Barriers to Entry of a Vertically Integrated Health Insurer: An Analysis of Welfare and Entry Costs*

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August 7, 2008

Abstract

This paper investigates the welfare effects of market entry by vertically integrated health insurers and the reasons why recent expansion attempts by these insurers have failed. Integrated health plans offer both advantages and disadvantages compared to their competitors. They limit their provider networks significantly but offer high-quality preventive care and broad coverage in exchange for the reduction in consumer choice. I use an econometric model of consumer demand for hospitals and insurers to simulate the welfare effects of entry of an integrated plan into 28 new markets. The analysis takes into account the effect of integration on the number of hospitals and physicians, the technologies available, the quality of preventive care and the premiums charged by all plans in the market. The baseline results, with no entry barriers included, imply that total social surplus would increase by over $34 billion per year if an integrated plan entered each of the 28 markets in the data. I then use the simulation model to investigate the magnitudes of several potential barriers to entry. The results indicate that three issues are particularly important. Integrated plans cannot attract enough enrollees to support their provider networks unless they can significantly exceed their competitors' quality levels and convince consumers of this benefit. Both tasks have become more difficult as competition has increased with the growth of managed care. Regulatory costs caused by Certificate of Need laws, which restrict plans' ability to build new facilities, can also be important.

*I am grateful to David Cutler, Ariel Pakes, Sherry Glied, David Dranove and Martin Gaynor for their advice on this project. All remaining errors are my own.

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1 Introduction

The impact of vertical integration on consumer and producer surplus is subject to debate. There is a diverse theoretical literature on incentives for vertical mergers and their potential effects. Perry (1989) summarizes the theoretical literature. Previous empirical papers such as Chipty (2001) suggest that vertical mergers can lead to efficiency effects which reduce prices and increase both firm profits and consumer welfare; however, Gilbert and Hastings (2005) show that they can also be used as a means to raise competitors' input costs, leading to increased prices and a reduction in consumer surplus. This paper extends the empirical literature by considering the effect of integration between health insurers and providers in the medical care market. The application of this question to medical care is important in its own right. Integrated health insurers were viewed as the most cost-effective and promising option during the development of managed care[1] but their success has been very limited. My analysis considers the reasons for this limited growth.

Unlike other managed care organizations in their markets, integrated health insurers limit their networks of providers significantly, either owning physician groups and hospitals or agreeing on exclusive contracts with both types of providers[2]. The benefits of integration in this context include improved coordination of the care provided by different specialties and a potential for cost reductions. Plans use these two benefits to offset the reduction in consumer choice of hospitals. On average these plans offer higher-quality preventive services (measured, for example, by the rate of screening for cancers and for chronic diseases) and broader coverage than other plans in their markets. They are very successful in the areas where they originated: Kaiser Permanente, the leading example of an integrated plan, has a market share of over 30% of the commercially insured population in several California markets. I investigate the impact of integrated health insurers by using data on 15 markets that contain integrated plans and 28 markets that do not, together with a model of demand and of plan premium-setting, to simulate the effect of entry of an integrated plan into new markets. I find that this market entry is welfare-improving. Median values from the baseline simulation, which does not account for barriers to entry, imply a benefit to consumers of $24.6 billion per year from new plan entry over the 28 markets considered; the total welfare gain is $34.9 billion per year.

However, despite its impressive quality ratings and its popularity in its existing markets, Kaiser has made failed attempts to enter four new markets since 1980 and has been successful in only three.

[1] See, for example, McNeil and Schlenker (1981).

[2] Insurers that contract with, rather than owning, providers are not strictly defined as vertically integrated firms. However, they offer the same benefits and disadvantages to consumers and face similar strategic decisions and so are included in most of my analyses.

Other integrated plans have similarly failed to expand or been forced to exit entirely since the 1990s. If these plans improve consumer welfare, why have their recent expansion attempts not been successful? I use the simulation model to quantify the extent to which several potential barriers to entry are able to explain the data. Estimates from the demand model indicate that integrated plans would have to reduce their premiums by approximately $77 per member per month (a more than 50% price cut), all else equal, to compensate consumers for the restricted choice of hospitals and physicians compared to other plans. They are unlikely to have low enough costs for this strategy to be feasible; they therefore need to offer superior quality on some dimension in order to attract the enrollees they need to support their exclusive provider networks. I demonstrate that high competitor quality of preventive care in particular markets, while of course being beneficial to consumers, makes it difficult for integrated plans to achieve a substantial lead on this dimension and therefore to attract enrollees. In addition, even in markets where competitor quality is low so that integrated plans do offer benefits to consumers, the nature of health plan quality as an experience good introduces an information failure which reduces the speed at which the new integrated plan can build scale. Under reasonable assumptions about the parameters of the model, the simulations show that these two explanations together are enough to explain the variation in the data. The third cost is generated by Certificate of Need laws which require health insurers and providers to obtain state approval before constructing new health care facilities. The analysis indicates that this cost is significant but probably not enough to rationalize the data unless we also include the first two entry barriers. The first two costs are not caused by market failures. Indeed, the first implies that the benefits offered by integrated plans may be quite small, particularly in markets where existing plan quality is low. Only the third explanation, a regulatory cost, could potentially be addressed by public policy.

I consider several other arguments listed in the literature such as the impact of switching costs, problems with adverse selection and the frictions caused by employers who wish to offer a single health plan or who choose not to pass on cost savings to enrollees. I also analyze the possibility that consumers in markets where vertically integrated plans have a long history have different preferences over hospitals and plans from those elsewhere, perhaps because their long experience of limited networks implies that they have no relationships with other providers and therefore no desire for additional choice. None of these arguments is sufficient to explain the data.

The health policy literature contains a number of papers which suggest reasons for the limited success of integrated plans. For example, Gitterman et al (2003) describe the rise and fall of Kaiser Permanente in North Carolina. Enthoven and Tollen (2005) discuss the relative benefits of potential models of health care competition and the reasons for the current fragmented delivery system. Enthoven and Tollen

(2004) put together a collection of essays that explore the potential benefits and costs of multispecialty physician group practice. Robinson (2004, chapter 10) considers the limits of integrated models of care. Burns and Pauly (2002) and Burns et al (2000) provide detailed discussions of the benefits and costs of integration. Gaynor et al (2004) study the effects of physician incentives in an HMO network and find suggestive evidence that financial incentives linked to quality may stimulate an improvement in measured quality; this has implications for integrated plans which typically employ physicians on a salaried basis. Gaynor and Haas-Wilson (1999) summarize recent changes in the horizontal and vertical structure of the medical care market and their implications for competition and efficiency. The January 2006 issue of the Journal of Health Economics contains several papers on vertical integration between hospitals and physicians which consider similar issues to those analyzed here; see Gaynor (2006) for a review. The literature on consumer choice of hospitals is also relevant to this paper. In particular, my demand model is closely related to Town and Vistnes (2001) and especially Capps *et al* (2003). However, previous authors have not used quantitative analyses or simulations to investigate the effect of integrated plans.

The paper continues as follows. Section 2 provides background on integrated health plans and hypotheses to explain the observed patterns of entry. Section 3 presents an overview of the model and describes the data and Section 4 sets out details on the method used to simulate plan entry and discusses the results. Section 5 analyzes the various hypotheses to explain the lack of integrated plan expansion, Section 6 estimates insurer returns to entry, Section 7 contains robustness tests and Section 8 concludes.

2 Background on Integrated Plans

Most health insurers do not own hospitals or physician groups. Insurers usually contract with the majority of providers in the market; their physician and hospital networks overlap significantly with those of their competitors. Prices are negotiated every 1-3 years through pairwise bargaining between the insurer and the provider. This arrangement makes it difficult to provide care that is coordinated or integrated across physicians and specialties. Many managed care plans make little effort to achieve this coordination. However, integrated insurers choose to restrict the providers in their networks significantly. They may merge vertically with a minority of primary and specialty care providers or may agree on exclusive contracts with a small group of independent physicians, reimbursing them with capitation payments (a fixed rate per enrollee per month rather than a fee per service provided). Each of these organizations essentially forms a multispecialty group, coordinated by a health insurer, which brings together the organization, financing, and delivery of health services to a particular population. Each has the goal of providing high quality integrated care at a lower cost than other health insurers can offer.

2.1 Examples and Advantages of Integrated Medical Care

The key example of vertical integration between health plans and providers is Kaiser Permanente. This is a popular HMO in California and elsewhere which has exclusive arrangements with physicians, owns many hospitals and contracts with few outside its own organization. It was opened to the public in 1945. From the beginning the organization owned its hospitals and recruited physicians to operate in a "prepaid group practice". Two other health insurers in my data have pursued similar strategies: Group Health Cooperative of Puget Sound, which is based in Seattle WA, and Scott and White Health Plan of Austin TX. Both plans offer coordinated, consumer-oriented care and broad coverage. Group Health was opened in 1947 and has always owned its own hospitals in the market as well as contracting with a few others to provide specialist services. It has been affiliated with Kaiser Permanente since 1997. Scott and White was set up in 1979 by Scott and White Medical Group, a physician organization which had been in operation since 1891. It owns one hospital and contracts with very few more.

The integrated health plan strategy implies a number of advantages compared to other types of insurance. First, integration increases insurers' ability to control costs. Providers' incentives are aligned with those of the insurer either because they form part of the same organization or because the provider receives capitation payments. The organization is also able to rationalize the provision of specialty services. Rather than contracting with all or most hospitals in the area, the majority of which offer tertiary services, the insurer can operate a small number of units and make a central decision on which services should be provided by each one.

Second, improvements in coordination may lead to quality improvements, particularly with respect to preventive care. A group practice culture in which primary care physicians (PCPs) and specialists work closely together may offer more coordinated care delivery than the usual network options (although this kind of collaboration may also be possible in a hospital where the physicians have exclusive relations without the provider being vertically integrated with the insurer). Physicians are more likely to offer consistent advice to patients if they have exclusive contracts with the insurer and therefore receive consistent ongoing education and training. Previous papers such as Beaulieu et al (2006), Sperl-Hillen et al (2000) and Wagner et al (2001) (all of which consider diabetes) document improved outcomes when physician coordination improves, especially for chronic diseases where patient compliance and selfmonitoring is important. The argument is born out in practice. For example, the US News and World Report's HMO rankings for 2005 listed four Kaiser plans among its top five insurers in the Pacific Region and one Kaiser plan in its top two in the Mountain Region. The website www.consumerreports.org listed three Kaiser plans and one other integrated plan, Group Health Cooperative of Puget Sound, among the top 10 HMOs in the country in 2005.

Finally, if hospitals are owned by the insurer this removes the need to bargain over prices. The integrated plan can therefore avoid the problem posed by the most popular hospitals which are likely to demand very high prices. In addition, Ho (2008) demonstrates that the bargaining process may generate incentives for hospitals to increase their leverage during bargaining by investing in characteristics (e.g. duplicative new technology) that make them popular with consumers or by merging with each other. Integration with the health insurer removes these incentives.

2.2 Disadvantages and Barriers to Entry

There are also several barriers to the entry and success of vertically integrated plans, many of which are discussed in the previous literature. The first is the importance of scale. The integrated model requires the plan to agree on exclusive contracts with a wide range of specialists and a number of hospitals before it can market itself to patients. Gitterman et al (2003) suggests that 100,000 enrollees may be needed to support this provider network. One Kaiser executive suggested that as many as 500,000 enrollees might be needed. However, it may not be easy for a new plan to build scale quickly.

The second issue is related to the first. The cost advantage of Kaiser and other integrated plans has been eroded in recent years as managed care penetration has increased; this implies an increased focus on quality competition between insurers. The often high preventive care quality of integrated plans is helpful here. However, the restricted choice of hospitals may imply that consumers do not have access to all their preferred acute care providers (for example they may not be able to visit the highest-quality cancer center in the market). The target market may therefore be limited to consumers with low probabilities of significant negative health shocks and a taste for preventive care. Further, the quality of care provided at integrated plan hospitals may be relatively low because managers are assured of a stream of patients and therefore have less incentive to focus on maintaining their popularity. While this could be beneficial in terms of social welfare because it translates to less investment in empty signals of quality, it could also reduce the true quality and popularity of the plan. Gaynor et al (2004) note that paying physicians on a salaried basis with no financial incentives to increase quality may exacerbate the problem. In addition, even if the plan achieves superior quality on some dimension, it faces the problem that quality is an experience good. In the absence of personal experience, consumers are likely to choose their health plans based on recommendations from friends or from their physicians rather than on published quality data. The previous literature supports this idea. Jin (2002) notes that Medicare enrollees who observed plan quality data in the late 1990s became better-informed about managed care overall but did not use the information to help distinguish one insurer from another. The problem is exacerbated by the fact that the integrated model of care is unfamiliar to consumers in new markets.

It may also not be easy to assemble the component parts of the plan. Burns and Pauly (2002) note that conflicting capital needs between hospitals and insurers can cause problems if the system does not have the capital needed to develop the infrastructure required by the growing plan. Gitterman et al (2003) argue that Kaiser's failure in North Carolina was due partly to physician unwillingness to join the new plan. Successful integrated insurers often have a long history in the market and have built good working relationships with the medical community over time; they tend to have difficulties in markets where physicians are unfamiliar with the practices required to join an integrated plan. For example, Robinson and Casalino (2001) compare the contracts between Aetna and its network physicians in New York to those in California in 2000 and show that capitation payments were far more widespread and physician medical groups (as opposed to solo practitioners) much more common in California[3]. In addition, Certificate of Need laws may limit the extent to which the plan can build its own hospitals, at least in the short term after entering new markets, implying that it must enter into potentially expensive contracts with existing providers. Finally Burns and Pauly (2000) note the dangers of expanding too quickly into markets with a different competitive environment from those in which the plan has previously operated and the potential for bidding wars when acquiring new primary care physicians.

There are other potential barriers to entry into new markets. Switching costs (particularly the costs to consumers of switching primary care physicians) may be important. Consumers in markets that have never experienced a vertically integrated system may have much stronger preferences for hospital choice than those who have been with an integrated plan for many years and have no relationships with providers outside its network. The integrated plan may also encounter problems if it becomes too attractive to certain types of consumers. For example, if it provides very high-quality preventive and primary care, it may experience adverse selection of enrollees with chronic diseases. Other participants in the market may also affect the integrated plan's ability to expand. Gitterman et al (2003) note that integrated plans are more likely to succeed in building scale if employers offer a choice of health plans

[3] Over 90% of Aetna's commercial HMO enrollment in California was covered by capitation contracts and over 90% was contracted to medical groups and IPAs. The corresponding figures in New York were just 12% and 12%.

and also pass on any savings in terms of reduced premiums to the employees who choose lower-cost plans[4]. Each of these potential costs will be considered in the analysis that follows.

2.3 The Kaiser Experience

Kaiser Permanente took advantage of all the benefits of integrated medical care and expanded significantly, becoming one of the most popular plans in California. It also has a substantial presence in 12 states and the District of Columbia. However, Kaiser's expansion efforts have not always been successful. Since 1980 it has attempted to enter seven new markets: Atlanta GA, Baltimore MD, Washington DC, North Carolina, Dallas TX, Kansas City MO and the Northeast Region. It had exited the last four of these regions by 2001. Table 1 provides details on Kaiser plans in 17 markets[5]. Market shares in these areas range from 3.3% of the commercially insured population in Baltimore MD to 55.5% in Oakland CA. The Table also provides details on the plan's unsuccessful expansion attempts.

2.3.1 Potential Explanations for Kaiser's Successes and Failures

I asked several Kaiser executives why they believed the organization had succeeded in some markets but not in others. They suggested three reasons. Their responses were consistent with the arguments given in the literature and discussed above. First they agreed that scale was important. For example, Kaiser's successful entry into Atlanta GA and Washington DC could be due to the fact that it entered through acquisition, thereby ensuring that it had a critical mass of enrollees at the outset. They also noted the importance of brand equity and personal recommendations from consumers. One Kaiser executive noted that the plan has found it easier to expand into contiguous markets (for example, from San Francisco into the California Central Valley) than elsewhere because ex-Kaiser enrollees are likely to have moved there and both to enroll into a new Kaiser plan themselves and to recommend it to their friends. Empirically, Kaiser has been successful in several high-turnover markets such as Washington DC and Baltimore MD, perhaps for similar reasons.

