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THE ROLE OF AGENTS AND BROKERS IN THE MARKET FOR HEALTH INSURANCE

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ABSTRACT

Health insurance markets in the United States are characterized by imperfect information, complex products, and substantial search frictions. Insurance agents and brokers play a significant role in helping employers navigate these problems. However, little is known about the relation between the structure of the agent/broker market and access and affordability of insurance. This paper aims to fill this gap by investigating the influence of agents/brokers on health insurance decisions of small firms, which are particularly vulnerable to problems of financing health insurance. Using a unique membership database from the National Association of Health Underwriters together with a nationally representative survey of employers, we find that small firms in more competitive agent/broker markets are more likely to offer health insurance and at lower premiums. Moreover, premiums are less dispersed in more competitive agent/broker markets.

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I. Introduction

Health insurance markets in the United States are characterized by the presence of imperfect information, complex products, and substantial search frictions. Consumers can choose from a wide range of insurance products that vary in multiple dimensions such as deductibles, provider networks, coverage of specific services and medications, and out-of-pocket prices for different sets of health services. Moreover, at the time of signing an insurance contract, most consumers have incomplete information about the types of health care services they will need *ex post*; thus, the information obtained on each product varies across consumers. Insights from search theory suggest that the presence of search and information costs leads to equilibrium premiums higher than those that would prevail in competitive insurance markets. Moreover, premiums are dispersed even for identical products.

In these types of market environments that exhibit high search and information costs, it is only natural that intermediaries emerge, whom Stigler (1961) refers to as “specialized traders”. These intermediaries exploit economies of scale in gathering information and provide a market place for matching buyers to sellers and products; their presence potentially reduces information-gathering and transaction costs. When search costs decrease, the resulting increase in search intensity is expected to lead to lower premiums (Diamond, 1971, Reinganum, 1979, Carlson and McAfee, 1983, Stiglitz, 1989, Cebul et al., 2011). Whether decreased search costs also lead to a decrease in premium dispersion is theoretically ambiguous and depends on the market environment (Baye, Morgan, and Scholten, 2006 provide a comprehensive review).

Intermediaries play a significant role in access, finance, and delivery of health insurance products. They sell insurance products from several insurers (brokers) or from a single insurer (agents). In exchange, they receive commissions typically from the insurer. In general, they act as the consumer's agent, providing specialized services to help consumers navigate the complexities of insurance products when the consumer lacks this expertise (Cummins and Doherty, 2006, Alderman, 2010). For example, they help individual consumers and employers determine desired benefit packages and obtain premium quotes for those packages. They provide guidance to employers on the complicated nature of rating and underwriting rules.

The role of brokers and agents is particularly important for small firms that usually lack the expertise and human resource departments to evaluate large health insurance choice sets. Small firms rely heavily on agents and brokers to search for health insurance products to offer their employees (Conwell, 2002, Hall 2000). The National Federation of Independent Business (NFIB) survey of firms suggests that seventy-one percent of small firms that offered insurance in 2007 purchased their plans from an insurance broker (Dennis, 2007).

Despite their direct and indirect influence on complex health insurance decisions, there is no empirical evidence about the effects of agent/broker market structure on access to and affordability of health insurance. In this paper, we investigate the role of agents and brokers in the health insurance offering decisions of firms with 50 or fewer employees (small firms), a sector that is particularly vulnerable to potential problems regarding health insurance financing. We use data from the 2008 Medical Expenditure Panel Survey – Insurance Component (MEPS-IC) and the National Association of Health Underwriters (NAHU) to examine whether the structure of the market for health insurance agents/brokers that serve small firms is related to the probability that small firms offer insurance and the premiums of plans offered. Specifically, we test the predictions from search theory that small firms in more competitive agent/broker markets will be more likely to offer insurance and to pay lower premiums if they do offer insurance. In addition, we investigate whether the variance of premiums paid by small firms is related to agent/broker market structure.

Our central finding is that small firms in more competitive agent/broker markets are more likely to offer health insurance to their active employees. We also find that increased agent/broker competition is associated with lower premiums. Finally, we find that premiums have lower variance (they are less dispersed) in markets with more agent/broker competition.

An empirical investigation of agent/broker market structure and small firms' insurance offering decisions has implications for two policy areas. First, small firms do not offer health insurance as frequently as larger businesses. In 2011, while 95.7% of establishments with 50 or more employees offered health insurance to their employees, only 35.7% of establishments with less than 50 employees offered health insurance.[1] Reducing this disparity by increasing the offering rate among smaller firms has been a long-standing goal of health care reform.

A second policy area impacted by our study relates to the provisions of the Affordable Care Act (ACA) of 2010 that standardize insurance products, improve transparency and reduce information costs. The ACA specifies a minimum, standard benefit package with varying levels of cost-sharing. It also calls for electronic, state-based health insurance exchanges designed to facilitate informed consumer choice among health insurance policies. The insurance exchanges will presumably reduce the search costs substantially. As yet to be determined is the role of brokers in these exchanges.

A general concern in empirical studies of market structure and performance is reverse causation: agents/brokers that serve small firms may locate in areas with strong unobserved demand for insurance by small firms. We take several approaches to account for potential

[1] MEPS-IC publicly available summary tables http://meps.ahrq.gov/mepsweb/data_stats/summ_tables/insr/national/series_1/2011/tia2.htm (accessed September 2012)

endogeneity. Our models control for a rich set of economic and demographic factors related to the demand for insurance at the county level as well as state fixed effects. In addition to responding to market demand for insurance, brokers and agents may be more likely to enter markets where employers offer more generous benefits in general. To capture this, our models control for various fringe benefit offerings (sick leave, paid vacation, disability and life insurance, pensions, etc.) at the employer level. Generous non-health benefits should be positively related to generous health benefits and thus should control for market selection by brokers.

