gains from switching insurers would likely not exceed the switching costs. From this perspective, the observation of high rates of turnover in insurance relationships is itself evidence for intermediate levels of market frictions. The churn predicted by the model is not merely a consequence of labor market turnover. Rather, we would expect to see movement of entire employer groups as clients exit after having found a better deal at a competing insurer.

3. Evidence Concerning Insurance Turnover and Price Dispersion

3.1. Turnover in Health Insurance Markets

To document the level of insurance policy turnover, we start with data from the Household Survey component of the Community Tracking Study (CTS) conducted in four waves (1996-97, 1998-99, 2000-01, and 2003) by the Center for Health System Change. Importantly for our purposes, the CTS Household Survey collects information on insurance coverage that we can use to estimate annual cancellation rates for a representative sample of consumers.¹⁴

One drawback of the CTS is that data on insurance changes is reported retrospectively. This raises the potential for recall errors and, more importantly, complicates our ability to identify persons who cancelled a private insurance plan in the year prior to the interview date. In practice, we identified a “cancellation” when (a) an individual reported a policy change or indicated the loss of insurance in the last year, and (b) reported “private plan” as their previous form of insurance. We cannot know with certainty that all these subjects had private coverage one year prior to interview, though it seems a reasonable assumption. “Non-cancellations” could

¹⁴ In the implementation of the survey, selected communities were over-sampled but weights were provided to construct national averages.

be cleanly identified as those reporting current private coverage with no reported change in plans over the last year. The ratio of cancelling subjects to the sum of non-cancelling and cancelling subjects provides our estimate for the one-year cancellation rate in private health plans.

Two other limitations of the CTS are relevant for our purposes. First, in characterizing prior insurance type, the broad category “private plan” includes both group plans and “direct purchase” plans (those purchased in the non-group market). As a result, we cannot specifically estimate the cancellation rate for employer group health plans. Second, even for current insurance type, the CTS does not distinguish between fully insured (FI) and self insured (SI) group plans.

Our second source of data comes from the proprietary enrollment records of a large regional insurer. Using these data we can observe cancellations directly. Our cancellation rates are calculated as the fraction of members enrolled with the insurer on July 1st of a given year who cancelled their policy by July 1st of the subsequent year. An important virtue of these data is that they allow us to distinguish between self insured and fully insured employer groups. Unfortunately we do not know how representative this insurer is of the entire market.

In Table 1 we present statistics on insurance cancellation rates. Column (1) provides an estimate of the one-year cancellation rate for private health plans based on the CTS sample. We find that 21% of respondents had private insurance within the previous 12 months and had cancelled that policy. Of this 21%, 87% had acquired a new private policy at the time of the CTS interview, while 10% were uninsured.

An alternative measure of insurance turnover, the one-year persistence rate, is presented in columns (2) and (3). Persistence rates are the fraction of current policyholders who report having the same plan for at least one year. The virtue of this measure is that the CTS

distinguishes between group and non-group private plans for current insurance holdings. As expected, the measured persistence rate is roughly 1 minus the cancellation rate. More importantly, our measure of persistence is essentially unchanged when we exclude private policyholders in non-group plans, which suggests our CTS measure of the cancellation rate is not substantially affected by the inclusion of persons in non-group plans.

Column (4) of Table 1 presents the aggregate cancellation rate of our regional insurer for policyholders in employer groups containing at least 10 members. The one-year cancellation rate is nearly identical to that measured from the CTS. The aggregate cancellation rate, however, masks important heterogeneity among employer groups. As reported in columns (5) and (6), cancellation rates for the regional insurer are more than twice as high for policyholders in fully insured groups (0.31) than for those in self insured groups (0.14).

In Table 2 we provide estimates of the cancellation rate for various years. Cancellation rates calculated from the CTS hover between 20 and 21% for each of the four waves of the survey, while cancellation rates for our insurer are somewhat more variable over time. Again we note that FI employer groups have much higher cancellation rates than SI groups for each year.

Our analysis of insurance market frictions highlighted the exit of entire employer groups from insurance relationships. Table 3 presents estimates of the proportion of cancellations due to the exit of entire employer groups from one insurer to another. In the Community Tracking Study we identify a cancellation by the employer group if the respondent indicated that the reason for the insurance cancellation was a change in the health plan offerings of one's employer. In the data from the regional insurer, we identify employer group cancellations based

on the aggregate cancellation rate for the group and the cancellation codes present in the administrative records.¹⁵

In the first column of Table 3 we provide information on the composition of cancellations in the CTS Household Survey. As reported in the first row of column (1), 35% of those identified as exiting a private plan over the prior year cited as their reason for cancelling a change in employer group offerings, while 40% reported job loss or job change as the reason for cancellation. These fractions are modestly lower than what we would expect if we could exclude persons in non-group plans, which comprise about 8% of all private policyholders in the CTS sample (based on the description of current policies). Adjusting for the presence of non-group policyholders (see rows titled “adjusted fraction”), we find that about 38% of cancellations among group policyholders is due to employer group cancellations, while about 43% are due to employer groups changing their insurance offerings. The remaining cancellations are primarily due to employees changing the plan they select among the employer’s menu of insurance options or employees switching to policies available through a spouse’s employer.

The remaining columns of Table 3 report estimates based on data from our regional insurer. In column (2), we estimate that roughly half of all cancellations are the result of employer groups discontinuing their relationships with the regional insurer, a figure that is higher than the 38% found in the CTS Household Survey. Some of this discrepancy may be due to the differences in the definition of “employer group cancellations” across the two data sets and the

¹⁵ Specifically, we defined employer cancellations as occurring when at least 90% of the group’s members were observed to cancel in a year or if at least 80% of members cancelled with at least one “group cancellation code” recorded in the insurance company’s enrollment files. Representatives of the insurer assisted in determining our rule for identifying group cancellations. We could not rely on the reason for cancellation coded in the insurers’ records because most of these codes were non-informative. We likely failed to identify some group cancellations in cases where a large fraction of a cancelling group’s members took advantage of COBRA to continue their coverage. Thus, our results

potential misreporting of cancellation reasons in the CTS. Some of this difference, however, might also be due to particular pricing policies of our regional insurance company. In a frictional insurance market, if the insurer offered policies with above average premiums, it would also experience higher than average employer group cancellation rates. Columns (3) and (4) demonstrate that group cancellations are especially common among fully insured groups, comprising 59% of all cancellations compared with 38% for self insured groups.

The results reported in Tables 1 through 3 indicate that annual cancellation rates are non-trivial and, consistent with our model of insurance market frictions, a substantial fraction of this turnover is the result of entire employer groups exiting plans. Turnover by entire employer groups is especially pronounced for fully insured groups, consistent with our model if search frictions are more severe in the fully insured market, as one would expect.

In Table 4 we take the analysis a step further, using the data from the regional insurer to compare cancellation rates by employer size and insurance status (FI or SI). Statistics in column 1 of Table 4 demonstrate that annual cancellation rates are highest among smaller employer groups. It is well known that worker turnover rates are higher among small employers (e.g., Brown and Medoff, 1989, and Rebitzer, 1986) but the results in column (2) suggest that this is not the primary cause of higher cancellation rates in smaller employer groups. Instead, the differences appear mostly due to differences in the cancellation rate of entire employer groups.

Columns (3) through (6) of Table 4 report similar statistics separately for SI and FI employer groups. The general pattern from columns (1) and (2) holds: cancellation rates fall as firm size increases and substantial portions of this turnover are due to employer group exits rather than labor market mobility. We also find that overall cancellation rates, as well as cancellations due to the exit of entire employer groups, are markedly higher among the FI groups

within any given firm size category. Among groups with fewer than 1000 members, the difference in aggregate cancellation rates across SI and FI employer groups is driven primarily by the difference in group cancellation rates.