Finally, relationships with providers have caused problems in some markets. Kaiser has found that physicians are not always willing to operate as coherent groups of specialists rather than as competing individual practitioners. Hospital contracts can also take time to acquire. Table 1 shows that Kaiser's

[4]Neither of these conditions were satisfied in North Carolina in the early 1990s, the period when Kaiser Permanente tried unsuccessfully to enter that market. Employers' decisions not to offer a choice of health plans probably also helped prompt Harvard Community Health Plan to move away from its closed panel physician model in Boston. However, of course adverse selection problems can result if too much incentive is given to consumers to choose the lowest-cost plans.

[5]Kaiser operates in more than the markets listed in Table 1. The analysis in this paper focuses on the 43 markets covered by the Atlantic Information Services (A.I.S.) data described in Section 3. The markets listed in Table 1 are the subset of the A.I.S. markets in which Kaiser has been active.

hospital strategy varies across markets. In some markets, particularly those where Certificate of Need (CON) laws apply, the plan contracts with existing hospitals rather than building its own units. Kaiser entered no CON markets before 1980. This may reflect Kaiser executives' comments that hospital contracts can be particularly expensive in these areas.

2.4 Evidence on Integrated Plan Quality

In order to build scale, the new plan has to convince consumers that its quality is significantly higher than that of its competitors on at least one dimension. Given the institutional features of integrated insurers we expect their preventive care quality to be higher than that of other plans. The restricted hospital choice is likely to lead to relatively low consumer expectations of acute care quality. I measure this expectation using a variable calculated as part of my demand estimation: the expected utility offered to the consumer by the set of hospitals in the plan's network. While this is clearly not perfectly correlated with outcomes, since it measures the consumer's preferences for hospital characteristics rather than actual hospital quality, it does capture consumer beliefs which are the key determinants of plan enrollment. The average expected utility offered by Kaiser plans is substantially lower than that offered by other insurers, not surprisingly given that integrated plans contract with only 29% of the hospitals in the market on average, compared to 80% for other plans.

I consider the issue of preventive care quality using data for the years 1997-2000[6] taken from the National Committee for Quality Assurance (NCQA)'s *Health Employer Data and Information Set* (HEDIS). The data are described in Section 3. I consider six quality measures: the rates of screening for breast cancer and cervical cancer, the proportion of pregnant women receiving prenatal care and the rates of checkups after delivery, of eye exams for diabetic patients and of outpatient appointments after a mental illness discharge. Table 2 shows that the scores of active Kaiser plans surpass those of their competitors on all six dimensions. Of course these variables may not perfectly capture preventive care quality: for example, integrated plans may do better on these dimensions partly because they have better systems for measuring these outcomes. However, HEDIS measures are probably well-suited to my analysis because they are the most readily available preventive care quality measures to consumers and therefore the most likely determinants of consumer perceptions of plan quality.

I examine the performance of Kaiser plans and their competitors in markets where Kaiser has been successful compared to markets where it later exited the area. Table 2 asks whether Kaiser was able to

[6] These NCQA data were first collected in 1996. The areas where Kaiser was successful are Northern California, Southern California, Colorado, Ohio, Mid-Atlantic States, Northwest Region and Georgia. Those where it later exited the market are Kansas City, Northeast Region and Texas. I exclude North Carolina due to missing quality data. I exclude markets in years after Kaiser exit.

match its competitors' preventive care quality in these markets. The first row for each quality measure reports the average percentage quality difference between successful Kaiser plans and their same-market competitors. The following three rows report equivalent figures for the three plans that later exited the market. A positive number implies that Kaiser's quality exceeds that of other plans in the area. It is clear from the Table that successful Kaiser plans maintained their quality advantage for all six quality measures over the time period considered. The Kaiser plans that exited the market dropped below their competitors in the year before exit for three of the six quality measures. Two things happened in that year. First, Kaiser quality fell in several cases: this was probably due to a reduction in focus on the market immediately before withdrawal. Second, there was also an improvement in the quality of Kaiser's competitors. More broadly, the data indicate that failed Kaiser plans did not establish as large a quality lead on several dimensions as did successful Kaiser plans. Ten of the 18 quality-year observations for 1997-99 (56%) had a smaller quality lead for failed Kaiser plans than for those that succeeded. The difference was significant at p=0.10 for five of these (28%). The quality difference was never significantly lower for successful Kaiser plans.

Next I consider how non-integrated plan quality responded to integrated plan entry. We might expect entry to generate increased competition and higher preventive quality at non-integrated insurers. I look in particular at the Northeast Region. I find that, for five out of six preventive quality measures, the average rating for non-integrated plans increased from 1997 (the year after Kaiser's entry) through 1999. Four of these increases were significant at p=0.05.

Finally I examine a cross-section of data for the year 2000. I compare the preventive care quality of non-integrated plans in markets where integrated plans have been successful to those where integrated plans have failed and (separately) those with no integrated plan entry. This comparison is shown in Table 3[7]. In seven out of eight measures considered here, average non-integrated plan quality was significantly higher in markets where integrated plans failed than in markets where they succeeded. Average quality in "failed" markets was also significantly higher than in markets where integrated plans had never entered in 5 out of 8 measures. The difference between markets with integrated plans and those that had never had entry was significant only for one measure.

These findings indicate that relative preventive care quality may be important for the success of integrated plans. The limited available data are consistent with non-integrated plans responding to integrated plan entry by increasing their quality (perhaps by different amounts in different markets),

[7] I consider the 43 markets in the data set described in Section 3 plus the 13 markets where I know Kaiser has been unsuccessful. The integrated plans are Kaiser, Group Health Cooperative and Scott and White Plan. I account for correlation between plans with overlapping physician networks by taking the average quality of non-integrated plans within each market before comparing quality levels across markets.

and integrated plans being less likely to fail in markets where this competition was less intense or where they succeeded in maintaining their quality lead for some other reason. It is not clear from the cross-sectional data whether cross-market differences in non-integrated plan quality help explain integrated plan entry choices as well as their success or failure after entry. The observed differences between markets with and without integrated plans are generally insignificant but this may be because competition after integrated plan entry increased quality in the "entered" markets to the level of the markets that integrated plans chose not to enter. Either way it is clear that the quality differential between integrated and non-integrated plans is important for the success of integrated plans in new markets.

3 An Overview of the Model and the Data

The goal of the model is to predict the effects of integrated plan entry into new markets on consumer surplus and the profits of each type of insurer. I use the model of consumer demand for hospitals, and for health plans given the set of hospitals offered by each plan, which I estimated in Ho (2006).

There are three steps to the estimation. The first is to estimate consumer demand for hospitals using a multinomial logit discrete choice model that allows for observed differences across individuals. With some probability consumer i (whose type is defined by age, gender, and zipcode tabulation area (ZCTA)) becomes ill. His utility from visiting hospital h given diagnosis l is given by:

$$u_{ihl} = \eta_h + x_h\alpha + x_h\upsilon_{il}\beta + \varepsilon_{ihl} \tag{1}$$

where x_h, η_h are vectors of observed and unobserved hospital characteristics respectively, υ_{il} are observed characteristics of the consumer such as diagnosis, location and income and ε_{ihl} is an idiosyncratic error term assumed to be iid Type 1 extreme value[8]. I estimate this part of the demand model using encounter-level data from the MEDSTAT Marketscan Research Database which gives details on the diagnoses, demographic characteristics and hospital choices of around 30,000 patients in 11 markets in 1997-98[9].

The second step is to use the estimated coefficients to predict the utility provided by the hospital network of every HMO/POS plan in my data. Individual i's expected utility from the hospital network

[8] This model was first proposed in McFadden (1973).

[9] The markets are Boston MA, Chicago IL, Dayton-Springfield OH, Orlando FL, Phoenix AZ, Seattle WA, and Detroit, Grand Rapids, Kalamazoo-Battle Creek, Lansing, and Saginaw-Bay, all in MI.

offered by plan j in market m is calculated as:

$$EU_{ijm} = \sum_{l} p_{il} \log \left(\sum_{h \epsilon H_j} \exp(\eta_h + x_h \hat{\alpha} + x_h \upsilon_{il} \hat{\beta}) \right) \tag{2}$$

where p_{il} is the probability that individual i will be hospitalized with diagnosis l. Types of individual i are defined by age, gender and zipcode. This calculation requires me to use information on the hospitals included in each plan's network. I use a hand-collected dataset detailing the network of every HMO/POS plan in 43 major markets (MSAs or PMSAs) in March/April 2003[10]. The information was collected from individual plan websites; missing data were filled in by phone. Most plans contract with most hospitals in their markets. Only 22 per cent of insurer-hospital pairs do not arrange contracts to provide care.

Finally the expected utility variable from the hospital demand model is included in an equation that models consumers' choices of insurance plans. I use a methodology similar to that set out in Berry, Levinsohn and Pakes (1995). The utility of individual i from plan j in market m is given by:

$$\tilde{u}_{ijm} = \xi_{jm} + z_{jm}\lambda + \gamma_1 EU_{ijm} + \gamma_2 \frac{prem_{jm}}{y_i} + \omega_{ijm} \tag{3}$$

where z_{jm} and ξ_{jm} are observed and unobserved plan characteristics respectively, $prem_{jm}$ are plan premiums, y_i is the income of individual i (approximated in the estimation by median income in the zip code), and ω_{ijm} represents idiosyncratic shocks to consumer tastes, again assumed to be iid Type 1 extreme value. Premium occurs twice in this equation: once in z_{jm} (measuring the average price effect) and once divided by income, to uncover any variation in premium elasticity with wealth.

Several datasets are required as inputs to this third step of the analysis. I take data on the characteristics of health insurers from two datasets from Atlantic Information Services: *The HMO Enrollment Report* and *HMO Directory 2002*, both of which are based on plan state insurance filings. The data cover all managed care insurers in the same 43 major markets included in the network data for Quarters 3 and 4 of 2002. I supplement this information with data from the *Weiss Ratings' Guide to HMOs and Health Insurers* for Fall 2002. Data on plan performance comes from the *Health Employer Data*

[10] The markets are: Atlanta GA, Austin TX, Baltimore MD, Boston MA, Buffalo NY, Charlotte NC, Chicago IL, Cincinnati OH, Cleveland OH, Columbus OH, Dallas TX, Denver CO, Detroit MI, Fort Worth TX, Houston TX, Indianapolis IN, Jacksonville FL, Kansas City MO, Las Vegas NV, Los Angeles CA, Miami FL, Milwaukee WI, Minneapolis MN, New Orleans LA, Norfolk VA, Oakland CA, Orange County CA, Orlando FL, Philadelphia PA, Phoenix AZ, Pittsburgh PA, Portland OR, Sacramento CA, St. Louis MO, Salt Lake City UT, San Antonio TX, San Diego CA, San Francisco CA, San Jose CA, Seattle WA, Tampa FL, Washington DC, and West Palm Beach FL.

and Information Set (HEDIS) and the *Consumer Assessment of Health Plans* (CAHPS) 2000, both of which are published by the National Committee for Quality Assurance (NCQA). These data measure preventive care performance and patient satisfaction in 1999. Hospital characteristics are taken from the American Hospital Association (AHA) dataset for 2001. Ho (2006) uses all these datasets: further details on the data, and the methodology used to create additional variables (such as plan market shares) that are employed again in this analysis, are given there.

I consider all three integrated health insurers that are active in the markets in the data: Kaiser, Scott and White Health Plan and Group Health Cooperative. I include all Kaiser Permanente plans (including those that do not own hospitals) in the group of vertically integrated plans. I assume that the decision not to build or acquire hospitals was exogenous because, as Table 1 demonstrates, it was highly correlated with the application of Certificate of Need Laws. In addition the integrated care strategy has many of the same advantages (such as care coordination and rationalization of service provision) whether or not the insurer owns hospitals and physician practices, as long as relationships with physicians remain exclusive on the part of the physician. Of course some benefits are lost, including the ability to pay hospitals at or near cost and to avoid time-consuming negotiations with hospitals. For this reason I repeat the main analyses including only Kaiser plans which own their own hospitals in the group of vertically integrated plans. The results are included in Section 7.

Table 4 provides summary statistics on the 16 integrated plans in the data and the 500 plans that are not vertically integrated. I categorize integrated plans into three types. Type 1 integrated plans own all the hospitals in their networks. Type 2 plans own some hospitals and contract with others. Type 3 plans do not own hospitals. The average premium for integrated plans is higher than that for other plans, consistent with the anecdotal evidence that integrated plans' cost advantage has been eroded in recent years and also that Kaiser has been reluctant to eliminate benefits as non-integrated plans have done in order to reduce premiums[11]. However, the premium data do not take into account copayments and deductibles, the out-of-pocket prices charged by plans at the point of care. Integrated plans offer broad coverage compared to other managed care insurers, implying that out-of-pocket prices are lower than those for non-integrated plans (see www.chcf.org/documents/insurance/TAInsuranceMarkets112002.pdf for evidence on this point). Unfortunately the dataset does not include these additional prices. I control for the low copayments and deductibles of integrated plans by including a dummy for these plans in the demand system.

The data on other plan characteristics are consistent with the discussion above. Integrated plans have

[11] Premiums are calculated, at the plan-state level, as total premiums earned by the plan divided by the total number of enrollees.

smaller primary care physician networks (an average of 0.6 physicians per 1000 population compared to 1.6 for non-integrated plans), contract with fewer hospitals in the market (29% of the existing hospitals on average, compared to 80% for other plans) and have higher preventive care quality (as measured by the rate of screening for cervical cancer, the rate of eye exams for diabetic enrollees and the rate of checkups for people who have had mental illness) than other plans. Most plan characteristics do not vary significantly between the three types of integrated plans, supporting the assumption that the distinction between types is based on the extent of CON laws in the market rather than a difference in insurer strategy.

Table 5 contains summary statistics on the hospitals in the networks of integrated and non-integrated plans. Hospitals that contract with integrated plans are summarized in column 2; those that are owned by integrated plans are included in column 3. The strategy of fully vertically-integrated plans is clear from column 3. The hospitals that are owned by plans have more physicians per bed and fewer cardiac and cancer services (that is, fewer high-tech services) than other hospitals. They also have fewer beds and lower costs per admission. None of these hospitals are teaching hospitals; however, they are more likely to be affiliated with a medical school and to have approval from the Accreditation Council for Graduate Medical Education to train residents. Column 2 shows that integrated plans do not always succeed in matching their contracted hospitals' characteristics with those of their own providers. Contracted hospitals have more beds, fewer physicians per bed and more tertiary services than owned hospitals. In general their characteristics are between those of hospitals owned by plans and those of other hospitals, lending some support to the theory that integrated plans are trying to replicate their overall strategy when forced to contract with, rather than build, hospitals.

4 Simulating the Effect of Entry of a Vertically Integrated Plan

4.1 Details and Results of the Demand Model

As noted above, I estimate the hospital demand equation using micro (encounter-level) MEDSTAT data which provide information on the hospital admissions of indemnity plan and PPO enrollees[12]. There are two steps to the analysis. First I use standard maximum likelihood techniques to estimate the utility equation, including hospital fixed effects to ensure consistency of the coefficient estimates. The

[12]It would be preferable to estimate consumers' hospital choices using data for managed care enrollees. However, this was not feasible because the available data do not identify the hospital networks offered by each managed care plan, so the choice sets of managed care enrollees are unobserved. Instead I considered the choices made by indemnity and PPO enrollees, whose choice set is unrestricted. I assumed that indemnity/PPO enrollees have the same preferences over hospitals as HMO/POS enrollees, conditional on their diagnosis, income and location.

interactions between hospital and consumer characteristics include the distance between the two as well as interactions between services provided (e.g. cancer services) and types of patient (income, type of plan and diagnosis). Then I regress the estimated hospital dummy coefficients on hospital characteristics. These include the number of beds, the numbers of nurses and doctors per bed and details of services offered, ownership, and accreditation[13].