In Section 4 below we argue that high turnover rates reduce private incentives to invest in future health. Many of those investments, especially those relating to the management of chronic disease, are best made in middle age or later. In Table 5 we therefore present cancellation rates by age. For both the CTS sample and our regional insurer, cancellation rates are highest among younger policyholders, but even in the oldest age category, turnover rates are substantial—approximately 15% per year. For older policyholders, group cancellations account for a particularly large fraction of all cancellations. This is especially true among older members in fully insured groups. For our regional insurer, these policyholders have cancellation rates of almost 25%, two-thirds of which is attributable to employer group cancellations.

In sum, we find that there is substantial health insurance turnover, much of it due to group-level cancellations. Turnover is more than twice as high in fully insured (FI) group plans than in self insuring (SI) group plans. This latter difference is due almost entirely to higher rates of group-level turnover in FI plans. This pattern is what we would expect if the market for fully insured employer groups had significant search frictions while the market for self insured employer groups did not.

3.2. Price Dispersion in the Health Insurance Market

We turn now to evidence on price dispersion drawing on the 1997 Robert Wood Johnson Foundation Employer Health Insurance Survey (EHIS). Our purpose in conducting this analysis is to compare the empirical distribution of group insurance premiums to features of the distribution predicted by our search model.

As we have noted, self insured (SI) employers hire insurance companies to administer their health plans while fully insured (FI) employers purchase both administrative services *and* insurance. If the fully insured health insurance market is more subject to search frictions than the self insured market – as suggested by the higher cancellation rates observed for FI plans – then we would expect to see a larger amount of unexplained premium variation in FI plans than in SI plans. We would also expect that the “excess price dispersion” in FI plans is right-skewed.

Our analysis focuses on 5,261 establishments that offered a non-HMO plan as their dominant plan option when surveyed.¹⁶ Table 6 provides a breakdown of these establishments by insurance type and FI/SI status. Within this sample, the strongest predictor of SI status is firm size (see Table 7). Among firms with 35 or fewer workers, only 2.5% of establishments offered SI plans, while SI plans dominate establishments within larger firms. Our variable of interest is the “single monthly premium” recorded for the dominant plan at the surveyed establishment. For both FI and SI employers, the premium includes the contributions of employers and employees. For SI insurers, the premium figure is best understood as approximating the expected no-load cost of insurance.

In Table 8 we report the distribution of raw premiums within SI and FI group plans in our sample. Mean premiums are nearly the same across SI and FI group plans, but the distribution of FI group premiums shows substantially higher variance and a more pronounced right skew.¹⁷

¹⁶ See the Data Appendix for detail on data exclusions.

¹⁷ We also find that mean premiums across SI and FI plans are similar after we control for plan/group characteristics under a variety of specifications. *Ceteris paribus*, our model leads us to expect higher premiums in FI plans, but in comparing FI with SI plans all else is probably *not* equal. Large employers, who tend to self insure, offer higher wages than smaller employers (Brown and Medoff, 1989). We would therefore expect SI plans to offer richer and more expensive insurance because health insurance is a normal good and because the tax breaks for health insurance are most valuable for high-income employees.

The greater premium variance observed in FI group plans is plausibly the result of search frictions, but could also result from greater heterogeneity in the expected costs associated with FI plans. We therefore focus our attention on “residual premiums,” i.e., on the premium that is left unexplained by a premium regression estimated using a large number of control variables. The premium prediction models were estimated via GLM using the log “link” function and gamma distributional family.¹⁸ Separate regressions were run for FI and SI plans and both regressions included identical covariates measuring plan and establishment characteristics such as plan type (PPO/POS), deductible level, co-payment for typical office visit, the inclusion of prescription drug coverage; and establishment characteristics such as firm and establishment size, percent of workers who are full-time, percent female, age distribution of workers and mean payroll. Details on these premium regressions are presented in the data appendix.

Table 9 and Figure 1 present the distribution of residual premiums derived from premium prediction models estimated separately for FI and SI group plans. The patterns in the data are what we would expect if there are search frictions in the market for FI group plans. Even after conditioning on group and plan characteristics, the residual premium variance is much higher for FI plans than SI plans. The included covariates explain a much smaller fraction of the original variance in premiums in FI group plans (about 20%) than for SI group plans (about 54%). The distribution of residuals for FI group plans also has a pronounced right skew not evident among SI group plans, as our model would predict. Table 10 gives calculations of the mean premium residual in different quintiles of the residual distribution. Here again the results suggest that variation in premium residuals is larger for FI plans.

¹⁸ Specification of the premium prediction model followed the advice presented in Manning and Mullahy (2001) for the modeling of skewed health care cost distributions. The link and distributional family assumptions were supported by the Box-Cox test and modified Part test. See the Data Appendix for

The sample of FI firms contains more small employers than does the sample of SI firms. Small firms are of particular interest to our analysis because they are likely to face especially high per-employee costs of search. It is nevertheless useful to see if our patterns persist for firms in size categories that are common to both the SI and FI samples. In Table 11 we present residual variation comparisons by firm size and confirm our central result. Residual variation is higher for FI than SI plans even among the medium-sized firms common to both the FI and SI samples.

3.3. Estimating The Magnitude of Market Frictions

In this section we fit the theoretical distribution of insurance premiums to the actual distribution of premiums in order to recover an estimate of the magnitude of market frictions. Equation (6) in Section 2 expresses the distribution of premiums in terms of three parameters: the cost of providing insurance, c ; the market friction parameter, γ ; and the reservation premium, p^R . In this section we derive an empirical estimate of p^R and use this to estimate values of c and γ that “best fit” the empirical distribution of premiums.

We know of no direct estimates of the reservation price for health insurance, p^R , but search models suggest that one can infer p^R from the empirical distribution of premiums. As we discussed earlier, in the Burdett-Mortensen model, the reservation premium is the highest premium found in the empirical distribution of premiums. To estimate p^R we calculate the average residual in the top 5 percent of the residual distribution. For FI plans this is \$204 per member per month, which would imply a reservation premium of \$380 per member per month for the “average” FI plan. This estimate likely overstates the true value of p^R because it ignores the contribution of unobservable plan and employer characteristics make to the unexplained

additional details and estimate results.

variation in FI premiums. We address this problem by allowing the residual distribution in SI plans to serve as a benchmark for the residual distribution we would expect in FI plans in the absence of search frictions. For instance, premiums are \$94 higher in the upper 5% tail of the residual distribution for SI plans, but are \$205 higher in the upper 5% tail of the residual distribution for FI plans. Therefore, we estimate the reservation premium for the average FI plan as equal to the $\$176 + \$204 - \$94$ or $\$286$ per member per month. We take this as our estimate of p^R .

In a similar fashion, we construct an empirical distribution of adjusted premiums by adding the mean FI premium to the difference in average residuals observed at different quintiles of the residual distributions (from Table 10). The resulting adjusted premiums for each quintile are presented in column 1 of Table 12.