The plan demand model is estimated using the aggregate data from Atlantic Information Services, the NCQA and the AHA. Consumers can choose any HMO or POS plan in the market or one of two additional options: an indemnity/PPO plan, defined using assumptions about the characteristics of these insurers in each market, and the outside option of being uninsured. The plan characteristics considered are premium, the size of the physician network, plan age and a list of eight clinical quality variables and two consumer assessment variables taken from the NCQA's HEDIS and CAHPS datasets. I also include market fixed effects and fixed effects for the eleven largest health insurers in the data, including Kaiser. As noted the Kaiser coefficient will identify consumers' valuation of its relatively low copayments and deductibles, which are not observed in the data, as well as any other unobserved Kaiser characteristics. I adjust the standard errors of the estimates to take account of the variance introduced in the previous stages of estimation (see Ho (2006) for details).

I account for the potential endogeneity of the premium variable using instruments: the set of other plan characteristics (the z's), the average hourly hospital wage and the average weekly nurse wage across the markets in which each health plan is observed to be active. The assumption required for these to be valid instruments is that health plan costs are correlated with premiums but not with unobserved health plan quality[14]. I do not instrument for the expected utility variable. This implies an assumption that plans' hospital networks are not correlated with unobserved plan characteristics such as the generosity of prescription drug coverage. I control for this issue in part by including large plan fixed effects. The fact that the correlation between expected utility and observed plan attributes such as cancer screening and physician network size is small - less than 0.09 for these two variables - is also reassuring.

It is worth noting here that, while I am forced by data restrictions to estimate the hospital demand

[13] I also make an assumption regarding prices. PPO enrollees may be required to pay additional copays or deductibles if they choose to go out-of-network. These financial penalties are only included in the dataset for the hospital chosen by each patient; the hospitals in the PPO network are also not identified. I therefore assume that out of pocket prices charged to patients on the margin are zero for both PPO and indemnity patients. This may be reasonable since the average copay for PPO enrollees in my data was $289 for an average stay of 4.8 days or around 3% of the average cost per admission. I tested the assumption further by re-estimating the hospital choice model using data for indemnity enrollees only (roughly half the total sample). The results were similar to those for the main specification; see Ho (2006) for details.

[14] Premium is defined as average plan revenue per enrollee (including both employer and employee contributions). The measure is therefore noisy: this may lead to attenuation bias in the estimated premium coefficient. The implications are discussed below. However, it is reassuring to note that the premium charged by Kaiser to Stanford University faculty in 2005 was $157.42 per month, in line with the values in my dataset.

model using data on PPO and indemnity enrollees, my plan demand estimation is based on the observed market shares of all plans in the market including managed care organizations. I observe each plan's hospital network and use this information to predict the expected utility variable which is then included, together with plan premiums, in the plan demand specification. The model is therefore able to take into account the basic tradeoff between premium and choice made by people choosing between different health insurance coverages. The key assumption needed is that indemnity and PPO enrollees have the same preferences over hospitals as HMO/POS enrollees conditional on diagnosis, location and income[15].

One additional assumption simplifies the estimation. I reduce the two-stage process by which employers choose a menu of plans and then consumers choose a plan from that menu into a single stage representing a "joint" employer/consumer choice. There is a small literature (e.g. Cooper, Vistnes and Vistnes (2001)) that investigates how employers make their decisions and how these decisions relate to consumer preferences but since my data do not identify employers I am forced to ignore this question.

The results of the first stage of the analysis are given in Column 1 of Tables 7 and 8. Table 7 shows the results of the first step: the estimation of the hospital choice model using MLE and including hospital fixed effects. The results are consistent with the previous hospital choice literature and are intuitive. For example, if a hospital moves an additional mile away from a patient's home, this reduces the probability that the patient will choose it by 21%. The interactions show that patients with the most complex conditions (neurological diagnoses) attach the highest positive weight to teaching hospitals. Cardiac diagnoses place a strong positive weight on hospitals with good cardiac services; cancer patients on hospitals with good cancer services (although this coefficient is not significant at p =0.1), and women in labor and newborn babies have a strong preference for hospitals with good labor services. The results of the regression of the predicted hospital dummy coefficients on hospital characteristics are shown in Table 8. Consumers place a positive value on the number of nurses per bed, the number of doctors per bed, and overall on hospital accreditation and the provision of high-tech services.

Column 1 of Table 9 sets out the results of the third step of the analysis. The premium coefficient is negative but not significant in any of the specifications. Its magnitude suggests an insurer-perspective elasticity of -1.24 and that a $5 increase in premiums per member per month would reduce the probability that a plan is chosen by 0.0012[16]. These figures are at the low end of the range generated in previous studies: for example Cutler and Reber (1996) estimate the value to be -2; Royalty and Solomon (1998) have estimates ranging from -1.02 to -3.5. These studies are based on the decisions made by individual

[15] I tested this assumption by estimating the hospital choice model separately using data for HMO/POS enrollees in Boston, where the vast majority of managed care plans are observed to contract with all hospitals. The estimated coefficients are similar to those estimated using PPO/indemnity enrollee data for Boston; see Ho (2006) for details.

[16] The insurer-perspective elasticity is based on the full premium rather than out-of-pocket prices faced by enrollees.

employees, while my results also reflect decisions by employers, which might imply that less elastic demand is reasonable. If my estimated premium elasticities are under-stated, this will lead to an over-estimate of the welfare gains from integrated plan entry[17]. Section 7 investigates this possibility in more detail.

I find that consumers place a positive and significant weight on their expected utility from the hospital network when choosing a plan. The coefficient magnitudes imply that a one standard deviation increase in expected utility is equivalent to a reduction in premium of $39 per member per month (a little less than one standard deviation). The large plan fixed effects are all less than zero, indicating that, all else equal, consumers would prefer to choose local rather than large, national insurers. The Kaiser coefficient is negative but, as we would expect given its low copayments and deductibles, less negative than those of most other large plans. The other results are intuitive: consumers significantly prefer plans with larger physician networks and those with higher clinical quality as measured by variables such as the rate of screening for cancer and the rate of checkups for people who have had mental illness.

Columns 2 and 3 of Tables 7, 8 and 9 set out the results of estimating the models of consumer demand for hospitals and plans, respectively, separately in markets that contain an integrated plan and those that do not. These results are discussed in Appendix C; they investigate the effect of variation in consumer preferences across markets and do not influence any of the results in the body of the paper. However, one result is worth discussing here. The coefficient on premium in markets that contain integrated plans (Table 9) is positive (although not significant). As a robustness test I added an interaction between premium and a dummy for integrated plans: the premium coefficient switched signs and the interaction term was positive and significant. This indicates that the problem is caused by the high premiums observed for integrated plans in the data: these generate a positive correlation between premiums and market shares in these markets. The Kaiser dummy coefficient again absorbs the effect of integrated plans' low copayments and deductibles.

The demand results demonstrate the large premium reduction that would be needed to compensate consumers for the restricted provider choice imposed by integrated plans. The estimated coefficients on premium, the expected utility variable and physician network size in column 1 of Table 9 imply that integrated plan premiums would need to be approximately $77 per member per month lower than those

[17] The premium coefficient could be biased towards zero due to attenuation bias caused by the noisy premium measure or due to measurement error. There may also be endogeneity bias if the instruments are not valid. However, both hospital and nurse wage coefficients were significant at p=0.01 in a first-stage regression of premiums on instruments. The premium coefficient in a logit demand model assuming exogeneity of premiums was positive while that in the instrumental variables logit specification was negative and similar in magnitude to that for the full model at -0.92 (standard error 1.10). According to Hansen's test of overidentifying restrictions the null hypothesis that the assumptions of the GMM model, including the validity of the instruments, are satisfied cannot be rejected in a test of size 0.10 or smaller.

of their competitors in order to make consumers indifferent between the two types of plans, assuming all other characteristics of these plans were identical[18]. This is more than a 50% price cut compared to the average observed premium, probably an unrealistic strategy particularly given that integrated plans' cost advantage has decreased in recent years with the spread of managed care. It is clearly important for these insurers to offer consumers superior quality on at least one dimension.

4.2 Details of the Simulation

The demand model enables me to simulate the movement of consumers across both plans and hospitals when a new insurer with any specified set of characteristics enters the market. I consider the entry of a new vertically integrated plan to each of the 28 markets in my data where such a plan does not already exist. Details of the simulation model are given in Appendix A. I begin with a baseline methodology which serves as a starting point for my analysis of the hypotheses outlined in Section 2. I define the characteristics of the new plan as follows. I assume that the percentage difference in each attribute between the new integrated plan and other plans in the market is the same as the average percentage difference observed in markets where integrated plans already exist. I choose not to make the alternative assumption, that the *levels* of the integrated plan's characteristics are fixed across markets, because these characteristics (which include clinical quality, consumer satisfaction and size of physician network) are likely to be functions of the set of physicians and hospitals that exist in the area. I also choose not to allow the integrated plan a free choice of quality since my goal is to simulate the effect of this insurer's entry with its existing technology and institutional features rather than that of a hypothetical insurer with the "best" possible quality levels. Under these assumptions, the new plan has 61% fewer physicians per 1000 population than other plans; costs per admission are 10% lower than other plans; and clinical quality variables are between 3% and 300% higher than other plans in the market.

I use the same methodology to specify the expected utility from the new plan's hospital network. I therefore avoid making an ad-hoc assumption about which hospitals in the market the new plan might choose to contract with or exactly the characteristics (and locations) of the hospitals it might choose to build. The expected utility from a vertically integrated plan's hospital network is on average 19% lower than that from the networks of other plans in the area. I assume that the new integrated plan owns its hospitals; it therefore pays those hospitals at cost rather than bargaining to agree on final prices. Other, non-integrated plans are assumed to pay their hospitals a profit equal to 14% of costs, in line

[18] As a robustness test I added EU_{ijm}^2 to equation (3). The coefficients on expected utility, physician network size and premiums were essentially unchanged and that on the squared term was very low at 0.0005. The $77 compensating variation changed very little, increasing to $78. This figure will be overstated, however, if the premium coefficient is biased towards zero due to attenuation bias or measurement error. This possibility is investigated further in Section 7.

with the Kaiser Family Foundation's data on community hospitals for 2001-2[19].

The final assumption regards plan premiums. I conduct the simulation under two alternative assumptions. First I assume that all plans' premiums remain fixed when the new plan enters; as with other characteristics, I assume that the difference between the new plan's premium and those of incumbent plans is the same as the average difference for observed integrated plans. Second, I allow all plans to simultaneously adjust their premiums in order to maximize their profits when the new plan enters.

Section 2 discussed a number of potential explanations for limited growth by integrated plans. It is useful to note at this point which of these effects the baseline model allows us to identify and which it does not. The model will account for variation in consumer preferences for hospital and insurer characteristics across age, gender, location and income groups. However it cannot, in its simplest form, assess the effect of a reduced quality differential as competitor quality rises. Nor does it model consumers' potentially low initial expectations of insurer quality or their switching costs of moving between plans. These possibilities are analyzed in Sections 5 and 6. The model also cannot identify the effect of cross-market variation in preferences due to differences in unobserved characteristics: these could include sickness levels (to the extent that this is not accounted for by age), education levels, consumers' previous experiences of health plan networks and any other differences that affect consumers' choice of health care arrangements. I investigate the importance of this issue in Section 7. Of course the model also does not estimate supply side effects, including relationships with employers and costs of arranging contracts with providers or building new hospitals. I discuss these issues in Section 6.

The demand model identifies adverse selection due to variation in the set of hospitals offered by each plan because the expected utility term varies across consumers of different ages and genders (who have different probabilities of admission to hospital). However, I assume that all consumers have the same preferences for other health plan characteristics (the z's in equation (3)). This rules out adverse selection based on the quality of preventive services. Section 7 includes an additional demand analysis to test whether preferences over the z's differ by consumer age group. In any case adverse selection will only explain the limited entry of integrated plans if it affects plans more in some markets than in others, for example if consumers' plan choice sets differ across markets. This variation is unlikely to be large enough to explain the variation in entry behavior observed in the data.

[19] The Kaiser Family Foundation report "Trends and Indicators in the Changing Health Care Marketplace, 2004 Update" provides data on hospital costs and profits. The average community hospital payment-to-cost ratio from private payers in 2001 was 113.2%, implying margins of 13.2% of costs. The 2005 update reports higher numbers: an average payment-to-cost ratio for 2002 of 119%. I use a conservative figure in order to under-estimate the integrated plan's profits compared to those of other plans.

4.3 Baseline Simulation Results

The results of the baseline simulation are set out in Table 10. The first column gives the results when premiums are held fixed after entry. The second assumes that all plans can adjust their premiums in order to maximize profits after entry of the new plan. In the third column I assume that the plan which had the lowest profits in the previous simulation exits the market. I then repeat the premium adjustments and report the revised change in consumer surplus and plan profits taking into account this change in market structure. Premiums are always higher after adjustment (columns 2 and 3) than before (column 1), perhaps implying that the plans in the data in reality paid hospitals a profit of less than the assumed 14% of costs. However, this does not preclude reasonable comparisons within models since I either never allow for premium adjustments, or assume that they occur both before and after plan entry.

All three simulations indicate that the new integrated plan would increase consumer surplus and capture positive profits. Other insurer profits would fall. I predict a smaller increase in consumer surplus in the simulation where the least profitable plan is assumed to exit. The profits of the new integrated plan are compared to those predicted for observed integrated plans in the 15 markets where these insurers already exist. I find, in all three simulations, that the new plans will have higher premiums, higher profits per enrollee and more enrollees than existing plans. Total profits are much higher: for example they reach $654 million per year, compared to $267 million for existing integrated plans, in the model where premiums adjust but no plans are permitted to exit. (I will refer to this as the baseline model in the discussion which follows.) Finally, I predict the effects on existing non-integrated plans. These plans change their premiums only slightly after the new plan's entry. However, their profits per enrollee fall because the integrated plan (with its less comprehensive hospital networks) attracts relatively young and healthy consumers, leaving the sicker patients to go to other plans. The total number of enrollees also falls, implying an overall decrease in profits. Overall the baseline model predicts an increase in consumer surplus from new plan entry of approximately $25 billion per year over the 28 markets in the sample. The new plans' aggregate profits are approximately $18 billion per year. The loss in profits of all other plans add up to $8 billion, implying a net welfare gain of $35 billion per year.

Of course it is not surprising that these baseline results indicate that there is room in each market for a vertically integrated plan: an insurer that is popular in one market is likely to be popular in another if its quality relative to competitors is held fixed. However the results act as a baseline from which we can investigate the magnitudes of different potential barriers to entry.

5 Simulations to Explain Limited Entry by Integrated Plans

The second step is to investigate a range of potential explanations for the limited growth of integrated plans. I estimate the magnitude of each effect by adding each to the baseline model in turn.

5.1 Variation in the Quality Lead of Integrated Plans

Section 2 suggests that preventive care quality relative to non-integrated plans in the market is an important factor in determining integrated plan success. The simulation model needs to account for this issue carefully. The baseline simulation assumed that every new integrated plan exceeded the average of its competitors' quality levels by the same percentage as observed integrated plans. I now make a different assumption which allows for the effect described by one Kaiser executive as "crowding at the top". Most quality measures in the data are defined as rates of the plan's enrollees receiving a particular service. The integrated plan's lead over a competitor rate of 80%, for example, will probably be lower than its lead over a competitor rate of 60%. I therefore assume that the new plan's percentage distance from 100% undercuts those of its competitors by the same proportion in new markets as in its existing markets. That is, I use $(1 - X_m)$, rather than X_m, as my unit of measurement, where X_m is the average competitor quality level in market m[20].