Applying our estimates of p^R and the adjusted premiums in each quintile to equation (6), we then used Stata's non-linear least squares procedure to obtain values of c and γ that minimize the sum of squared errors across the quintiles of the distribution. The results of this exercise are presented in column (2) of Table 12. The predicted distribution of adjusted insurance premiums matches the empirical distribution remarkably well. At each quintile, the difference never exceeds \$2.50 per month and the R^2 of the "fit" is 0.999. Our estimates of c and γ are \$139.3 and 0.35 respectively. These results are not appreciatively changed if we use deciles rather than quintiles to describe the distribution of premiums.¹⁹

As a check on the plausibility of these results, we compare our estimate of average costs of insurance against estimates derived from other data sources. In 1997, total private insurer

¹⁹ The standard errors in Table 12 are calculated using bootstrap methods to allow for the fact that the values of p^R and the adjusted premiums (by quintile) are estimated values.

spending on personal health care was \$320b, and 188 million persons were covered by private insurance at some point during the year (National Center for Health Statistics, 2002). These numbers imply that insurers spent about \$142 per member per month in 1997. This is very closely to the \$139.3 estimate that emerges from our structural analysis.²⁰

We can also gauge the plausibility of our estimate of the market friction parameter by examining turnover data from our regional insurer. Recall from section two that the endogenous group cancellation rate due to search is $\lambda F(p)$ where $F(p)$ is the rank of a firm's premium in the distribution of premiums. The exogenous cancellation rate is represented by parameter δ , so the fraction of group turnover due to endogenous separations is $\frac{\lambda F(p)}{\lambda F(p) + \delta} = \frac{F(p)}{F(p) + \gamma}$. Given our estimate that the market friction parameter is 0.35, it follows that search frictions account for about 60 percent of group turnover for the median insurer. If we attribute all of the employer group turnover to endogenous search, then the result in Table 3 that 58.8% of turnover is due to group exits suggests that our regional insurer has premiums near the median for its market.²¹

Our estimates of p^R , c and γ imply a substantial aggregate transfer from policy-holders to insurers as a result of frictions in the fully-insured market segment. The monthly consumer

²⁰ This estimate suggests that premiums exceed costs in FI plans by 23%. This seems reasonable. In 1997 total premium payments (\$359 billion) exceeded the total payouts of private insurers on enrollees' health care (\$320 billion) by about 12%, but this is aggregated over FI and SI plans (as well as non-group plans). Taking into consideration that approximately 60% of enrollees in group plans are in SI plans, and assuming minimal excess overhead for these plans, we would expect the excess overhead aggregated over all plans to be roughly half as large as the overhead for FI plans exclusively. These estimates are also not out of line with studies of other imperfectly competitive health-related insurance markets. Brown and Finkelstein (2007), for example, estimate that in the market for long-term care insurance; policy holders receive \$0.82 in benefits for every premium dollar spent. Their result implies that the ratio of the discounted present value of premiums to the discounted present value of expenditures by insurers is 1.22.

²¹ Alternatively one can use the cancellation rate for self insured groups (0.054) as a rough benchmark for the exogenous group turnover rate. Subtracting this exogenous group turnover rate from 0.588 does not appreciably alter our conclusion that the regional insurer is likely close to the median insurer.

surplus created by a health insurance policy is $p^R - c = \$143$. Over the course of 12 months this amounts to \$1,716 per member. From equation (7) we know that for the average firm, the fraction of the surplus accruing to insurers in the form of higher prices is: $\gamma/(\gamma+1) = 0.26$ or \$445 over the course of a year. Calculated over the 73.1 million policy holders in the FI group health insurance market in 1997, the total rent transfer due to market frictions amounts to 32.5 billion dollars.²²

4. Implications for Investments in Future Health

Our empirical investigation indicates that there is a substantial turnover in the market for fully-insured health insurance and considerable dispersion of prices for observationally similar policies and employer groups. Rough estimates suggest that in equilibrium these market frictions result in a significant transfer of surplus from consumers to insurers (in comparison to a competitive benchmark). These results have important implications for the quality of care delivered by the health care system.

Inadequate preventive care, especially for those with chronic disease, is one of the most important quality failures in the U.S. health care system (Institute Of Medicine Committee On Quality Of Health Care In America, 2001). McGlynn *et al.* (2003) estimate that only 55% of adults receive recommended levels of preventive care, while adults with such chronic illnesses as diabetes, asthma, coronary artery disease, chronic obstructed pulmonary disorders, and hypertension receive only 56% of the chronic care recommended by clinical guidelines. The care of patients with chronic diseases accounts for 75% of annual health care expenditures

²² From Health, United States, 2002, we know the number of persons less than 65 who obtained health insurance through their workplace in 1997 was 155.6m (National Center for Health Statistics, 2002). We estimate that roughly 47% of covered workers were in fully insured plans in 1997 by averaging figures for 1996 and 1998 from The 1999 Annual Employer Health Benefits Survey (The Kaiser Family Foundation and Health Research Educational Trust, 1999). This implies approximately 73.1m persons were in fully insured plans in 1997.

(National Center for Chronic Disease Prevention and Health Promotion 2005). The complications associated with these conditions accumulate over time, so early interventions can improve patient care and reduce medical costs. Excess turnover induced by search frictions shortens the expected duration of insurance relationships and therefore undermines insurers' incentives to invest in preventive care and disease management.

To see the theoretical issue at hand, we return to the model outlined in Section 2. Now, however, suppose that at the time a client enrolls, an insurance company makes an investment I that reduces future health care costs. Such investments might include any number of preventive measures.²³ We let cost now be $c(I)$, with $c(0) = c$, $c'(I) < 0$ and $c''(I) > 0$.

Ignoring for the moment the potential improvements in patient health and welfare, we focus attention on cost savings. The efficient level of investment will be I^e such that $-c'(I^e) = r$; the level of investment is selected at which the marginal return equals the interest rate. Consider, though, a firm operating in the search environment discussed in Section 2. Now the profit equation (3) depends on I as follows:

$$(8) \quad \pi(I, p) = \left(\frac{\delta}{\delta + \lambda[F(p)]} \right) \left(\frac{p - c(I)}{r + \delta + \lambda[F(p)]} - I \right).$$

Optimizing over I we find that the firm will choose I^* such that

$$(9) \quad -c'(I^*) = r + \delta + \lambda F(p).$$

The right-hand side of this latter expression clearly exceeds r , so the firm chooses $I^* < I^e$. For example, consider an investment such that $r < -c'(0) < r + \delta + \lambda F(p)$. A positive level of investment would be efficient in this case, but no firm will offer such an investment. If the

²³ In the case of diabetes, for instance, it might represent resources spent aiding patients to control hemoglobin A1c (HbA1c) and blood lipids. See Beulieu, *et al.* (2007) for a discussion and reference

return to the investment is high enough, i.e., if $-c'(0)$ is large enough, some investment will occur. Suppose this is the case. Then in the resulting equilibrium, all firms will choose the pair, $(p, I(p))$, with profit given as depicted in (8), though with a potentially different equilibrium price distribution, say $H(p)$, replacing $F(p)$. It is easy to see that the equilibrium level of health care investment chosen will be negatively correlated with the price of policies the firms offer.

Differentiating (9), but using the c.d.f. $H(p)$ instead of $F(p)$, we have

$$(10) \quad \frac{dI^*(p)}{dp} = \frac{-\lambda H'(p)}{c''^*(p)} < 0.$$

This makes sense. An insurance company that is near the low end of the price distribution will typically have clients whom they serve for a relatively long time, as the insurance company is less likely to be under-bid by a rival firm. This increases the expected payoff to an investment in future good health of the client.²⁴ In the absence of long-term contracts, however, every insurer will finance a level of investment below the efficient benchmark.²⁵

to further literature.

²⁴ Our observation that equilibrium price dispersion can generate variation along non-price dimensions has been discussed in the literature on labor market search (e.g., Acemoglu and Shimer, 2000, and Lang and Majumdar, 2004). Two studies have used labor market turnover to estimate the effect of short term insurance relationships on future health outcomes. Herring (2006) offers some evidence from the CTS that markets with higher rates of average turnover among insurers are less likely to offer the following preventative services: office-based preventive care visits, flu shots, and mammograms. Fang and Gavazza (2007) find that industries with low turnover (due to higher investments in firm-specific human capital) also have larger investments in health insurance, and their employees may have better long-term health outcomes.

²⁵ If turnover resulting from market frictions leads to sub-optimal investments, can we expect long-term contracts to emerge to mitigate this problem? As an empirical matter, long term health insurance contracts are very rare in the fully-insured commercial health insurance market. The absence of long-term health insurance contracts likely reflects an important market failure because short-term contracts do not allow individuals to insure against reclassification risk, i.e., the risk that in the process of aging an individual might come to learn that they are high-cost type of patient who is more costly to insure (Diamond, 1992, Hendel and Lizzeri, 2003, and Finkelstein, McGarry, and Sufi, 2005). The feasibility of long-term health insurance contracts are also complicated by the rapid rate of technical change in health care. How can insurers price an insurance contract in year t if they do not know

We have so far treated investments in future health as a relationship-specific investment, but many of the most important investments are fully general in the sense that they reduce costs with the current insurer and all subsequent insurers. Even with fully general investments, however, search frictions will lead to less than optimal spending on future health. To see this, consider the following case. Suppose that when a client first enters the insurance market she can make an investment in future health with life-long effects.²⁶ All clients are identical in this market and so adopt the same level of investment. Suppose that investment reduces the cost that future insurers incur from c to $c_0 < c$. Because of the cost-reducing impact of clients' health investments, the equilibrium distribution of policy price shifts leftward. Importantly, the average price declines from

$$(11) \quad \bar{p} = \left(\frac{1}{1+\gamma} \right) c + \left(\frac{\gamma}{1+\gamma} \right) p^R$$

to

$$(12) \quad \bar{p}_0 = \left(\frac{1}{1+\gamma} \right) c_0 + \left(\frac{\gamma}{1+\gamma} \right) p^R.$$

Notice, though, that the change in the average price must be *smaller* in absolute value than the change in cost itself.²⁷ This reasoning establishes a general point. In a market with frictions, insurers have some market power. As a result, the benefits of health investments undertaken by

which expensive and efficacious new treatments might appear between year t and $t+10$?

²⁶ In our exposition so far, we have treated the client as the firm who purchases insurance on behalf of employees. To make our point in this example, however, we alter this usage. We imagine that each employee purchases his/her own insurance so that δ should be interpreted as the instantaneous rate of permanent exit. In a steady state, for each permanent exit a new client enters the market—a client who would then want to make an appropriate health investment.

²⁷ This is obvious, since the average price is a weighted sum of c and p^R , with weights that are between 0 and 1. Notice that if the market friction parameter, γ , is high, the price distribution does not change much at all when c declines.

a client cannot be fully realized by that client and frictions will lead to sub-optimal investments.²⁸ Given our estimated market friction parameter, 0.35, we have $1/(1+\gamma) = 0.74$, i.e., an investment that reduces c by 1 dollar results in an average price reduction of only 0.74 dollars. Clients in frictional insurance markets can never capture the full expected return to an investment that reduces future health costs. The conclusion that frictions prevent clients from capturing the full return from health investments applies with equal force to general investments that improve future health outcomes without reducing costs.²⁹

5. Conclusion

We have argued that search frictions distort commercial health insurance markets in ways that increase the cost of health care to consumers and reduce care quality along important dimensions. Evidence on insurance turnover rates and premiums suggest that the problem is concentrated in the fully insured part of the health insurance market. Our estimates indicate that the magnitudes of these search frictions are sufficient to transfer roughly a quarter of the consumer surplus from policy-holders to insurers (a transfer of roughly \$29.8 billion dollars in 1997). Frictions also substantially increase the rate of turnover within insurers. Both the capture

²⁸ Our argument parallels Acemoglu's (1997) reasoning about investments in human capital in a frictional labor market. He provides a careful proof of the proposition that labor market frictions lead to equilibrium underinvestment in human capital even if that human capital is fully general.

²⁹ Beaulieu *et al.* (2007) find that most of the social value of diabetes disease management programs accrues to individuals in the form of better health outcomes rather than reduced costs. To understand how frictions can distort returns to investments that promote better health outcomes, consider a health investment whose only effect is that it reduces the hazard rate of dying in each period. Because an individual who undertakes this investment is less likely to die, she derives more value from medical services (Murphy and Topel, 2006). This naturally increases the willingness to pay for the insurance that finances these services, expressed as parameter p^R in our model. In a competitive market, an increase in p^R accrues entirely to the individual who undertook the mortality reducing investment. It is clear from equation (11), however, that insurers in a frictional health insurance market capture part of the consumer surplus by increasing premiums.

of consumer surplus and high rates of turnover have the effect of reducing incentives to invest in future health.

Ours is the first paper to estimate the magnitude of search frictions in health insurance markets, and it is clearly important for future work to replicate our findings with premium data and turnover data taken from other sources and other years. There is also considerable variation across states and over time in the rules governing the rate setting practices of health insurers in the small group market. Future work could exploit this variation to better understand the determinants of market frictions (Hall, 2000b). Confidence in our results would also be increased by empirical tests of ancillary predictions of our model. The most important of these predictions is that investments in future health are influenced by the expected tenure of the insurer-policy holder relationship increases.³⁰

Our analysis provides a potentially useful framework in which to evaluate proposals for insurance reform. For example, in a search model, firms that occupy the high-price end of the distribution provide a negative externality on the marketplace, as employers expend resources fielding offers that they are unlikely to accept. Policy makers might be able to shorten the right tail of the distribution of insurance premiums—eliminating these inefficiency-inducing offers—by making available a simple, moderately priced, and well marketed “backstop” policy that employers can choose if they don’t find something they like better. Even if the cost of providing insurance is higher for the government than the private sector (e.g., if there are unavoidable bureaucratic inefficiencies), such a program can in theory be welfare enhancing.

³⁰ A few studies have found support for this hypothesis (e.g., Herring, 2006, and Fang and Gavazza, 2007), but much remains to be done to firmly establish a causal connection between insurance duration and investments in future health.

More generally, though, assessing the impact of search frictions requires a better understanding of their underlying causes. In our introduction we emphasize the limited ability of small and medium-sized employers to compare the price and quality of the bewildering variety of complex health insurance policies. This “information overload” mechanism matches nicely with some of the institutional features of the fully insured health insurance market (a very large number of complex competing insurance products, heavy reliance on brokers, significant marketing costs for insurers, etc.) but it is not the only possible source of frictions consistent with our analysis. Frictions might also result from the various state-level regulations that limit entry into the market and also distort pricing and the provision of product variety in health insurance markets (Hall, 2000b).³¹ Still a third source might be adverse selection that gives an employer group’s incumbent insurers an advantage over outside rivals. Each of these possible causes of frictions has distinct implications for improving the functioning of health insurance markets.

If the primary cause of frictions lies with the cognitive limitations of purchasers, outcomes might be improved simply by the adoption of more effective ways to disseminate information about the true price and quality of health insurance.³² As for the “backstop” policy mentioned above, this might prove to be an especially effective policy if the issue is the scarce “mental shelf-space” of purchasers (as this space would then not be wasted considering inferior offers).