Data limitations imply that this definition of new plan quality is based on an assumption and may not be accurate. The advantage of this method is that it allows the new plan to achieve higher quality than its competitors - consistent with the data on current and most past integrated plans - while still accounting for the increasing difficulty in raising quality as average levels rise. The analysis in the next section, in which consumers expect integrated plan quality to equal the average quality in new markets, can be viewed as providing a lower bound for the welfare results considered here.

The results of the simulation are given in Column 2 of Table 11. (The baseline results are repeated in Column 1 for ease of comparison.) The increase in consumer surplus from integrated plan entry is much lower than that for the baseline model. The integrated plan now has lower premiums in new markets than in observed markets because its quality advantage is smaller. Its enrollment falls from $374,000$ in the baseline model to $190,000$ (lower than the median value predicted for existing plans of $193,000$). Integrated plan profits in new markets fall to a median value of \$284 million per year, only slightly higher than those for existing plans.

[20] For example, if on average the breast cancer screening rate among other insurers in markets which contain integrated plans is 0.60 and the average integrated plan rate is 0.70 then I assume that new integrated plans will achieve rates that are $\frac{0.40-0.30}{0.40} = 25\%$ closer to 1 than their competitors. A new plan entering a market where the average rate is 0.80 will therefore achieve a rate of 0.85. Under the alternative assumption the new Kaiser rate would be $0.80\left(1+\frac{0.7-0.6}{0.6}\right) = 0.93$. This much higher implied rate ignores the fact that it becomes more difficult to increase quality as the base level increases.

The difference between these results and those of the baseline model is entirely due to the variation in competitor quality across markets. This is enough to imply that new markets are no better for integrated plans than existing areas. Any additional friction (such as the experience good and regulatory issues analyzed below) would bring the plan's expected profits below those in its current markets and therefore deter entry. It is also worth noting that, as discussed above, integrated plan entry may have led to increased competition and improvements in non-integrated plan quality in the relevant markets. We may therefore be observing competitor quality in integrated plan markets which has risen since entry compared to that in other areas. This is consistent with integrated plans having chosen to enter the most attractive markets in terms of incumbent quality. In addition, the issue of competitor quality has likely become more problematic in all areas over time. NCQA press releases indicate that average insurer preventive care quality has risen in the time since 1996 when quality data were first collected[21]. This simulation therefore both helps to explain Kaiser's recent failure in certain markets (where competitor quality probably improved after its entry) and also suggests that integrated plans' choices of markets to enter both in the past and today may be influenced by competitor quality levels.

5.2 Plan Quality as an Experience Good

The second possibility is that, because preventive care quality is an experience good, it may be difficult to persuade consumers to choose their plans based on published quality data. I test the importance of this idea by assuming that consumers expect the integrated plan's clinical quality measures and unobserved quality ξ to take the average values of other plans in the new market. Other characteristics are maintained at the values in the previous simulation since they are assumed to be observable to consumers before the plan choice is made. I then repeat the simulation. The results are in Column 3 of Table 11.

As expected, the results are different from the previous simulations. Consumer surplus still increases as a result of entry but the change is much smaller than in the baseline model. The new plan has lower premiums and lower profits than those of the existing integrated plans[22]. The median enrollment in the new plans is only $89,700$ compared to a median value for existing plans of $193,000$. Other plans' profits fall when the new plan enters but now this change is quite small. This simulation, together with the previous hypothesis, is all that is needed to explain the data. Gitterman et al (2003) suggest that the minimum efficient scale for Kaiser when entering North Carolina was over 100,000 enrollees; Kaiser

[21] See e.g., "NCQA Finds Quality Despite Chaos", 2002, at www.ncqa.org/Communications/Publications/NCQAUpdate/oct02update.htm#1.

[22] I assume that consumers in markets where integrated plans already exist have perfect knowledge, gained from experience and through word-of-mouth, of the quality of these insurers.

executives suggested the higher figure of 500,000 enrollees. Of the 16 integrated plans in my data only two had enrollment less than 100,000 in 2002: these were Kaiser in Baltimore MD, with 25,700 enrollees, and Kaiser in Orange County with 74,000 enrollees. It may be that the integrated plan is unwilling to risk entering a market where it predicts initial enrollment below this cutoff level.

It is worth noting that the median results still imply a $6.2 billion increase in welfare, partly caused by a $4.9 billion benefit to consumers, when the new integrated plan enters the market. Even in this conservative case integrated plans on average have a positive effect on social surplus. However, the benefit to consumers breaks down to just $122 per privately insured person per year, not a large number compared to average premiums of $140 per month[23].

5.3 Certificate of Need Laws

The impact of Certificate of Need (CON) laws may also be important. These laws may require a new integrated plan to contract with existing hospitals rather than building its own units (at least in the short term). I use the simulation model to predict the profits of the new integrated plan if it chooses to enter a market where CON laws apply. I assume that the plan is now required to pay hospitals profits at the same level as other private insurers. I also use the set of integrated plans that contract with hospitals (Type 3 plans in Table 4) as a comparison group when calculating the new plans' characteristics. The analysis builds on the baseline simulation model. That is, I do not account for the difficulty in raising quality above the high level attained by other plans in the market, nor do I include low consumer expectations. The results are given in Column 4 of Table 11. The addition of CON laws reduces integrated plan enrollment to 250,000 enrollees: this is considerably lower than the baseline level but neither below the previous literature's estimate of minimum scale nor below the predicted level for existing Type 3 plans (140,000 enrollees). Integrated plan profits fall from $654 million in the baseline model to $370 million per year: again, these are still higher than the profits predicted for existing Type 3 plans (shown in the Table to be $172 million per year). Consistent with the evidence in Section 2, CON laws seem to be an important barrier to entry but they may not be enough to explain the data in isolation.

[23] I also ran the simulation assuming that the least profitable plan exited the market after integrated plan entry, ensuring that the number of plans in the market remained constant when the integrated plan entered. This reduced the problem caused by the infinite support of the logit error term which creates an upwards bias on the welfare effects of product entry. The total benefit from entry fell to $5.5 billion per year; the consumer surplus increase was $4.2 billion per year.

6 Estimates of Returns to Entry

6.1 Other Barriers to Entry

Section 2 listed a number of other potential entry costs which are not analyzed in the simulation model. Table 12 sets out the possible costs together with estimates of their magnitudes. The Table is divided into two sections. First I list the entry barriers that are considered in the simulation. Then I list those whose magnitudes have not yet been estimated: adverse selection, the cost of building hospitals and of contracting with physicians, employer strategies such as their preference to offer just a single plan and their policy not to share cost-savings with enrollees, and consumer switching costs. The Table also gives approximate magnitudes of the effects. I note in Section 4.2 that the variation in choice sets across markets is likely to be too small to make adverse selection a plausible explanation for the observed behavior. Not much information is available on the cost of building a new hospital; however, published sources indicate a cost of approximately $2 million per bed[24]. The median Kaiser plan owns or contracts with three hospitals in its market, each of which has on average 250 beds. If the new plan builds all its hospitals the total fixed cost is therefore likely to be approximately $1500 million.

I estimate the costs of relationships with physicians and employers with reference to the previous literature. Gitterman et al (2003) note that Kaiser's expansion effort in North Carolina began in 1985. By 1993 the plan's net income was $6.5 million per year; enrollment peaked at 134,000 consumers. However, its profitability then began to fall: by 1996 its annual loss was $15.9 million per year and it exited the market in 2000. I assume that Kaiser Carolina exceeded its competitors' clinical quality levels (this is an assumption since the plan did not report clinical quality data in most of the years considered in Section 2) and that by 1993 (8 years after Kaiser's entry) consumer expectations about the plan's quality were accurate. I also assume that consumer costs of switching plans were no longer relevant by 1993, consistent with the switching costs model outlined below. Kaiser's failure in North Carolina must therefore have been caused by other factors. Gitterman et al (2003) argue that a combination of reduced support from major employers in the market during the 1990s, together with a loss of support from physicians as new insurers entered the area, induced enrollees to switch away from Kaiser. I therefore assume that I can use the data from Kaiser Carolina to approximate the costs generated by relationships with physicians and with employers. If Kaiser's loss of profits from 1993 to 1996 are entirely attributed to these issues, then the two together caused a loss of the order of $23 million per year[25].

[24] The Kansas City Business Journal stated on June 18 2003 that "current industry standards ... estimate a cost of $1 million a bed for any new hospital facility being built." In November 2005 the Washington Post reported a commitment by Howard University trustees to build a $400 million hospital complex including a 250-bed facility with a top-level trauma unit, research divisions and an office building. The figure of $2 million per bed is therefore probably an over-estimate.

[25] It is possible that Kaiser Carolina's profits in 1993 were already depressed due to problems with employers and

The only remaining entry barrier is the cost to consumers of switching health plans. These are generated largely by the fact that joining an integrated insurer necessarily implies that the consumer must switch doctors (unlike switching to a traditional plan where there is a reasonable chance that switching plans does not imply switching doctors). I estimate these costs using data on the growth of new plans in particular markets taken from the *Weiss Ratings' Guide to HMOs and Health Insurers* for Fall 1992-2002. These data give the enrollment of each plan by state and year together with the plan's date of entry to the state[26]. I consider two possible sources of switching costs: the time involved with paperwork to change insurers and the uncertainty and discomfort generated by switching physicians. I do not have sufficient data to estimate these separately. Instead I assume the first cost is zero and estimate the second using my data on plan growth over time. Strombom et al (2002) investigate the extent to which switching costs differ across individuals and find large differences associated with health status, age and job tenure. I allow for this heterogeneity by modeling the costs of switching physicians as random draws from a lognormal distribution with parameters (μ, σ^2). Each consumer is assumed to receive a new draw in each year and to make his choice of plan that year given the observed draw. For example, a consumer who had a negative health shock and therefore relied on his relationship with his physician would receive a high draw for that year. Consumers who are recent immigrants to the state or whose physicians have retired, died or moved away in the previous year are assumed to have zero incremental costs of changing doctors. I adapt the demand model in equations (1)-(3) to incorporate these issues and use it to estimate the distribution of switching costs. Details of the methodology are set out in Appendix B. The results imply a lognormal distribution whose mean is equivalent to a premium increase of \$456.24 per year; the standard deviation is equivalent to \$3018.40 per year. Finally, I simulate the impact of these switching costs on the profits of new vertically integrated plans. I find only a small effect on enrollment. Switching costs reduce the integrated plan's profits by \$84 million (or 12.9%) in the first year compared to the baseline simulation. By the fifth year the integrated plan's profits are only \$4 million lower and its enrollment only 2,000 lower than they would have been with no switching costs. The patterns are similar for the model assuming low consumer quality expectations.

physicians. In that case \$23 million per year is an under-estimate of physician and employer costs. However, Kaiser executives did not list problems with employers as a key barrier to entry in most markets. Gitterman et al (2003) also note other potential issues, such as problems caused by regulatory uncertainty after market entry, which help explain the failure of Kaiser Carolina. These are included in the \$23 million per year number.

[26] I focus on the entry of plans that follow the standard managed care strategy, contracting with networks of physicians and hospitals which overlap with those of other plans in the market and monitoring utilization without attempting to integrate the provision of care. I therefore assume that the characteristics of the new insurer are known to consumers; any reluctance to switch plans is due to switching costs rather than uncertainty about the plan's quality.

6.2 Implications for Total Returns to Entry

Table 13 sets out the implications of the results for the five-year and ten-year expected discounted profits of entering plans. The median new plan in the baseline simulation (column 2 of Table 10) has a profit of $654 million per year. This implies a total expected discounted value of $2.9 billion over five years or $4.9 billion over a ten year period assuming a 7% discount rate. We cannot infer that the plan is viable from this information alone because the simulations do not account for all insurer costs: non-hospital costs of care are excluded from the calculations, as are the costs of capital, interest and depreciation. The model also does not include insurers' investment income. However, we can compare the estimates to those for observed integrated plans. These have a median profit of $267 million per year, implying a discounted value of $1.2 billion over five years or $2.0 billion over ten years. Costs totalling at least $1.7 billion over the first five years of operations are therefore needed to explain the data.

The Table sets out the effect of each potential entry cost in turn. First, it is clear that switching costs alone are not enough to explain the data. Even when combined with the costs of contracting with physicians, building hospitals and dealing with employer frictions[27], they reduce 5 year profits only to $1.14 billion, only just below the level for observed integrated plans. Certificate of Need laws may be a serious deterrent in some markets: combined with hospital[28], physician and employer costs they reduce the median integrated plan's five year profits to $22 million per year.

However, the Table makes clear that the reduced quality differential when competitor quality rises, together with problems with convincing consumers of integrated plan quality, create by far the largest barriers to success. If we take account of the first of these but not the second and again introduce physician, hospital and employer costs, we generate a five year discounted value of - $355 million. If we also account for low consumer expectations, and allow enrollment to rise linearly in the first five years after entry to reach a point where consumer expectations are consistent with the level attained given high competitor quality, we reduce the five year discounted value to - $806 million. It is clear that the plan's ability to attract enrollees by exceeding its competitors' quality, and convincing consumers that it has done so, is key to its success in new markets.

[27] Including both the cost of building hospitals and the $23 million per year cost of contracting with physicians over-estimates entry costs because the figure comes from the experience of Kaiser Permanente in North Carolina. Kaiser did not open hospitals in that market. The $23 million number therefore includes the steady state cost of contracting with hospitals (although possibly not the cost of initial negotiations), implying that we may be double-counting hospital costs.

[28] Again, including the cost of building hospitals here may imply an over-estimate of entry costs. I include them as a proxy for the cost of initial negotiations with hospitals after market entry.

7 Robustness Tests

I conduct several robustness tests of the simulation model. First I check that the simulation results are consistent with the observed data in markets where integrated plans already exist. As expected, the health plan demand model leads to an almost-perfect fit with the data because of the inclusion of unobserved plan quality ξ_j as well as the idiosyncratic error term ε_{ij}. The results for existing integrated plans in Column 1 of Table 10 therefore describe the actual data very well: for example, these plans in reality have a median of 2.10x10^5 enrollees, as predicted by the simulation. Non-integrated plans in other markets have a median enrollment of 2.54x10^4, again as predicted in Column 1.

The second robustness test concerns adverse selection. I would ideally have used a demand model that allowed consumer sickness levels to affect preferences for preventive services and therefore controlled for selection through the quality of preventive measures as well as through the hospital choice. While I do not have data on sickness, I do have age information. I therefore re-estimated the model in equation (3) including interactions between an indicator for "old" consumers (aged 45-64 or 55-64) and HEDIS quality measures. I also added additional moments matching the model's predictions of the probability of choosing a particular plan conditional on age group to data from the NCQA. Unfortunately there was too little variation in the data to generate significant coefficients. I therefore report only the simulations which use the original demand model, relying on my observation that consumers' plan choice sets probably differ too little across markets for adverse selection to explain the observed variation in plans' market entry.

Next I consider whether unobserved consumer characteristics generate variation across markets in demand for certain types of health insurer. For example, consumers in California who have grown up with Kaiser and are used to its restricted networks may have a lower valuation for hospital choice relative to their desire for high-quality preventive care than consumers in New England. This could explain Kaiser's success in the former and failure in the latter[29]. Alternatively, consumer preferences over hospital characteristics (rather than plan characteristics) might differ across markets. I investigate these hypotheses by estimating the plan and hospital demand systems separately in markets that contain an integrated plan and in those that do not and then repeating the simulation analysis using the new parameter estimates. Details of these analyses and their results are given in Appendix C. In both cases consumer preferences are different in the two types of markets but the differences are not large enough to explain the data.

[29] This is separate from the adverse selection issue mentioned earlier. Adverse selection concerns the selection of relatively costly enrollees compared to other plans within a market. This test considers whether consumers in some markets have very different valuations for integrated plans from those in others.

Fourth, as discussed in Section 4.1, the estimated demand elasticity with respect to premiums from the plan demand model is at the low end of the range found in previous studies. If the elasticity is under-stated this will lead to an over-statement of the welfare gain from integrated plan entry. It will also generate an over-estimate of the importance of plan quality to consumers compared to that of price, implying that the two quality-related entry barriers may be somewhat less important than these results indicate. I investigated this possibility by repeating the simulations after increasing the elasticity to -3, a value towards the high end of the range estimated in the previous literature. The baseline welfare gain from entry falls to $14.15 billion. The gains under the reduced quality differential and low consumer expectations hypotheses are $7.04 billion and $3.07 billion respectively; that under Certificate of Need laws is $6.82 billion. The five year discounted value of the median new plan in the baseline simulation is now $882 million, less than the $1.2 billion value for observed integrated plans but still probably large enough to be viable. Median enrollment for the new integrated plans is 311,000. The two quality-related hypotheses together, with no physician, hospital and employer costs, now reduce the five year discounted value to $248 million. Median enrollment of the new plans falls to 74,000. Certificate of Need laws alone, in contrast, reduce the five year discounted value to $417 million and median enrollment only to 169,000. Even this quite different price elasticity, which is likely to be at the top end of the feasible range, therefore does not change the qualitative results of the analysis. While Certificate of Need laws may now be enough to explain much of the variation in the data, the two quality-related hypotheses are still by far the largest barriers to success.

Fifth, it is useful to compare the predictions of the simulation model to the data on integrated plan entry. One testable prediction, in addition to those analyzed in Sections 2-4, relates to turnover. The switching costs simulation described in Appendix B implies that an increase in the proportion of the population that has immigrated from outside the state in the previous year translates to an increase in the proportion that can costlessly change plans. This is likely to boost a new integrated plan's enrollment and its profits[30]. Census data for 1997-98 indicate that the proportion of the population that had immigrated to DC in 1997-98 was 4.9%; the figure for Maryland was 4.4%. Kaiser has successfully entered these two markets. The corresponding figures for Massachusetts and New York (where Kaiser was unsuccessful) are 1.9% and 1.4% respectively. These differences may have contributed to the differences in outcomes for Kaiser. I estimate the magnitude of the turnover effect by repeating the simulation of integrated plan profits including switching costs and varying the percent of the population that immigrates each year from 1.4% to 4.9%. The median integrated plan's profits are predicted to be

[30] High immigration implies low switching costs for employees but not directly for employers. Local firm turnover rates, which affect employer switching costs directly, are also likely to affect integrated plan entry.

$2.6 million higher in the high-turnover market than those in the low-turnover market in the first year after entry. The effect of turnover on simulated profits therefore has the expected sign although it may be too small to be the primary cause of success or failure in a particular market.

Sixth, the arguments that CON laws and high incumbent preventive care quality constitute barriers to entry for integrated insurers imply a possible testable prediction. Preventive care quality might be lower in CON states than in states without CON laws because there is less need to improve quality when the threat of entry is low. However, the data are not consistent with this prediction. Preventive care quality in 2000 was significantly higher in CON states than elsewhere on several dimensions, perhaps because of differences in the characteristics and behavior of physicians and consumers in largely rural, central non-CON states compared to the coastal, more urban CON states.

Finally I repeat the baseline analysis including only Type 1 and Type 2 integrated plans (those that own at least a subset of the hospitals in their networks) in the comparison group when specifying the characteristics of new integrated plans. The results are given in Table 14. They are not significantly different from the main baseline results.

8 Discussion and Conclusions

This paper investigates several potential explanations for the limited diffusion of vertically integrated health insurers. The model cannot address every potential change in the market equilibrium after entry of a new integrated plan. For example, the contracts of incumbent plans with existing hospitals are assumed not to change after entry. However, the analysis is still helpful in suggesting three explanations for the pattern of expansion of integrated plans. First the integrated plan needs to attract a large number of enrollees in order to support its exclusive network of providers. However, the superior preventive care quality required to compensate consumers for restricted provider choice may be difficult to achieve in markets with high existing plan preventive care quality or a high probability of quality improvements by incumbent plans after integrated plan entry. Second, the information failure associated with experience goods, which makes it difficult for a new insurer to persuade consumers of its superior quality, acts as an even larger barrier to building scale. Under reasonable assumptions these two issues together are sufficient to explain the variation in the data. Finally, the third entry barrier is regulatory: Certificate of Need laws generate additional costs which the simulation model indicates may be substantial. Only the third entry cost, a regulatory issue, is a market failure which could be corrected by a change in public policy.

These three factors help to explain both past and current patterns of success. In the past entry through acquisition was associated with high success rates, consistent with the idea that scale was important. Today insurers face two increased barriers to building scale. First, by the year 2000 the number of other managed care plans in operation had increased significantly, implying an increase in the competition faced by integrated insurers. This together with the erosion of their cost advantage implied that consumers' expectations about the quality-choice tradeoff were increasingly important. Second, the increasingly high preventive care quality of non-integrated plans in potential new markets, while clearly beneficial to consumers, is likely have both reduced the quality advantage of integrated plans and increased consumer skepticism that the new insurer could dominate their other options. These effects together made it difficult for new plans to attract substantial numbers of enrollees. The results may also explain why existing non-integrated insurers and physician groups have not in general chosen to merge. The new approach would lead to consumer skepticism, and an unwillingness to give up choice of providers in the hope of benefiting from improved quality, in the case of a merger just as it would in the case of market entry.

The paper also considers welfare effects. Consumers are likely to benefit from the entry of integrated plans into new markets but this benefit is quite small, particularly in areas where existing plan quality is high. The most conservative simulation, which assumes that expected integrated plan preventive care quality equals but does not exceed the average level in the market, is probably the most relevant for high-quality markets. It implies a welfare gain of $6.2 billion per year over the 28 markets in the sample but a benefit to consumers of only $122 per privately insured person per year. If integrated plans improve on their competitors' quality, as is likely in low-quality areas, the welfare gain rises to $16.5 billion per year. The benefit to consumers increases somewhat to $346 per privately insured person per year. The numbers are higher if the quality lead is substantial. If integrated plan entry prompts other plans to improve their preventive care quality, as some of the data suggest, this may provide a larger benefit to consumers. The strategy adopted by Kaiser and similar plans of providing broad coverage, a restricted choice of providers and high-quality preventive care is predicted to be particularly popular with young, healthy consumers.

Appendix A: Details of the Entry Simulation

The simulation model quantifies the welfare effects of entry of a new integrated plan to each of 28 markets[31]. First I consider consumer surplus. Following Nevo (2001) and McFadden (1981), define consumer i's expected gain from entry of a new plan to the market, as:

$$\Delta_i = w_i^t - w_i^{t-1} \tag{4}$$

where u_i^t and u_i^{t-1} are defined by:

$$w_i^t = E_\omega \max_{j \in J_t}(\tilde{u}_{ijm}) = E_\omega \max_{j \in J_t}(V_{ijm} + \omega_{ijm}) \tag{5}$$

with $\tilde{u}_{ijm}^t$ defined as in equation (3), so that:

$$V_{ijm} = \xi_{jm} + \ z_{jm}\lambda + \ \gamma_1 EU_{ijm} + \gamma_2 \frac{prem_{jm}}{y_i}. \tag{6}$$

I limit the new plan's HEDIS and CAHPS scores to be less than 100%. The average quality of the new integrated plans (before accounting for observed characteristics and the unobservable ξ) is assumed to be equal to the estimated Kaiser fixed effect from the demand model. I assume that new plan's unobserved quality (the ξ in equation (3)) takes the average value estimated for Kaiser in the demand model.

Note that V_{ijm} is the expected welfare gain from the perspective of the econometrician given the available data. A dollar-valued measure of welfare can be obtained using the method suggested by Hicks (1939) to create the equivalent variation (EV). The EV is the change in consumer wealth that would be equivalent to the change in consumer welfare due to the network modification. McFadden (1981) shows that:

$$EV_{it} = \frac{1}{\alpha_i}(w_i^t - w_i^{t-1}) \tag{7}$$

where α_i is the negative of the coefficient on premium in the plan utility equation. Integrating analytically over the extreme value distribution of ω and summing over types of individual implies that:

$$EV_m = \sum_i \frac{n_i}{\alpha_i} \left[\ln \sum_{j \epsilon J_t} \exp(V_{ijm}) - \ln \sum_{j \epsilon J_{t-1}} \exp(V_{ijm}) \right] \tag{8}$$

where n_i is the population in ZCTA-age-sex cell i and the difference between J_t and J_{t-1} comes from the entry of the new plan and from adjustments in premiums to maximize plan profits after entry (and, in the third simulation, from the exit of the lowest-profit plan post-entry)[32].

Next I consider the effect of entry on plan profits. I use the demand estimates to predict consumer flows to both plans and hospitals before and after the network change. These are used to calculate revenues (which are increasing in the number of consumers that choose high-premium plans) and costs (which increase if consumers on average choose more expensive hospitals). I assume that non-integrated

[31] The markets are: Boston MA, Buffalo NY, Charlotte NC, Chicago IL, Cincinnati OH, Columbus OH, Dallas TX, Detroit MI, Fort Worth TX, Houston TX, Indianapolis IN, Jacksonville FL, Kansas City MO, Las Vegas NV, Miami FL, Milwaukee WI, Minneapolis MN, New Orleans LA, Norfolk VA, Orlando FL, Philadelphia PA, Phoenix AZ, Pittsburgh PA, St. Louis MO, Salt Lake City UT, San Antonio TX, Tampa FL and West Palm Beach FL.

[32] In applying this framework to a context where consumers have insurance, I am ignoring the issue of moral hazard. Consumers do not face the full price of the medical care they consume and therefore may choose to consume beyond the efficient level. The resulting wedge between consumer surplus and social surplus is not captured in my analysis.

plans pay hospitals profits equal to 14% of costs. Integrated plans are assumed to pay hospitals at cost. The profit of plan j in market m is therefore:

$$\pi_{jm} = \sum_i n_i \; s_{ijm}(prem_{jm} - \; pmt_i) \tag{9}$$

where n_i is again the population in ZCTA-age-sex cell i, s_{ijm} is plan j's share of type-i people in market m as specified by the demand system, and pmt_i is the payment made by the plan to the hospitals in its network for treating consumer i. Calculating pmt_i requires an estimate of $cost_i$, the cost of hospital treatment for type-i consumers. As before, define p_{il} as the probability that consumer-type i is admitted to hospital for diagnosis l. If s_{ihl} is the probability that a type-i person with diagnosis l will visit hospital h and $cost_{hl}$ is the cost that hospital h incurs by treating a patient with diagnosis l, then $cost_i$ is given by:

$$cost_i = \sum_l p_{il} E(\text{cost}_{il}) = \sum_l p_{il} \sum_{h \epsilon H_{jm}} s_{ihl} cost_{hl} \tag{10}$$

Data on total hospital expenses per admission are taken from the AHA 2001. Diagnosis-specific cost data would be preferable (since patient flows are predicted for each diagnosis separately) but were not available for this study. I repeat the calculation before and after the entry of the new plan and note the difference between them. The total change in plan profits in the market is the sum of these values over all plans j in market m.

I include plans' hospital costs in the simulation but ignore non-hospital costs. Including them and holding premiums fixed implied that almost all plans earned negative profits; allowing premiums to adjust led to very high premiums of over $200 per member per month, contradicting the observed data. Data from Weiss indicate that the majority of plans in reality have negative profits if we take premiums and total costs into account; they make up the difference by investing the float. I avoid modeling this investment process by including only hospital costs in my profit analysis.

I model plans' premium adjustments after entry of a new integrated insurer as the result of an equilibrium price-setting game, computed by finding the values that simultaneously minimize all plans' first order conditions. I assume that incumbent plans' hospital networks do not change after the change in market structure. I impose the predicted "optimal" premiums both before and after entry because the predicted values are different from those observed in the data (not surprising given that the model excludes plan non-hospital costs and does not model plans' investment of the float).

I adjust both consumer surplus and profit calculations for hospital capacity constraints. When a hospital is predicted to be over 85% of its maximum capacity I reallocate patients randomly to non-capacity constrained hospitals in the market. The adjustment affects patients' hospital choices and therefore their values of EU_{ijm}; these values are used to adjust down each patient's utility from each plan. Patients' choices of plan are not affected; I assume that consumers expect to have access to every hospital on the plan's list when they make their plan choice. Instead I account for the fact that some patients find, when they get sick, that they cannot access their preferred hospital and therefore receive less utility than expected from their chosen plan. The median equivalent variation falls only slightly as a result of this adjustment[33].

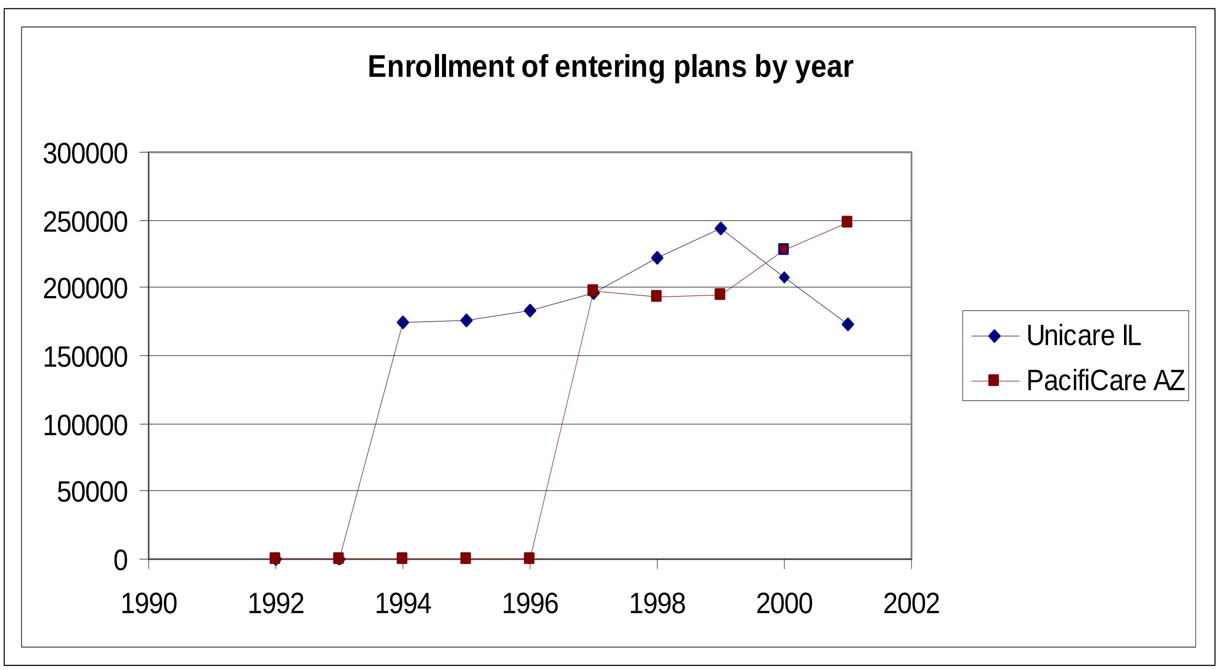
[33] I allocate excess patients to non-constrained hospitals equally, using probabilities $\frac{1}{H}$ where H is the number of non-constrained hospitals. I would ideally reallocate them according to their preferences (so that a patient whose preferred hospital was full would go to his second choice hospital). However, this would be computationally very intensive, adding another layer of simulation to an already complex model. The adjustment would not affect plan market shares; only their costs (due to allocation of enrollees across hospitals) would change. It would not affect the predicted profits of new integrated plans since their hospitals are assumed not to be capacity constrained. The profits of other plans would increase in some cases and decrease in others (depending on the costs of consumers' preferred hospitals). The change in consumer surplus from the introduction of the new plan would probably fall since the new plan's ability to ease capacity constraints

Appendix B: Methodology to Estimate Switching Costs

This Appendix sets out the methodology used to estimate the cost to consumers of switching health plans. I use data on the growth of new plans in particular markets taken from the *Weiss Ratings' Guide to HMOs and Health Insurers* for Fall 1992-2002. These data give the enrollment of each plan by state and year together with the plan's date of entry to the state.