³¹ For example, laws assuring guaranteed renewability of insurance can lead to excess product variety (and associated search frictions) because insurers are not permitted to close out an old product unless it is willing to transfer the existing subscribers into a new and similar product. Under these circumstances, insurers keep old products on the books even if they cover a small number of persons (Mark Hall, personal communication).

³² Thaler and Sunstein (2008) describe a number of possible methods to reduce the information burden of searching for health insurance. Their discussion is in the context of Medicare Part D, but is applicable to many other health insurance settings.

If state regulations are an important source of frictions, improvements might be best achieved by thoughtful pruning of the thicket of state and Federal rules governing insurance markets—especially for small and medium-sized employers. Finally, if the ultimate source of frictions is adverse selection, attention must be devoted to new ways of creating risk pools so as to mitigate this problem. Specifically individuals might be placed into large pools in ways that are unrelated to health risk (Hall, 2008).³³

Understanding the relative contribution made by the various sources of frictions is also important because policies best suited to one type of friction might worsen other types. Consider, for example, a policy to “open up” state insurance markets to nationwide competition. In principal this could increase the flow of offers to employers, thereby reducing the price of insurance. But in a search model, an increase in the number of insurers need *not* lead to lower prices if it does not reduce the cost to insurers of marketing and medical underwriting or reduce the cost to employer groups of evaluating offers.³⁴ Indeed, this sort of proposal might exacerbate frictions resulting from information overload.

Health insurance reform is among the most pressing policy issues in the United States today. A better understanding of the causes and consequences of search frictions will be important for formulating better policy and improving the efficiency of insurance markets.

³³ Diamond (1992) and Emanuel and Fuchs (2005) sketch ambitious and far-reaching reform proposals along these lines.

³⁴ Lang and Rosenthal (1991) provide a nice example that illustrates this point. In their model, contractors bid on a project (in much the same way insurers might bid to be the policy provider for an employer group). The winning bid in their zero-expected-profit equilibrium is *rising* in the number of bidders.

Table 1. Annual Cancellation Rates for Privately Insured Individuals

	Community Tracking Study All waves (1996-2003)			Regional Private Insurer Enrollment Data 2001-2005		
	Cancellation Rate	Persistence Rate	Persistence Rate	Cancellation Rates		
	(1) All Privately Insured	(2) All Privately Insured	(3) All Group Insured	(4) All Group Insured	(5) Self Insured Groups	(6) Fully Insured Groups
Rate	.209 (.002)	.778 (.003)	.780 (.003)	.208 (.0003)	.139 (.0004)	.306 (.0006)
Employer Group Plans Only	NO	NO	YES	YES	YES	YES
N	60,316	60,770	56,170	1,601,199	936,532	664,667

Note: Author calculations from the CTS and enrollment records of a private insurer.

The CTS sample includes household heads aged 23-65 at interview. *Cancellation Rate* is defined as the fraction of persons with private insurance 12 months prior to interview who cancelled that policy by the time of the interview. *Persistence Rate* is defined as the fraction of persons with a currently active private policy (at interview) with no reported change in insurance within the last 12 months. Column (3) restricts the sample to private policyholders (at interview) with insurance through their employer. Results are weighted to be nationally representative.

The sample for the regional private insurer is primary policyholders aged 22-64 with an active policy at July 1st of a given year (2001-2004). The sample is limited to members of employer groups having at least 10 members. *Cancellation Rate* is defined as the fraction who cancelled their policy by July 1st of the subsequent year. Individual members are potentially represented up to four times.

Standard errors are in parentheses.

Table 2. Annual Cancellation Rates over Time

Community Tracking Study		Regional Private Insurer			
	(1) Cancellation Rate		(2) Cancellation Rate	(3) Cancellation Rate	(4) Cancellation Rate
Period	All Privately Insured	Period	All Group Insured	Self-Insured Groups	Fully Insured Groups
2003 (wave 4)	.206 (.007)	2004-05	.189 (.0006)	.114 (.0006)	.302 (.0011)
2000-01 (wave 3)	.210 (.004)	2003-04	.194 (.0006)	.124 (.0007)	.303 (.0012)
1998-99 (wave 2)	.218 (.004)	2002-03	.240 (.0007)	.185 (.0008)	.320 (.0011)
1996-97 (wave 1)	.204 (.004)	2001-02	.210 (.0007)	.135 (.0007)	.298 (.0011)

Note: Author calculations from CTS data and enrollment records of a private insurer. Samples are as defined as in Table 1. Standard errors are in parentheses.

Table 3. Fraction of Annual Cancellation Rate Attributable to Employer Group Cancellations

	Community Tracking Study All waves	Regional Private Insurer 2001-2005		
	(1) All Privately Insured	(2) All Group Insured	(3) Self Insured Groups	(4) Fully Insured Groups
Fraction of <i>Cancellation Rate</i> due to employer group cancellations	.351 (.006)	.508 (.0009)	.383 (.0013)	.588 (.0011)
Adjusted Fraction	.381	n/a	n/a	n/a
Fraction of <i>Cancellation Rate</i> due to job loss/change	.401 (.007)	n/a	n/a	n/a
Adjusted Fraction	.434	n/a	n/a	n/a

Note: Author calculations from CTS data and enrollment records of a private insurer. See Table 1 for samples. Standard errors are presented in parentheses.

In the CTS results, we attribute cancellations to employer group if the respondent indicated that the reason for the cancellation was “employer group changed offerings” (for those insured at interview) or “employer stopped offering coverage” (for those uninsured at interview). We attribute cancellations to job loss/change if the respondent indicated that the reason for the cancellation was “own/spouse job change” (for those insured at interview) or “lost job/change employers,” “spouse/parent lost/changed job,” or “became part time/temporary” (for those uninsured at interview). In each case, the adjusted fraction provides an estimate of the fraction of cancellations attributed to each cause if the sample were restricted to those with employer group coverage, by dividing the unadjusted fraction by the (weighted) fraction of currently private-insured persons who receive insurance through their employer (.920).

For regional insurer results, we attribute cancellations to employer group if either (i) $\geq 90\%$ of group members exited plan in year, or (ii) $\geq 80\%$ of group members exited plan in year with at least one member having an assigned cancel code indicative of group cancellation. (Strict reliance on the assigned cancellation codes was not feasible since most were system-generated and non-informative.) The fraction of cancellations attributed to employer group cancellation is not strictly comparable across samples because group cancellations resulting from an employer going out of business are attributed to job loss/change in the CTS results, but attributed to employer group cancellation in the regional insurer results.

Table 4. Annual Cancellation Rates by Employer Group Size for the Regional Private Insurer

Group Size (# members)	All Groups			Self Insured (SI) Groups			Fully Insured (FI) Groups		
	(1) Cancellation Rate	(2) Emp Group Cancellation Rate	N	(3) Cancellation Rate	(4) Emp. Group Cancellation Rate	N	(5) Cancellation Rate	(6) Emp. Group Cancellation Rate	N
10-50	.294 (.0007)	.157 (.0006)	403,218	.204 (.0013)	.075 (.0009)	92,110	.321 (.0008)	.182 (.0007)	31,108
50-200	.238 (.0007)	.134 (.0005)	385,897	.157 (.0008)	.062 (.0005)	194,787	.320 (.0011)	.207 (.0009)	191,110
200-1000	.181 (.0006)	.090 (.0004)	403,353	.140 (.0006)	.053 (.0004)	293,367	.291 (.0014)	.187 (.0012)	109,986
>1000	.123 (.0005)	.051 (.0003)	408,731	.113 (.0005)	.046 (.0003)	356,268	.195 (.0017)	.088 (.0012)	52,463
All sizes	.160 (.0003)	.107 (.0002)	1,601,199	.139 (.0004)	.054 (.0002)	936,532	.306 (.0006)	.183 (.0005)	664,667

Note: Author calculations from enrollment records of a private insurer. *Employer Group Cancellation Rate* is defined as fraction of members (as of July 1st in a given year) in groups that cancelled coverage by July 1st of the subsequent year. Group cancellations are identified as in Table 3.