I consider the entry of plans that follow the standard managed care strategy: they contract with networks of autonomous physicians and hospitals which overlap with those of other plans in the market and monitor utilization without attempting to integrate the provision of care. I therefore assume that the characteristics of the new insurer are known to consumers; any reluctance to switch plans is due to switching costs rather than uncertainty about the plan's quality or method of operation. This enables me to estimate switching costs (barriers to entry caused by the short-term costs associated with filling in forms to change insurers and with finding a new primary care physician) separately from the effect of unobservable quality. I also simplify by considering markets where no other insurers entered less than three years before or after the new plan: this justifies an assumption that consumers only pay the switching cost if they choose to join the entering plan. Only two events in my data matched these criteria: Unicare's entry to Chicago IL in 1994 and PacifiCare's entry to Phoenix AZ in 1997. The growth in enrollment for these two plans is given in Figure B1; I assume that the market-level growth rate for the new plans is the same as that at the state level[34]. It should be clear from the graph that switching costs are likely to be low: these two plans' enrollment ramped up quite quickly after entry.

Figure B1: Enrollment of Entering Plans By Year, 1990-2002



I consider two sources of switching costs: the administrative costs of paperwork to switch insurers and the uncertainty and effort involved with changing physicians. I do not have sufficient data to estimate these separately. Instead I set the former to zero and assume that the latter is a random draw

would become less valuable to consumers. This would strengthen the point that consumer benefits from entry of integrated plans are quite low.

[34] The insurer may in fact have entered markets in the state sequentially. In that case enrollment at the state level would probably ramp up more slowly than market-level enrollment, implying that I am over-estimating switching costs.

from a lognormal distribution with parameters (μ, σ^2)[35]. Each consumer receives a new draw in each year and makes his choice of plan that year given the observed draw. I adapt the demand model in equations (1)-(3), using my previous estimates for $(\hat{\alpha}, \hat{\beta}, \hat{\lambda}, \hat{\gamma})$, to estimate μ and σ.

I use data from the previous literature to inform my estimation. First, Chernew et al (2004) report that in January 2000 the average overlap between the physician networks of network model HMOs within a market was 54%. I assume the same average degree of overlap from 1994-2002. Therefore, when Unicare or PacifiCare entered their new markets, on average 54% of consumers could switch to these new plans without changing physicians (that is, according to my model they could switch costlessly)[36]. Second, data from the US Bureau of the Census's Current Population Reports indicates that on average 3% of the population of the states considered in my data had immigrated to that state in the year 1997-98. I assume the same level of immigration in every state. Finally, a survey on physician retention published by Cejka Search and the American Medical Group Association in 2005 states that 3.4% of physicians retire, die or move away from their area of practice every year.

These data together imply that, in the year when the new plan enters the market, 57% of the population can switch plans with no incremental cost of changing physicians (54% would not require a physician change; the remainder would have had to switch physicians in any case). The remaining 43% would have a switching cost drawn from the lognormal distribution whose parameters are to be estimated. The following year a further 6.3% of the remaining population would have zero incremental costs (either because they were new immigrants to the state or because their physicians retired, died or moved away). The population facing zero costs is assumed to increase similarly each year[37].

The analysis assumes that in each year t after entry, each consumer observes his switching cost draw (either zero or a draw from the lognormal distribution) and chooses whether to move plans. His utility from any particular plan j is

$$\tilde{u}_{ijtm} = \xi_{jm} + z_{jm}\hat{\lambda} + \hat{\gamma}_1 EU_{ijm} + \hat{\gamma}_2 \frac{prem_{jm}}{y_i} - c_{itj} + \omega_{ijm} \tag{11}$$

where $(\hat{\lambda}, \hat{\gamma}, EU_{ijm})$ were estimated in the main demand model and c_{itj} is his switching cost draw for the new plan and zero for all other plans[38]. I use equation (11) to predict the probability that each consumer chooses each plan and sum over consumers to predict market shares. The parameters (μ, σ) are estimated by fitting observed to predicted shares for each plan in each of the first four years after entry using a general method of moments methodology. The results imply a lognormal distribution with mean 0.358 utils and standard deviation 2.368 utils. This is equivalent to a premium increase of \$456.24 per year; the standard deviation is equivalent to \$3018.40 per year.

The second step is to simulate the impact of these switching costs on the profits of new vertically integrated plans. Here I assume that all consumers who move from their current plan to the integrated insurer must incur an incremental physician switching cost unless they are new immigrants or their physician has retired, died or moved away[39]. I add the estimated switching costs to the baseline

[35] I also conducted the analysis setting the second cost to zero and estimating the first. This method generated lower estimated switching costs and a smaller effect on integrated plan profits than the results given here.

[36] This figure would be reduced and the estimated switching costs would also fall if we accounted for the fact that some consumers are in reality attached to two doctors (e.g. their primary care physician and their OB/GYN). This would strengthen the finding that switching costs are not an important issue for integrated insurers.

[37] There is an implicit assumption that all immigrants remain in the market and that other members of the population leave each year so that the total population size remains constant.

[38] I assume that the estimated values of $(\hat{\lambda}, \hat{\gamma}, EU_{ijm})$ from the main demand model are unaffected by switching costs. This is consistent with the assumption, made in the switching cost analysis, that switching costs have a negligible effect more than four years after entry. No plans entered the 43 markets in the data less than four years of 2002. I also assume that plan characteristics were unchanged between 1992 and 2002.

[39] In reality some positive proportion of physicians would probably move to the integrated plan when it entered the market, taking their patients with them. My assumption therefore implies an overestimate of the effect of switching costs

simulation and to the simulation assuming low consumer expectations of plan quality. In both cases I use utility equation (11) and assume that the switching cost applies only to the new integrated plan. I predict the new plan's enrollment and profits for the five years after entry. The results are set out in Table B2. I find, as expected, that switching costs have only a small effect on enrollment. The integrated plan's profits in the baseline simulation are $84 million (or 12.9%) lower than the scenario without switching costs in the first year; it has 44,500 enrollees (approximately 12%) fewer enrollees than in the no-switching costs scenario. By the fifth year, the integrated plan's profits are only $4 million lower, and its enrollment only 2000 lower than they would have been with no switching costs. The pattern is similar for the model assuming low consumer quality expectations. By the fifth year the integrated plan has lost only $1 million and 700 enrollees compared to the no-switching costs case. These results are not surprising given the low estimated average switching costs. For example, the median estimated difference between utility from the integrated plan and that from the next-best plan, for people who preferred the integrated plan in West Palm Beach FL, was 1.13 utils in the baseline simulation. This is far larger than the average switching cost of 0.36 utils. The results also support the assumption that switching costs only apply for the first 4 years after plan entry into a new market.

The results are approximate: I have very limited data and therefore cannot hope to accurately estimate the true distribution of costs. However, these simple estimates may be sufficient for a comparison of the orders of magnitude of the different barriers to entry. Switching costs are very low compared to the barriers to entry generated by plan problems with exceeding their competitors' high quality levels and compared to consumer skepticism regarding the benefits of new integrated plans.

Table B2: Effects of Estimated Switching Costs on Integrated Plans

	Baseline Simulation		Low consumer expectns	
Median values	Number of enrollees	Total Profit per year	Number of enrollees	Total Profit per year
Existing integrated plans	1.93×10^5	2.67×10^8		
New integrated plans	3.74×10^5	6.54×10^8	8.97×10^4	1.20×10^8
With switching costs				
Year 1	3.29×10^5	5.70×10^8	7.71×10^4	1.03×10^8
Year 2	3.61×10^5	6.30×10^8	8.58×10^4	1.15×10^8
Year 3	3.69×10^5	6.43×10^8	8.79×10^4	1.18×10^8
Year 4	3.71×10^5	6.47×10^8	8.86×10^4	1.19×10^8
Year 5	3.72×10^5	6.50×10^8	8.90×10^4	1.19×10^8

Notes: This Table summarizes two simulations of entry of a vertically integrated plan to each of the 28 markets in the A.I.S. data in which no integrated plan is observed. Premiums are permitted to adjust before and after entry. Columns 1-2 set out median enrollment and profits for the baseline simulation and then add switching costs for consumers choosing the new integrated plan. Columns 3-4 allow consumers to expect the new insurer's HEDIS and CAHPS variables and unobserved quality to take the average value of existing plans in the market and then add switching costs to this scenario.

on integrated plans.

Appendix C: Simulations to Account for Variation in Consumer Demand for Insurers and Hospitals

Variation in Consumer Demand for Insurers

Section 7 notes the results of two simulations to analyze the extent and effect of variation in consumer preferences for insurers and hospitals across markets. The first analysis considers preferences over insurers. I estimate the model of consumer demand for plans separately in markets that contain an integrated plan and in those that do not. The results are set out in Table 9. There are some differences in preferences across the two types of markets. The coefficients on physicians per population and expected utility from the hospital network are lower, and those on many HEDIS measures are higher, in markets that contain integrated plans. These results are intuitive, since integrated plans tend to be popular in their current markets and to have relatively small provider networks and high-quality preventive care[40].

The next step is to repeat the simulation using the results of the new demand analysis: that is, allowing consumers in markets where the plan is to enter to have different preferences from those where similar plans already exist. As in Column 2 of Table 10, I do not allow other plans to exit after the change in market structure but do allow premiums to adjust both before and after plan entry. The results are reported in Column 1 of Table 14.

Two issues from the demand analysis will affect our interpretation of the results. First, many of the coefficients which were significant in the main demand analysis are now insignificant (for example, those on the size of the physician network and on the rate of screening for breast cancer); the results should therefore be interpreted with caution. Second, the coefficient on premium is positive in markets containing integrated plans despite the fact that I instrument for premiums. Adding more instruments beyond those used in the baseline model did not alter the sign of this coefficient. As noted above, adding an interaction between premium and a dummy for integrated plans generated a negative premium coefficient and a positive and significant interaction term. This indicates that the problem is caused by the high premiums observed for integrated plans in the data, which generate a positive correlation between premiums and market shares in these markets. The Kaiser dummy coefficient, which is now even less negative than in the main demand estimation, again absorbs the value to consumers of the plan's low copayments and deductibles. Most of the simulation exercise concerns markets that do not initially contain integrated plans and are therefore unaffected by this problem. However, it implies that we cannot predict premium adjustments in markets that already contain integrated plans since the code to adjust premiums does not converge when the premium coefficient is positive. We therefore cannot use plans in these markets as a comparison group for the new entrants. Instead I use the baseline results for existing integrated plans as a comparison group.

The results do not explain the lack of growth of integrated plans. As before, consumer surplus increases when the new plan enters the market and the integrated plan receives positive profits. The total welfare increase is lower, and the benefit to consumers is smaller, than in the baseline simulation because consumers have a lower valuation for most of the new plan's characteristics. However, the new plan is actually more profitable on average than it was before: it reduces its premiums to take account of

[40] These differences in tastes could be caused by variation in consumer sickness levels. If the prevalence of cancer or diabetes was higher in California than elsewhere then it would not be surprising that consumers in California placed a higher weight on preventive measures for these conditions or that integrated plans chose to focus their efforts on the West Coast. However, the publication "United States Cancer Statistics: 2002 Incidence and Mortality" states that the rate of invasive cancer incidence in males in 2001 was 544.8 per 100,000 in the US as a whole but only around 500 per 100,000 (the 6th lowest of all states) in California. Data from the Center for Disease Control's Diabetes Program Surveillance System indicate that the prevalence of diabetes in 2003 was 9.2 per 100 people aged 45-64 in the US as a whole and 10.1 per 100 population in California. The difference is not large enough to easily explain the variation in consumer preferences. It seems that these preference differences are due to idiosyncratic taste (and perhaps a need to learn through experience about the value of high-quality preventive care) rather than medical need.

consumers' increased price sensitivity but in doing so (and partly because of high consumer valuations for some HEDIS characteristics, such as the rate of eye exams for diabetic patients and receiving care quickly) it succeeds in increasing enrollment and total profits. Other plans in the market also reduce their premiums compared to the baseline simulation; again their profits fall when Kaiser enters.

Variation in Consumer Demand for Hospitals

The next step is to consider whether consumer preferences over hospital characteristics (rather than plan characteristics) might differ across markets. I consider this issue by estimating the hospital demand model separately in markets which contain integrated plans and those that do not. Unfortunately this analysis is more limited than that in the previous section because the MEDSTAT data used for the hospital demand model contain only 11 markets in total. Only one of them, Seattle WA, contains a vertically integrated plan (Group Health Cooperative of Puget Sound). I therefore estimate the demand model in that market and then repeat the same analysis in the remaining 10 markets in the data. I exclude any variables that do not vary across observations in Seattle. I also exclude variables from the regression of hospital dummy coefficients on hospital characteristics if their coefficients were insignificant in the main demand model. This ensures that I have more observations than independent variables and therefore that the regression is feasible. The results are given in Columns 2 and 3 of Tables 7 and 8.

The results indicate that consumers in Seattle (the market containing an integrated plan) care less about their distance from the particular hospital and have a higher preference for large hospitals than those in other markets. Consumers in markets without integrated plans have a higher valuation for hospitals with a large number of nurses and physicians per bed and for those with a medical school affiliation. It is perhaps surprising to note, from Table 6, that hospitals offered by integrated plans tend to be strong on the dimensions preferred by consumers in these new markets. They have more nurses and physicians per bed, fewer beds and are more likely to have an affiliation with a Medical School than other hospitals. We should expect, then, that the integrated plan should do better under the revised simulation exercise than in the baseline model.

The results of the simulation, given in Column 2 of Table 14 and outlined in Section 7, are consistent with this intuition. Consumer surplus increases as a result of the new entry but again by less than in the baseline simulation (because the new plan's premiums increase in order to capture the value of its now-popular hospitals). The new integrated plans have higher premiums and higher profits than before. Other plans suffer as a result of the new insurer's increased popularity: their median profits fall compared to the baseline. The overall effect is a benefit to consumers of $18.84 billion per year, to the new integrated plans of $20.24 billion per year, and a total welfare gain of $32.53 billion per year. Again, this simulation fails to explain the observed limited entry of integrated plans.

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Table 1: Market Shares of Kaiser Permanente in 13 U.S. Markets

Market	Market Share 1998	Date entered	Owns hospitals?	CON Laws?	Exited Market?
Los Angeles, CA	0.352	1945	Yes	No	No
Oakland, CA	0.555	1945	Some	No	No
Orange County, CA	0.164	1945	Some	No	No
Sacramento-Yolo, CA	0.530	1945	Yes	No	No
San Diego, CA	0.318	1945	Some	No	No
San Francisco, CA	0.392	1945	Yes	No	No
San Jose, CA	0.421	1945	Yes	No	No
Portland-Salem, OR	0.296	1955	Some	No	No
Cleveland, OH	0.119	1969	No	No	No
Denver, CO	0.276	1969	No	No	No
Baltimore, MD	0.033	1980	No	Yes	No
Washington, DC	0.177	1980	No	Yes	No
Atlanta, GA	0.099	1985	No	Yes	No
Dallas, TX	-	1979	No	No	1998
Kansas City, MO	0.057	1985	No	Yes	2001
North Carolina	-	1985	No	Yes	2000
Northeast Region	-	1996	No	Most	1999

Notes: This Table shows the market share of Kaiser Permanente in 17 U.S. markets (the 13 markets out of the 43 included in the A.I.S. data described in Section 3 in which Kaiser is active plus four markets that it unsuccessfully attempted to enter since 1979). Shares are given as per cent of the commercially insured population in 1998; enrollment data are taken from the InterStudy *Competitive Edge* report for that year. Date of market entry, and information concerning hospital ownership, are also given. (Kaiser offers only its own hospitals in some markets, such as Los Angeles; contracts exclusively with independent hospitals in others, such as Cleveland OH; and pursues both strategies in markets such as Oakland CA.) "CON Law" notes whether Certificate of Need Laws applied to hospital construction in the state in the year when Kaiser entered.