Table 5. Annual Cancellation Rates by Age

	CTS Household Survey All waves			Regional Private Insurer 2001-2005					
	All Privately Insured			All Groups		Self Insured (SI) Groups		Fully Insured (FI) Groups	
Age	(1) Cancellation Rate	(2) Emp Group Cancellation Rate	(3) Job Exit Cancellation Rate	(4) Cancellation Rate	(5) Emp Group Cancellation Rate	(6) Cancellation Rate	(7) Emp Group Cancellation Rate	(8) Cancellation Rate	(9) Emp Group Cancellation Rate
22-34	.285 (.006)	.082 (.003) [.088]	.137 (.004) [.149]	.302 (.0008)	.130 (.0006)	.222 (.0010)	.067 (.0006)	.385 (.0012)	.196 (.0010)
34-44	.212 (.005)	.073 (.003) [.078]	.083 (.003) [.089]	.223 (.0007)	.118 (.0005)	.152 (.0008)	.061 (.0005)	.310 (.0011)	.187 (.0009)
44-54	.180 (.004)	.075 (.003) [.080]	.060 (.003) [0.65]	.177 (.0005)	.103 (.0004)	.116 (.0006)	.053 (.0004)	.267 (.0010)	.177 (.0009)
54-64	.149 (.005)	.064 (.003) [.072]	.042 (.003) [.047]	.145 (.0006)	.080 (.0005)	.096 (.0006)	.040 (.0004)	.248 (.0013)	.165 (.0011)

Note: Author calculations from CTS and private regional insurer. For the CTS, age reflects the person's age one year prior to interview (i.e., age at "baseline" from which cancellation rates are measured). In columns 2 and 3, bracketed term represents an adjusted estimate of cause-specific cancellation rates under hypothetical restriction to persons with employer group coverage (see Table 3). Group cancellations are identified as described in Table 3. Standard errors are in parentheses.

Table 6. Fully Insured (FI) and Self Insured (SI) Status by Plan Type

Plan Type	Establishment Counts	
	FI Plans	SI Plans
Indemnity	841	284
PPO/POS	3446	690

Note: Author calculations from EHIS data. See Data Appendix for details.

Table 7. Fully Insured (FI) and Self Insured (SI) Status by Firm Size

Firm Size	Establishment Counts	
	FI Plans	SI Plans
<10	1128	25
10-35	1429	40
35-250	1268	201
250-5000	374	453
≥5000	88	255

Note: Author calculations from EHIS data.

Table 8. Raw Distribution of Single Monthly Premiums

Percentile	FI Group Plans	SI Group Plans
1%	\$55.70	\$60.00
5%	85.00	97.00
10%	100.00	107.80
25%	122.50	138.20
50%	158.00	163.00
75%	201.00	207.00
90%	275.00	250.00
95%	333.30	278.00
99%	452.00	350.00
<i>Mean</i>	176.2	177.7
<i>Variance</i>	6418.2	3741.4
<i>Skewness</i>	1.67	0.87
<i>N (count)</i>	4287	974

Note: Author calculations from EHIS data.

Table 9: Distribution of Premium Residuals

Percentile	FI Group Plans	SI Group Plans
1%	-134	-113
5%	-94	-72
10%	-72	-45
25%	-44	-18
50%	-11	-1
75%	28	18
90%	84	47
95%	138	59
99%	239	136
<i>Mean</i>	-0.06	0.11
<i>Variance</i>	5156.1	1736.0
<i>Skewness</i>	1.48	0.32
<i>N (count)</i>	4287	974

Note: Author calculations from EHIS data.

Table 10. Mean Premium Residuals across the Residual Distribution, FI and SI Plans

	(1)	(2)
	Mean Residual	
Quintile Range	FI Group Plans	SI Group Plans
0-20%	-80.5 (3.0)	-54.4 (3.9)
20-40%	-36.5 (1.5)	-14.7 (2.1)
40-60%	-10.1 (1.2)	-1.8 (1.2)
60-80%	18.9 (1.3)	14.7 (2.6)
80-100%	107.6 (4.3)	55.6 (4.1)
95-100%	204.1 (10.6)	94.0 (6.8)

Note: Author calculations from EHIS data. These are the mean premium residuals over different ranges of the residual distribution, with premium residuals estimated from the GLM premium prediction models (estimated separately for FI and SI plans). Bootstrap standard errors, with 300 replications, are presented in parentheses.

Table 11. Mean Premium Residuals across the Residual Distribution, by Firm Size

	Mean Residual							
<i>Firm size</i>	<i>0-35</i>		<i>35-250</i>		<i>250-5000</i>		<i>5000+</i>	
<i>Plan type</i>	<i>FI Groups</i>	<i>SI Groups</i>	<i>FI Groups</i>	<i>SI Groups</i>	<i>FI Groups</i>	<i>SI Groups</i>	<i>FI Groups</i>	<i>SI Groups</i>
Quintile Range								
0-20%	-83.2 (3.7)	--	-65.2 (4.2)	-33.6 (4.1)	-51.8 (4.9)	-34.1 (3.9)	--	-31.8 (4.1)
20-40%	-39.2 (1.9)	--	-21.0 (2.5)	-3.3 (0.8)	-12.7 (2.3)	-4.9 (1.4)	--	-3.9 (0.7)
40-60%	-10.1 (1.3)	--	-2.8 (1.2)	-0.7 (0.3)	-1.2 (0.7)	-1.2 (0.5)	--	0.4 (0.4)
60-80%	20.4 (1.6)	--	11.8 (2.0)	1.7 (0.6)	6.1 (2.1)	3.1 (1.3)	--	4.2 (0.8)
80-100%	111.3 (5.5)	--	76.7 (5.6)	27.5 (3.7)	58.2 (5.4)	34.2 (4.0)	--	28.7 (3.5)
95-100%	212.3 (12.8)	--	157.8 (11.5)	74.9 (9.6)	107.8 (9.7)	69.9 (6.8)	--	57.8 (7.8)
N (sample)	2557	65	1268	201	374	453	88	255

Note: Author calculations from EHIS data. Details are as in Table 10, but models were estimated (and mean residuals calculated) by firm size categories. Results omitted for categories with small sample sizes (N<100). Bootstrap standard errors, with 300 replications, are presented in parentheses.

Table 12. Estimates of Market Frictions and Insurance Cost for Fully Insured Employers

	(1)	(2)
Quintile	Adjusted Monthly Premiums by Quintile	Fitted Monthly Premiums by Quintile
0-20%	150.1	150.8
20-40%	154.4	155.7
40-60%	167.9	164.3
60-80%	180.4	182
80-100%	228.3	228.2
	<i>Fitted Model:</i>	$R^2 = .9999$
	<i>Estimate of Cost Parameter, c.</i>	139.3 (8.8)
	<i>Estimate of Market Friction Parameter, γ.</i>	0.35 (0.09)

Note: Author calculations from EHS data. Column 1 presents mean adjusted premiums by quintile. This is calculated by adding the average residual for fully insured employers in the quintile (from Table 10, column 1) to the overall mean (\$176.2) and then subtracting the mean residual by quintile for self-insured plans (Table 10, column 2). Column 2 presents the fitted mean adjusted premium for each quintile predicted by equation (6) using our estimate of p^R , and values for parameters c and γ that minimize the sum of squared residuals across quintiles (see text for details).