Table 2: Kaiser Quality Relative to Competitors in Existing and Exited Markets

% Difference between Kaiser and Competitors	1997	1998	1999	2000	2001
Breast cancer screening					
Existing Plans	0.133	0.087	0.078	0.093	
Texas	0.133	-0.065	Exits		
Northeast	0.146	0.100	0.041	Exits	
Kansas City	0.087	0.082	0.010	-0.046	Exits
Cervical cancer screeing					
Existing Plans	0.149	0.098	0.098	0.100	
Texas	0.186	-0.076	Exits		
Northeast	0.077	0.091	0.083	Exits	
Kansas City	0.062	0.058	0.118	-0.039	Exits
Prenatal Checkups					
Existing Plans	0.106	0.045	0.079	0.040	
Texas	0.027	-0.032	Exits		
Northeast	0.094	0.000	-0.010	Exits	
Kansas City	-0.018	-0.118	0.349	0.548	Exits
Checkups After Delivery					
Existing Plans	0.337	0.217	0.148	0.108	
Texas	0.888	0.106	Exits		
Northeast	0.194	0.111	0.114	Exits	
Kansas City	0.042	-0.094	0.230	0.109	Exits
Diabetic Eye Exams					
Existing Plans	0.729	0.439	0.634	0.588	
Texas	0.659	0.224	Exits		
Northeast	0.568	0.213	0.312	Exits	
Kansas City	1.163	0.991	1.226	0.626	Exits
Mental Illness Checkup					
Existing Plans	0.316	0.117	0.710	0.276	
Texas	-0.009	0.025	Exits		
Northeast	0.228	0.271	0.330	Exits	
Kansas City	0.005	0.592	0.491	0.158	Exits

Notes: This Table compares the clinical quality measures of Kaiser plans relative to their competitors in markets where Kaiser still exists compared to markets where it has left the area. Each element of the Table reports the average of the percentage difference between Kaiser's quality and those of each of the others plans in the market. A positive number implies high Kaiser quality. The first row for each quality indicator is an average of this value over all markets in the data where Kaiser still exists. The following three rows report the corresponding data for three Kaiser plans that have exited their markets.

Table 3: Comparison of Non-Integrated Plan Quality in Markets with and without Integrated Plans

Quality Measure	1. Markets with Integ. Plans Mean (Var)	2. Markets without Integ. Plans Mean (Var)	3. Markets where Int. Plans Failed Mean (Var)	p-value for difference in means 1. vs 2.	2. vs 3.	1. vs 3.
Breast cancer screening	74.08 (7.5)	74.44 (13.0)	75.55 (11.0)	0.36	0.18	0.11
Cervical cancer screening	73.22 (7.3)	72.15 (27.2)	76.25 (20.6)	0.20	0.01	0.02
Check-ups after delivery	72.99 (11.6)	74.15 (41.4)	78.43 (53.1)	0.23	0.04	0.01
Diabetic eye exam	46.18 (27.4)	46.06 (112.4)	54.16 (66.5)	0.48	0.01	0.00
Adolescent immunization 1	26.47 (66.1)	33.40 (297.5)	37.93 (198.9)	0.04	0.22	0.01
Adolescent immunization 2	12.81 (23.2)	14.05 (84.7)	21.73 (116.3)	0.29	0.02	0.01
Advice on smoking	62.91 (26.9)	64.77 (18.6)	67.81 (21.1)	0.13	0.03	0.01
Mental illness checkup	65.03 (147.4)	71.12 (50.8)	73.48 (75.1)	0.06	0.21	0.03
N	15	25	13			

Notes: This Table compares the average quality measures of non-integrated plans in the 15 markets in the data that contain integrated plans to the average of non-integrated plans in the 25 markets that do not and 13 markets that Kaiser has entered and subsequently exited. See Table 4 for definitions of the quality measures.

Table 4: Comparison of Vertically Integrated Plans and Other Plans

Variable	Definition	Non-VI Plans Mean (SD)	VI Plans Type 1 Mean (SD)	VI Plans Type 2 Mean (SD)	VI Plans Type 3 Mean (SD)
Premium pmpm ($)	Premiums earned per member per month	$138.98 (46.47)	$176.00 (0)	$157.29 (17.53)	$139.75 (8.19)
Physicians per 1000 popln	Number of physician contracts per 1000 popln in markets covered by plan	1.60 (1.53)	0.31 (0)	0.73 (0.72)	0.56 (0.63)
Breast cancer screening	% of women aged 52-69 who received a mammogram within last 2 yrs	0.73 (0.05)	0.77 (0)	0.79 (0.04)	0.81 (0.02)
Cervical cancer screening	% of adult women who received pap smear within last 3 yrs	0.71 (0.07)	0.80 (0)	0.82 (0.03)	0.82 (0.05)
Check-ups after delivery	% of new mothers receiving a check-up withing 8 weeks of delivery	0.72 (0.11)	0.81 (0.03)	0.79 (0.05)	0.80 (0.02)
Diabetic eye exam	% of adult diabetics receiving eye exam within last year	0.43 (0.09)	0.72 (0.03)	0.75 (0.07)	0.70 (0.14)
Adolescent immunizn 1	% receiving all required doses of MMR & Hep B vaccines before 13th birthday	0.31 (0.16)	0.35 (0.02)	0.37 (0.13)	0.49 (0.16)
Adolescent immunizn 2	% receiving all required doses of MMR Hep B & VZV vaccines before 13th birthday	0.15 (0.10)	0.18 (0.06)	0.25 (0.12)	0.41 (0.19)
Advice on smoking	% of adult smokers advised by physician to quit	0.63 (0.67)	0.67 (0.01)	0.71 (0.05)	0.70 (0.06)
Mental illness checkup	% of members seen as outpatient w/in 30 days of discharge after hospitalizn for mental illness	0.67 (0.15)	0.82 (0.03)	0.83 (0.06)	0.86 (0.06)
Care quickly	Member satisfaction re: get care as soon as wanted	0.76 (0.05)	0.75 (0.04)	0.78 (0.06)	0.79 (0.01)
Care needed	Member satisfaction re: getting authorizations for needed care	0.72 (0.06)	0.76 (0.02)	0.78 (0.05)	0.78 (0.03)
POS plan	Dummy for POS plan	0.36 (0.48)	0 (0)	0.14 (0.38)	0 (0)
Kaiser plan	Plan fixed effect	0 (0)	1 (0)	0.57 (0.53)	1 (0)
% hospitals	% of market hospitals in network	0.80 (0.19)	0.17 (0.07)	0.26 (0.12)	0.43 (0.17)
N		500	4	7	5

Notes: This Table compares the characteristics of non-vertically integrated plans to those of three types of integrated plans. Type 1 plans own their own hospitals. Type 2 plans own some hospitals and contract with others in their markets. Type 3 plans do not own hospitals.

Table 5: Hospitals offered by Integrated and Other Plans

	No contract with VI Plan Mean (Std Devn)	Contracts with VI Plan Mean (Std Devn)	Owned by VI Plan Mean (Std Devn)
Number of beds	337.9 (221.1)	376.9 (185.2)	236.1 (101.1)
Teaching status	0.20 (0.40)	0.19 (0.40)	0 (0)
Residency program	0.39 (0.49)	0.50 (0.50)	0.67 (0.49)
Medical school affiliation	0.46 (0.50)	0.52 (0.50)	0.67 (0.49)
For-profit	0.21 (0.41)	0.13 (0.34)	0 (0)
Registered nurses per bed	1.23 (0.48)	1.55 (0.56)	1.43 (0.70)
Physicians per bed	0.08 (0.21)	0.09 (0.18)	0.18 (0.32)
Cardiac services	0.81 (0.31)	0.88 (0.23)	0.56 (0.43)
Imaging services	0.54 (0.29)	0.57 (0.28)	0.55 (0.26)
Cancer services	0.65 (0.40)	0.76 (0.37)	0.26 (0.21)
Birth services	0.85 (0.35)	0.88 (0.32)	0.93 (0.26)
Distance from city center	10.57 (11.60)	9.96 (8.53)	9.56 (9.08)
Cost per admission ($000)	11.16 (4.42)	11.63 (4.58)	9.21 (5.02)
N	598	52	15

Notes: This Table compares the characteristics of hospitals which are not affiliated with integrated plans to hospitals which contract with integrated plans and to hospitals which are owned by integrated plans. Cardiac, imaging, cancer and birth services refer to four summary variables defined in Table 6.

Table 6: Definition of Hospital Services

This Table sets out the definition of the hospital service variables used to generate interaction terms for the hospital demand equation. Hospitals were rated on a scale from 0 to 1 within four service categories, where 0 indicates that no services within this category are provided by the hospital and a higher rating indicates that less common (assumed to be higher-tech) service in the category is offered. The categories are cardiac, imaging, cancer and births. The services included in each category are listed in the following Table.

Cardiac	Imaging	Cancer	Births
CC laboratory	Ultrasound	Oncology services	Obstetric care
Cardiac IC	CT scans	Radiation therapy	Birthing room
Angioplasty	MRI		
Open heart surgery	SPECT		
	PET		

The exact methodology for rating hospitals is as follows. If the hospital provides none of the services its rating = 0. If it provides the least common service its rating = 1. If it offers some service X but not the least common service its rating = (1 - x) / (1 - y), where x = the percent of hospitals offering service X and y = the percent of hospitals offering the least common service.

Table 7: Hospital Demand Results, ML Estimation

Interaction Terms	Variable	1. All Markets	2. Markets with Integrated Plans	3. Markets without Integrated Plans
	Distance (miles)	-0.215 (0.004)	-0.163 (0.015)	-0.213 (0.004)
	Distance squared	0.001 (0.000)	0.004 (0.000)	0.001 (0.000)
	Emergency * distance	-0.008 (0.004)	-0.160 (0.090)	-0.006 (0.004)
Teaching	Cardiac	0.090 (0.060)	1.134 (0.551)	0.075 (0.060)
	Cancer	0.192 (0.069)	-0.126 (0.458)	0.197 (0.071)
	Neurological	0.546 (0.175)	1.805 (3.720)	0.533 (0.176)
	Digestive	-0.145 (0.062)	0.016 (0.444)	-0.151 (0.062)
	Labor	0.157 (0.048)	-0.536 (0.391)	0.144 (0.048)
	Newborn baby	0.038 (0.075)	-0.745 (0.392)	0.024 (0.076)
	Income ($000)	0.007 (0.001)	0.033 (0.009)	0.007 (0.001)
	PPO enrollee	-0.067 (0.050)	3.511 (1.128)	-0.072 (0.051)
Nurses per bed	Cardiac	-0.096 (0.070)	-0.962 (0.955)	-0.082 (0.069)
	Cancer	0.445 (0.079)	-0.564 (0.842)	0.466 (0.079)
	Neurological	0.130 (0.200)	-7.294 (5.097)	0.133 (0.198)
	Digestive	-0.028 (0.076)	1.301 (0.933)	-0.053 (0.075)
	Labor	-0.002 (0.063)	0.885 (0.730)	0.022 (0.062)
	Newborn baby	0.071 (0.087)	0.468 (0.707)	0.153 (0.085)
	Income ($000)	0.005 (0.001)	0.009 (0.012)	0.005 (0.001)
	PPO enrollee	-0.099 (0.056)	-1.989 (1.220)	-0.087 (0.055)
Interactions: For-Profit	Cardiac	-0.164 (0.181)		
	Cancer	-0.197 (0.202)		
	Neurological	0.229 (0.379)		
	Digestive	0.195 (0.150)		
	Labor	0.300 (0.107)		
	Newborn baby	0.194 (0.122)		
	Income ($000)	-0.001 (0.003)		
	PPO enrollee	-0.036 (0.090)		
Cardiac Services	Cardiac	1.222 (0.134)	-0.079 (1.818)	1.267 (0.136)
	Income ($000)	0.001 (0.001)	0.042 (0.011)	0.000 (0.001)
	PPO enrollee	0.080 (0.088)	-22.08 (6.61)	0.103 (0.088)
Imaging Services	Cardiac	-0.188 (0.094)	-0.534 (1.011)	-0.195 (0.095)
	Cancer	-0.052 (0.107)	1.215 (1.241)	-0.049 (0.108)
	Neurological	-0.084 (0.287)	7.398 (6.869)	-0.090 (0.286)
	Digestive	-0.182 (0.105)	-1.281 (1.057)	-0.176 (0.105)
	Labor	-0.071 (0.084)	-0.923 (0.843)	0.066 (0.085)
	Newborn baby	0.398 (0.129)	-0.487 (0.823)	0.640 (0.133)
	Income ($000)	0.004 (0.001)	-0.038 (0.019)	0.004 (0.001)
	PPO enrollee	-0.061 (0.072)	0.595 (2.149)	-0.103 (0.071)
Cancer Services	Cancer	0.073 (0.082)	-0.709 (0.666)	0.101 (0.083)
	Income ($000)	-0.005 (0.001)	0.020 (0.014)	-0.005 (0.001)
	PPO enrollee	0.087 (0.056)	0.345 (1.187)	0.083 (0.054)
Labor Services	Labor	3.544 (0.391)		
	Newborn baby	3.116 (0.487)		
	Income ($000)	-0.003 (0.002)		
	PPO enrollee	0.045 (0.077)		
	Pseudo-Rsquared	0.43	0.28	0.43

Notes: MLE model of demand for hospitals including hospital fixed effects. N = 28,666 encounters. Column 1 contains the baseline specification; Columns 2 and 3 estimate the model separately in the market with an integrated plan and the 10 markets without. Variables excluded if no variation in either sample.

Table 8: Regression of Hospital Dummy Coefficients on Hospital Characteristics

Variable	1. All Markets	2. Markets with Integrated Plans	3. Markets without Integrated Plans
Neonatal Intensive Care	-1.79 (1.46)		
Angioplasty	-1.51 (1.61)		
Cardiac Catheterization Laboratory	5.90 (1.82)	25.37 (11.22)	3.62 (1.21)
Computed-tomography scanner	6.53 (3.88)		
Positron emission tomography	4.55 (1.57)	-3.85 (2.69)	2.97 (1.22)
Single photon emission computerized tomography	-3.23 (1.09)	-3.46 (0.82)	-1.22 (0.84)
Oncology services	2.90 (2.08)		
Obstetric services	-1.93 (1.69)		
Emergency Department	-4.29 (2.20)		
Breast cancer screening/mammograms	-4.44 (2.49)		
Burn care	2.10 (1.88)		
Alcohol/drug abuse inpatient care	0.51 (1.24)		
Number of beds	0.01 (0.004)	0.09 (0.04)	0.01 (0.00)
Distance from City Hall	0.63 (0.19)	2.07 (1.16)	0.39 (0.15)
Distance from City Hall squared	-0.02 (0.01)	-0.10 (0.06)	-0.01 (0.01)
Registered nurses per bed	28.18 (4.97)	-16.70 (8.40)	18.03 (4.12)
Nurses per bed squared	-9.74 (1.76)	5.32 (2.73)	-6.53 (1.44)
Doctors per bed	3.78 (1.79)	-14.79 (11.06)	1.82 (1.06)
JCAHO accreditation	6.83 (3.45)	14.79 (12.83)	4.65 (1.87)
Cancer Program approved by ACS	4.32 (1.72)	1.05 (9.74)	1.35 (1.34)
Residency Training Program	-4.46 (1.46)	-0.91 (7.92)	-3.29 (1.02)
Medical School	4.72 (1.36)	-35.21 (15.40)	2.93 (0.93)
Member of Council of Teaching Hospitals of the Association of American Medical Colleges	-0.29 (1.86)		
Independent Practice Association - hospital	5.27 (1.15)		
Foundation	-6.79 (2.04)	0.78 (4.50)	-2.13 (1.26)
Indemnity Fee for Service Plan - hospital	2.56 (2.27)		
Primarily osteopathic hospital	1.56 (3.72)		
Operates subsidiary corporations	2.24 (1.05)	-24.39 (12.18)	1.58 (0.85)
Controlled/owned by county	-9.51 (3.80)		
Controlled/owned by Church	-4.49 (1.41)		
Controlled/owned by For-profit partnership	19.69 (5.06)		
Constant	-32.10 (5.57)	-10.57 (4.15)	-29.76 (3.40)
Market fixed effects	Yes	No	Yes
R-squared	0.44	0.99	0.34

Notes: Regression of estimated hospital fixed effect coefficients from multinomial logit model on hospital characteristics. N = 434 hospital-years. Column 1 contains the baseline specification; Columns 2 and 3 report results from estimating the model separately in the 1 market which contains integrated plans and the 10 markets which do not. Variables excluded if not significant in baseline specification or if no variation in either sample. Robust standard errors are reported in parentheses.