The estimated values of c and γ are provided under column 2. Bootstrap standard errors based on 300 replications are presented in parentheses.

Data Appendix

1. Data Selection Criteria

The premium data are obtained from the 1997 Robert Wood Johnson Foundation Employer Health Insurance Survey (EHIS). The dataset consists of a stratified sample of establishments. Throughout our analysis, the “establishment” is treated as the unit of analysis. Sampling “establishment weights” provided in the EHIS dataset are used throughout the analysis to provide nationally representative estimates.

The following describes the selection criteria applied to construct the analytic sample:

- Private establishments offering at least one general medical plan (N=13,716).
- Restricted to establishments with at least 3 permanent employees (N=12,840). This was done because the characteristics of workers in the establishment were constructed over permanent employees only, and the characteristics of permanent employees were found to be strongly predictive premiums.
- Restricted to establishments with a single “dominant” health plan, that covered both inpatient and outpatient services (N=10,391). We defined a health plan as dominant when at least 90% of health plan enrollees from an establishment were enrolled in the same general medical plan. In the premium prediction models, the plan characteristics used as covariates were those associated with the dominant plan for that establishment.
- Restricted to establishments where funding of the dominant plan was recorded as either “fully insured” or “self insured” (N=10,329).
- Restricted to establishments where the single monthly premium recorded for the dominant plan was *not* imputed (N=7,578).
- Excluded establishments if the dominant plan was an HMO plan (N=5,261). HMO plans were excluded for two reasons. First, fewer than 5% of all HMO plans were self insured, compared with 17% of PPO/POS plans and 25% of indemnity plans. Second, premiums for HMO plans are expected to vary for reasons not well-captured by the recorded plan characteristics.

The application of these selection criteria yielded a sample of 5261 establishments offering a non-HMO plan as their dominant plan option. The variable of interest in the subsequent analysis was the single monthly premium recorded for the establishment’s dominant plan. An alternative premium measure – the family monthly premium – was

not recorded as frequently, specifically not in cases where a family plan was not offered by the employer.

2. Covariates Used in the Premium Prediction Models

The same covariates were included in the two premium prediction models, with the exception of three covariates that were not applicable to self insured establishments.

- Plan characteristics:
 - plan type is PPO/POS (indicator)
 - must enroll with gatekeeper (indicator, applies to PPO/POS plans only)
 - deductible level (quadratic)
 - copayment for typical office visit (quadratic, in some cases inferred by EHIS on basis of reported coinsurance level)
 - any catastrophic cap (indicator)
 - catastrophic cap level
 - includes prescription drug coverage (indicator)
 - includes mental health coverage (indicator)
 - includes vision care coverage (indicator)
 - includes dental coverage (indicator)
 - includes coverage for preventive dental care and orthodontics (indicator)
 - family coverage option available (indicator)
 - no exclusions for health reasons (indicator)
 - enrollees must report medical history (indicator)
 - no waiting period for enrollment (indicator)
 - contract includes guaranteed renewal (indicator)
 - contract include minimum participation requirement (indicator)

- Establishment characteristics:
 - establishment size (5 categories)
 - percent workers, permanent
 - percent workers, full-time
 - percent workers, female
 - percent workers, age 30-39
 - percent workers, age 40-49
 - percent workers, age 50+
 - mean payroll per worker (quadratic)
 - any union workers (indicator)
 - firm size (5 categories)
 - firm industry (7 categories, agriculture collapsed with construction due to small sample size)
 - firm years in business (4 categories)
 - establishment part of insurance purchasing coalition

- premium source (4 categories)³⁵
- state dummies

³⁵ The source for the single monthly premium was identified as one of the following: (a) reported premium, (b) COBRA, (c) reported same premium for single and family premium, or (d) derived from aggregate paid premiums.

Appendix Table A1: Premium Prediction Models

	GLM		OLS	
	FI Plans (1)	SI Plans (2)	FI Plans (3)	SI Plans (4)
A. Establishment characteristics				
Employee characteristics				
fraction permanent	0.11 (0.08)	0.01 (0.14)	18.93 (14.70)	25.10 (22.81)
fraction full-time	0.05 (0.04)	-0.02 (0.07)	4.08 (7.76)	0.47 (12.70)
fraction female	0.07 (0.04)	0.03 (0.08)	10.35 (7.70)	0.18 (13.71)
fraction age 30-39	0.04 (0.05)	0.06 (0.07)	5.52 (9.84)	4.10 (12.10)
fraction age 40-49	0.25 (0.07)**	0.15 (0.06)*	45.27 (12.96)**	23.13 (11.96)+
fraction age 50+	0.36 (0.07)**	0.06 (0.09)	61.43 (12.56)**	7.56 (16.85)
mean annual pay (/10 ⁵)	0.24 (0.09)*	-0.17 (0.10)+	39.53 (19.90)+	-26.18 (20.31)
mean annual pay sqrd (/10 ¹⁰)	-0.12 (0.05)**	0.05 (0.05)	-19.16 (9.69)+	4.04 (10.42)
any union employees	0.18 (0.04)**	0.05 (0.08)	36.26 (8.11)**	7.82 (14.48)
Establishment size ^a				
8-20	0.00 (0.02)	0.06 (0.04)	-0.25 (3.82)	13.55 (8.24)
20-50	0.01 (0.03)	-0.13 (0.05)*	-0.08 (4.70)	-26.25 (10.92)*
50-300	-0.03 (0.04)	-0.08 (0.07)	-3.55 (8.50)	-12.58 (11.94)
300+	-0.04 (0.05)	0.17 (0.09)+	-8.69 (9.27)	36.01 (20.62)+
Firm size ^b				
10-35	-0.03 (0.03)	0.22 (0.14)	-5.91 (4.94)	31.74 (22.63)
35-250	-0.03 (0.03)	0.15 (0.11)	-6.07 (5.34)	19.18 (20.10)
250-5000	-0.12 (0.04)**	0.23 (0.10)*	-24.10 (7.86)**	35.74 (15.91)*
5000+	-0.03 (0.10)	0.19 (0.11)+	-2.45 (17.13)	28.76 (17.44)
Industry category ^c				
mining and manufacturing	0.00 (0.04)	-0.05 (0.08)	-0.78 (7.16)	-19.88 (16.35)
transportation/communications	-0.01 (0.05)	0.01 (0.08)	-3.77 (8.68)	-5.17 (17.73)
wholesale trade	0.07	-0.15	15.87	-35.15

	(0.07)	(0.09)+	(15.23)	(21.09)+
retail trade	0.02	-0.12	4.46	-26.06
	(0.03)	(0.12)	(6.24)	(22.96)
finance/insurance/real estate	0.02	-0.09	2.56	-24.94
	(0.03)	(0.08)	(4.91)	(15.76)
professional services	0.05	0.01	8.09	-8.65
	(0.04)	(0.11)	(6.09)	(23.15)
other services	-0.02	0.05	-4.65	5.07
	(0.04)	(0.09)	(8.08)	(17.18)
Years in business ^d				
5-10 years	-0.03	-0.04	-4.03	-9.32
	(0.06)	(0.08)	(12.03)	(14.49)
10-20 years	-0.00	0.07	-0.91	8.57
	(0.04)	(0.07)	(6.97)	(12.20)
20-50 years	0.01	0.10	1.22	16.49
	(0.04)	(0.07)	(7.49)	(10.31)
50+ years	0.06	0.07	11.60	7.39
	(0.03)+	(0.08)	(6.89)+	(11.36)
Establishment involved in a purchasing arrangement to buy HI	0.04 (0.02)*	0.08 (0.06)	6.30 (3.37)+	17.70 (12.64)
B. Plan characteristics				
Plan type				
PPO plan	-0.02 (0.03)	0.07 (0.05)	-3.82 (5.37)	13.24 (11.08)
PPO plan w/ gatekeeper	-0.04 (0.02)*	-0.08 (0.07)	-6.70 (3.85)+	-12.66 (12.63)
Plan offers family coverage	0.06 (0.05)	-0.49 (0.11)**	10.00 (9.04)	-121.18 (25.01)**
Cost sharing				
deductible (/10 ²)	0.00 (0.01)	-0.04 (0.03)	1.16 (2.00)	-8.45 (5.01)+
deductible sqrd (/10 ⁴)	-0.00 (0.00)	0.00 (0.00)	-0.10 (0.21)	0.42 (0.39)
copay level (/10)	-0.02 (0.04)	-0.02 (0.07)	-3.43 (7.40)	-4.77 (13.61)
copay level sqrd (/10 ²)	-0.02 (0.01)	-0.00 (0.01)	-3.14 (2.50)	-0.11 (2.74)
plan has catastrophic cap	0.10 (0.03)**	0.14 (0.06)*	17.84 (5.85)**	25.99 (10.88)*
catastrophic cap amount	-0.11 (0.09)	-0.01 (0.22)	-20.04 (18.27)	3.67 (37.81)
Coverage included				
outpatient prescription drugs	0.08 (0.03)*	-0.04 (0.12)	12.87 (6.01)*	-6.81 (20.80)
mental health services	-0.05 (0.07)	-0.18 (0.12)	-11.87 (15.63)	-24.27 (18.77)

vision care	0.00	0.04	1.65	7.12
	(0.03)	(0.05)	(5.09)	(9.08)
any dental	0.05	-0.01	7.04	-0.96
	(0.03)+	(0.04)	(5.14)	(7.80)
premium dental ^c	0.11	0.09	22.39	15.25
	(0.04)**	(0.07)	(7.53)**	(12.75)
Coverage restrictions				
any employees excluded because of health conditions	0.01	0.04	2.59	6.05
	(0.02)	(0.04)	(3.94)	(7.98)
employees required to provide medical history	-0.00	--	-0.43	--
	(0.02)		(5.14)	
no waiting period for coverage	0.01	-0.01	1.86	-2.10
	(0.02)	(0.03)	(4.51)	(6.21)
contract for plan is guaranteed renewal	-0.01	--	-1.12	--
	(0.03)		(5.54)	
contract includes minimum participation requirement	-0.00	--	-1.11	--
	(0.03)		(5.16)	
Basis for reported premium				
COBRA	-0.09	0.03	-15.12	6.37
	(0.07)	(0.03)	(13.88)	(6.59)
reported that single premium did not differ from family premium ^f	0.09	0.16	16.89	27.87
	(0.03)**	(0.23)	(5.67)**	(43.14)
derived from aggregate paid premiums	-0.11	-0.01	-15.97	-10.53
	(0.05)*	(0.12)	(9.75)	(19.62)
State Fixed Effects	YES	YES	YES	YES
<i>Sample size</i>	4287	974	4287	974
<i>Premium mean</i>	176.2	177.7	176.2	177.7
<i>Premium variance</i>	6418.2	3741.4	6418.2	3741.4
<i>Residual premium variance</i>	5156.1	1736.0	5124.8	1757.1

Notes: Data is drawn from the 1997 Robert Wood Johnson Foundation Employer Health Insurance Survey (EHIS). Sample consists of 5261 private establishments meeting the following criteria: at least 3 permanent employees at establishment; firm offers at least one general medical plan to employees at establishment; at least 90 percent of participating employees were enrolled in the same non-HMO plan (the establishment's "dominant" health plan); and single plan premium was not imputed.

Dependent variable is single monthly premium recorded for establishment's dominant plan. Plan characteristics refer to establishment's dominant plan.

Prediction model in columns 1 and 2 are estimated using generalized linear model (GLM) with log link and gamma distributional family. Coefficients are interpreted as changes in the log of predicted premium. The distributional family was determined by way of the modified Park Test.

Prediction model in columns 3 and 4 are estimated using linear OLS.

Establishment-level weights applied to produce nationally representative estimates.

Robust standard errors in parentheses, adjusted for clustering by sampling strata (+ significant at 10%; * significant at 5%; ** significant at 1%).

^a omitted category: <8 employees

^b omitted category: <10 employees

^c omitted category: construction, plus agriculture/fishing/forestry (one establishment)

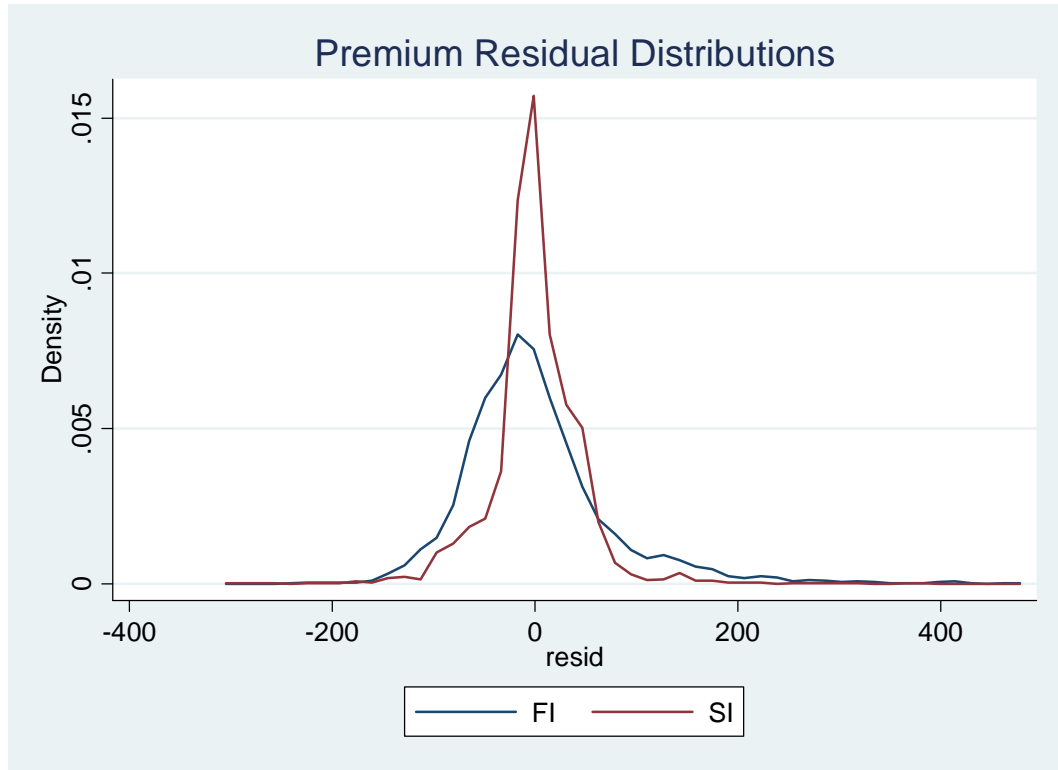
^d omitted category: <5 years

^e dental coverage that includes both preventive and orthodontic services

^f omitted category: reported premium

^g recorded single premium same as reported family premium in these cases

Figure 1.



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