Table 9: Results of Plan Demand Estimation

	Baseline Coefft Estimate	Markets with Integrated Plans Coefft Estimate	Markets without Integrated Plans Coefft Estimate
Premium ($00 pmpm)	-0.94 (1.13)	1.19 (1.34)	-2.08 (2.73)
Expected utility from hospital network	0.59 (0.21)	0.35 (0.24)	0.63 (0.31)
Premium ($00 pmpm) / Income ($000 per yr)	0.002 (43.9)	0.04 (4.09)	2.53 (1.58)
Physicians per 1000 population	0.21 (0.09)	0.07 (0.09)	0.31 (0.18)
Breast cancer screening	-0.38 (2.66)	3.57 (5.55)	-1.12 (3.87)
Cervical cancer screening	4.40 (2.09)	5.64 (5.35)	2.05 (2.78)
Check-ups after delivery	0.18 (1.38)	2.94 (2.73)	0.13 (1.20)
Diabetic eye exams	-1.19 (1.60)	0.25 (2.48)	1.50 (1.59)
Adolescent immunization 1	-4.11 (1.17)	-2.89 (2.70)	-4.30 (2.75)
Adolescent immunization 2	3.08 (3.76)	0.17 (2.49)	1.59 (2.97)
Advice on smoking	6.17 (2.08)	3.64 (3.19)	5.82 (3.51)
Mental illness check-ups	2.70 (1.30)	1.53 (2.94)	0.72 (1.17)
Care quickly	0.78 (5.63)	-4.04 (6.05)	6.61 (6.31)
Care needed	0.85 (3.99)	-5.89 (5.73)	-0.47 (6.97)
Plan age: 0 - 2 years	1.36 (0.97)		2.28 (1.92)
Plan age: 3 - 5 years	-0.64 (1.97)	-0.55 (0.64)	-0.56 (0.85)
Plan age: 6 - 9 years	-0.25 (0.58)	-0.17 (0.46)	-0.79 (0.66)
POS plan	-1.11 (0.13)	-1.16 (0.13)	-0.97 (0.21)
Constant	-10.50 (5.65)	-8.32 (4.47)	-9.05 (6.98)
Aetna	-0.59 (0.62)	-1.33 (0.57)	-0.47 (0.52)
CIGNA	-1.37 (0.68)	0.39 (2.04)	-0.91 (0.52)
Coventry	-0.62 (0.83)	-0.70 (0.75)	-0.72 (0.66)
Health Net	-0.88 (0.44)	-0.70 (1.27)	0.47 (2.61)
Kaiser	-0.67 (0.44)	-0.38 (0.60)	
Humana	-1.73 (0.75)	-0.83 (0.75)	-2.11 (0.84)
One Health	-2.82 (1.22)	-1.05 (0.79)	-3.58 (1.23)
PacifiCare	-1.42 (0.49)	-2.18 (0.67)	-2.16 (0.75)
United	-0.48 (0.57)	-0.64 (0.74)	-0.53 (0.48)
Unicare	-6.74 (1.34)	-6.06 (1.44)	-0.53 (0.48)
Blue Cross Blue Shield	-0.07 (0.99)	0.67 (0.56)	-0.52 (0.48)
Market fixed effects	Yes	Yes	Yes

Notes: N=559 plans. Column 1 contains the baseline specification; Columns 2 and 3 report results from estimating the model separately in the 15 markets which contain integrated plans and the 28 markets which do not. Standard errors (adjusted for the three-stage estimation process) are reported in parentheses.

Table 10: Simulated Effects of Vertically Integrated Plan Entry

		1. No Premium Adjustment	2. Premiums adjust before and after entry	3. Premiums adjust; lowest-π plan exits
Median effect on Consumer Surplus ($ per privately insured person per year):				
EV per person per year ($)		$603.97	$612.56	$545.91
Median effect on Integrated Plan:				
Premium pmpm ($)	existing plans	$148.01	$184.60	$184.60
	new plans	$176.85	$199.23	$200.61
Profit per enrollee per yr ($)	existing plans	$922.68	$1360.10	$1360.10
	new plans	$1379.00	$1602.70	$1635.50
Number of enrollees	existing plans	2.10×10^5	1.93×10^5	1.93×10^5
	new plans	3.31×10^5	3.74×10^5	3.75×10^5
Total profit per year	existing plans	$\$1.84 \times 10^8$	$\$2.67 \times 10^8$	$\$2.67 \times 10^8$
	new plans	$\$4.15 \times 10^8$	$\$6.54 \times 10^8$	$\$6.98 \times 10^8$
Median effects on other HMO/POS Plans:				
Premium pmpm ($)	before entry	$146.02	$195.84	$195.71
	after entry	$146.02	$194.66	$195.25
Profit per enrollee per yr ($)	before entry	$730.04	$1301.10	$1302.10
	after entry	$718.30	$1290.90	$1297.00
Number of enrollees	before entry	2.54×10^4	2.23×10^4	2.50×10^4
	after entry	2.12×10^4	1.73×10^4	2.09×10^4
Total profit per year ($)	before entry	$\$1.77 \times 10^7$	$\$2.87 \times 10^7$	$\$3.28 \times 10^7$
	after entry	$\$1.38 \times 10^7$	$\$2.16 \times 10^7$	$\$2.72 \times 10^7$
Median effects on Indemnity/PPO Plans:				
Premium pmpm ($)	before entry	$177.77	$214.21	$214.21
	after entry	$177.77	$214.62	$212.63
Profit per enrollee per yr ($)	before entry	$1112.00	$1450.00	$1450.00
	after entry	$1100.50	$1442.20	$1432.10
Number of enrollees	before entry	8.94×10^5	9.31×10^5	9.31×10^5
	after entry	7.11×10^5	7.50×10^5	7.50×10^5
Total profit per year ($)	before entry	$\$1.09 \times 10^9$	$\$1.26 \times 10^9$	$\$1.26 \times 10^9$
	after entry	$\$7.78 \times 10^8$	$\$1.05 \times 10^9$	$\$1.05 \times 10^9$
Overall Welfare Effects implied by medians ($ billion):				
Increase in CS		$24.21 billion	$24.56 billion	$21.89 billion
Increase in PS: Integrated plan		$11.62 billion	$18.32 billion	$19.55 billion
Increase in PS: HMO/POS		- $0.93 billion	- $1.45 billion	- $1.66 billion
Increase in PS: Indemnity/PPO		- $4.86 billion	- $6.55 billion	- $6.54 billion
Total		$30.04 billion	$34.88 billion	$33.24 billion

Notes: This Table summarizes 3 simulations of entry of a vertically integrated plan to each of the 28 markets in the A.I.S. data in which no integrated plan is observed. It lists median effects on consumers; on the new plan; on other HMO/POS plans and on the indemity/PPO plans in the market, followed by aggregate effects implied by the medians. CS means the EV generated by entry. New plan profits are compared to those for existing integrated plans in the other 15 A.I.S. markets. Profits of HMO/POS and indemnity/PPO plans are listed before and after entry. Column 1 assumes fixed premiums; they are adjusted to maximize plan profits (before and after entry) in Column 2. Column 3 assumes the exit of the plan with lowest post-entry profit in Column 2; premiums are readjusted and the outcome compared to that before entry. (The group of other HMO/POS plans considered for this specification includes just the plans that do not exit.) Assumptions re: characteristics of the entering plan are outlined in Section 4.

Table 11: Simulations To Test Theories Re: Integrated Plan Entry

		1. Baseline Model	2. Reduced Quality Differential	3. Consumer Expectns	4. CON Laws Applied
Median effect on Consumer Surplus ($ per privately insured person per year):					
EV per person per year ($)		$612.56	$345.60	$122.25	$333.48
Median effect on Integrated Plan:					
Premium pmpm ($)	existing plans	$184.60	$184.60	$184.60	$182.30
	new plans	$199.23	$183.83	$175.53	$209.22
Number of Enrollees	existing plans	$1.93x10^5$	$1.93x10^5$	$1.93x10^5$	$1.40x10^5$
	new plans	$3.74x10^5$	$1.90x10^5$	$8.97x10^4$	$2.49x10^5$
Total profit per year	existing plans	$\$2.67x10^8$	$\$2.67x10^8$	$\$2.67x10^8$	$\$1.72x10^8$
	new plans	$\$6.54x10^8$	$\$2.84x10^8$	$\$1.20x10^8$	$\$3.70x10^8$
Median effects on other HMO/POS Plans:					
Premium pmpm ($)	before entry	$195.84	$195.84	$195.84	$195.84
	after entry	$194.66	$195.89	$194.82	$194.48
Total profit per year ($)	before entry	$\$2.87x10^7$	$\$2.87x10^7$	$\$2.87x10^7$	$\$2.87x10^7$
	after entry	$\$2.16x10^7$	$\$2.47x10^7$	$\$2.61x10^7$	$\$2.47x10^7$
Median effects on Indemnity/PPO Plans:					
Premium pmpm ($)	before entry	$214.21	$214.21	$214.21	$214.21
	after entry	$214.62	$210.26	$211.71	$220.61
Total profit per year ($)	before entry	$\$1.26x10^9$	$\$1.26x10^9$	$\$1.26x10^9$	$\$1.26x10^9$
	after entry	$\$1.05x10^9$	$\$1.16x10^9$	$\$1.22x10^9$	$\$1.16x10^9$
Overall Welfare Effects implied by medians ($ billion):					
Increase in CS		$24.56 billion	$13.86 billion	$4.90 billion	$13.37 billion
Increase in PS: New plan		$18.32 billion	$7.96 billion	$3.36 billion	$10.36 billion
Increase in PS: HMO/POS		- $1.45 billion	- $0.95 billion	- $0.37 billion	- $0.73 billion
Increase in PS: Indem/PPO		- $6.55 billion	- $4.36 billion	- $1.73 billion	- $4.15 billion
Total		$34.88 billion	$16.51 billion	$6.16 billion	$18.85 billion

Notes: This Table summarizes 4 simulations of entry of a vertically integrated plan to each of the 28 markets in the A.I.S. data in which no integrated plan is observed. See Notes to Table 10 for variable descriptions. Premiums are permitted to adjust before and after entry. Column 1 repeats the results of the baseline specification (Column 2 of Table 9). Column 2 models the reduced quality differential between the integrated plan and its competitors as average quality levels increase (see Section 5.1 for details). Column 3 allows consumers to expect the new insurer's HEDIS and CAHPS variables and unobserved quality to take the average value of existing plans in the market. Column 4 adds the implications of Certificate of Need laws to the baseline simulation (see Section 5.3 for details). "Existing integrated plans" in Column 4 include only plans that contract with hospitals (Type 3 plans in Table 4).

Table 12: Potential Sources of Entry Costs

Source of Entry Cost	Approximate Magnitude
Estimated in Simulation Model	
1. Reduced quality differential as competitor quality increases	Reduces enrollment from 374,000 to 190,000; reduces plan profits by $370 million per year
2. Low consumer expectations for experience characteristics (HEDIS)	Reduces enrollment from 190,000 to 90,000 in first year compared to 1.; reduces plan profits by a further $23 million per year in first year
3. Certificate of Need laws	Reduces enrollment from 374,000 to 249,000; reduces plan profits by $284 million per year
Not in Simulation Model	
4. Adverse selection	Small
5. Cost of building hospitals	$1500 million for 3 hospitals
6. Cost of contracting with physicians	Less than $23 million per year together with employer strategies[41]
7. Employer strategies (offering a single plan; failure to share cost savings with enrollees)	Less than $23 million per year together with physician costs
8. Consumer switching costs	See Appendix B

[41] See Section 7.1 and Gitterman et al (2003) for details.

Table 13: Effects of Entry Costs on Expected Discounted Plan Profits

Scenario		Annual Profits ($ million)	EDV (5 years)	EDV (10 years)
Observed integrated plans		$267 million	$1.17 billion	$2.01 billion
New plans: baseline		$654 million	$2.87 billion	$4.91 billion
Accounting for Potential Costs				
New plans: baseline + switching costs	No additional costs	$570 million in first year	$2.74 billion	$4.78 billion
	Add hospital, physician and employer costs	$547 million in first year	$1.14 billion	$3.10 billion
New plans: CON laws	No additional costs	$370 million	$1.62 billion	$2.78 billion
	Add hospital, physician and employer costs	$347 million	$22.4 million	$1.11 billion
New plans: reduced quality differential	No additional costs	$284 million	$1.25 billion	$2.13 billion
	Add hospital, physician and employer costs	$261 million	- $355 million	$461 million
New plans: low consumer expectations	No additional costs	$120 million in first year	$767 million	$1.60 billion
	Add hospital, physician and employer costs	$97 million in first year	- $806 million	$10.3 million

Notes: This Table calculates the implications of the simulations for the five year and ten year expected discounted value of the median integrated plan entering a new market. See Tables 10 and 11 for simulation results. The simulation with low consumer expectations assumes that enrollment increases linearly to a point consistent with the simulation allowing for a reduced quality differential as average quality levels rise.

Table 14: Robustness Tests

		1. Variation in Plan Preferences	2. Variation in Hospital Preferences	3. Integrated plans own hospitals
Median effect on Consumer Surplus ($ per privately insured person per year):				
EV per person per year ($)		$457.17	$469.98	$543.86
Median effect on Integrated Plan:				
Premium pmpm ($)	existing plans	$184.60	$177.92	$187.56
	new plans	$152.87	$203.57	$194.77
Total profit per year	existing plans	$2.67x10^8$	$2.79x10^8$	$3.55x10^8$
	new plans	$7.95x10^8$	$7.23x10^8$	$5.54x10^8$
Median effects on other HMO/POS Plans:				
Premium pmpm ($)	before entry	$133.81	$202.54	$195.84
	after entry	$135.53	$199.14	$194.99
Total profit per year ($)	before entry	$1.29x10^7$	$2.25x10^7$	$2.87x10^7$
	after entry	$7.83x10^6$	$1.81x10^7$	$2.21x10^7$
Median effects on Indemnity/PPO Plans:				
Premium pmpm ($)	before entry	$152.14	$215.75	$214.21
	after entry	$160.91	$217.39	$213.44
Total profit per year ($)	before entry	$7.61x10^8$	$1.13x10^9$	$1.26x10^9$
	after entry	$4.89x10^8$	$8.77x10^8$	$1.02x10^9$
Overall Welfare Effects implied by medians ($ billion):				
Increase in CS		$18.33 billion	$18.84 billion	$21.81 billion
Increase in PS: Integrated plan		$22.26 billion	$20.24 billion	$15.52 billion
Increase in PS: HMO/POS		- $1.28 billion	- $1.30 billion	- $1.50 billion
Increase in PS: Indemnity/PPO		- $9.66 billion	- $5.25 billion	- $6.91 billion
Total		$29.65 billion	$32.53 billion	$28.92 billion

Notes: This Table summarizes 3 robustness tests for the simulations of entry of a vertically integrated plan to each of the 28 markets in the A.I.S. data in which no integrated plan is observed. See Notes to Table 10 for variable descriptions. Details on assumptions regarding characteristics of the entering plan are outlined in Section 4. Column 1 allows for different consumer preferences for plans across markets and Column 2 allows for cross-market variation in hospital preferences. Column 3 repeats the simulation using only integrated plans that own at least a subset of the hospitals in their networks as the comparison group to define the characteristics of new integrated plans. "Existing integrated plans' in Columns 1-2 are all integrated plans in the data; in Column 3 they are plans that own hospitals.