More important, we use an instrumental variables approach exploiting variation in the number of agents/brokers that do not serve small firms. Their presence in a given market should be correlated with the presence of agents/brokers that serve small firms due to similar cost and entry conditions. However, the market structure of agent/brokers that do not serve small firms should not influence small firms' insurance offering decisions.

If some unobserved market-level factors simultaneously affect insurance demand in the small-firm and large-firm markets, the validity of the instrument would be of concern. While we cannot completely rule out this possibility, we undertake several sensitivity tests that alleviate this concern.

First, we estimate our models with different definitions of the geographic market (which vary by population size and geographic boundaries). The problem of common market-level unobservables would likely be most pronounced in smaller geographic markets (such as a county), and less so as the geography widens (for example, the metropolitan Core Based Statistical Area (CBSA)). If these factors are important, our estimates should vary substantially across different geographic market definitions, but our findings are consistent across different geographic market definitions.

Next, we exclude county-level characteristics and fringe benefit offerings which are likely related to insurance demand to assess the impact of their omission on the parameter estimates. While this is not a formal test of endogeneity or instrument validity, it lets us examine insurance demand based on observed characteristics and serves as a guide to assess the extent of unobservable characteristics affecting demand (Altonji, Elder and Taber, 2005).

Third, in a related sensitivity analysis, we include fixed effects for large CBSAs when we define the geographic market as a county. These fixed effects capture unobserved factors at the CBSA level, such as the insurer market structure, that could influence demand for insurance and the availability of insurance products.

Fourth, we exploit variation in the number of loan agents and brokers across counties as an alternative instrument. The correlation between health insurance brokers that serve small firms and loan brokers is weaker than the correlation between health insurance brokers that serve small firms and those that do not. However, one may argue more plausibly that small firms' insurance offering decisions do not respond to the market structure of loan brokers.

Fifth, we conduct a falsification test by examining insurance offerings and premiums of policies offered by large firms (200 or more employees). If common market-level unobservables influence both the small and the large-group markets, we would expect large firms' insurance offering rates and premiums to be spuriously correlated with the market structure for agents and brokers that serve small firms. We find that neither the offering decisions nor the premiums of large firms respond to the market structure for agents and brokers that serve small businesses.

The remainder of this paper is organized as follows. Section II presents background information on health insurance for small firms. Section III introduces a conceptual framework for thinking about the agent/broker market structure for small firms. Section IV presents the data, measures and the study sample. Section V discusses empirical specification. Section VI presents results, and Section VII concludes. In the remainder of the paper, for simplicity of discussion, we refer to both agents and brokers as "brokers".

II. Health Insurance for Small Firms

Small firms historically have reported problems with the availability and affordability of health insurance (Brown, Hamilton and Medoff, 1990, McLaughlin, 1993, Fronstin and Helman, 2000). In 2004, two-thirds of small-firm owners listed health care costs as a critical problem – a proportion that increased by 18 percentage points between 2000 and 2004 (NFIB, 2004). In 2008, 96% of firms with 50 or more employees offered insurance. However, only 43% of firms with fewer than 50 employees offered coverage, down from 47 % in 2000[2]. In 2011, even fewer small employers (35.7%) offered health insurance.[3] Low offer rates by small firms have been attributed, in part, to lower demand for insurance by workers in small firms, as well as high administrative costs associated with offering coverage and the unwillingness of insurers to underwrite small firms, given concerns about adverse selection (McLaughlin, 1992, Fronstin and Helman, 2000, Monheit and Vistnes, 1999, Abraham et al., 2009).

Karaca-Mandic, Abraham, and Phelps (2011) examined health insurance loading fees, which represent the portion of the total premium above and beyond the actuarially fair value of expected claims to be received from the policy during the coverage period. The loading fee includes general and claims-related administrative expenses, profits, broker commissions, other sales-related expenses. Accordingly, one can think of the loading fee as the relevant "price" of

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[2] Agency for Healthcare Research and Quality, Center for Cost and Financing Studies. Medical Expenditure Panel Survey - Insurance Component, 2008 and 2000.
[3] MEPS-IC publicly available summary tables http://meps.ahrq.gov/mepsweb/data_stats/summ_tables/insr/national/series_1/2011/tia2.htm (accessed September 2012)

the health insurance policy (Pauly, 1997, Phelps, 2010, Feldstein, 1999, Chernew and Hirth, 2002, Blumberg and Nichols, 2004, Marquis et al., 2007). The authors generated new estimates of the size of loading fees and how they differ across the firm size distribution using data from the confidential MEPS Household Component–Insurance Component Linked File. They found that firms of up to 100 employees face similar loading fees of approximately 34% (premiums charged are 34% higher than the claims incurred by health insurers). Loads decline with firm size and are estimated to be 15% on average for firms with between 101 and 10,000 employees, and 4% for firms with more than 10,000 workers. The loading fee gradient by firm size offers an explanation for the lower insurance offering rates observed in small firms relative to larger ones.

The substantially higher price of insurance implied by high loading fees is also consistent with the presence of higher search frictions for smaller firms relative to larger firms in the market for health insurance. A key result of search theory is that higher search costs are related to a larger gap between equilibrium premiums and the marginal cost of providing insurance (Cebul et al., 2011).

Intuitively as well, larger firms can avoid complexities related to searching for and obtaining information about insurance products through self-insurance (Cebul et al., 2011, Conwell, 2002). A firm that self-insures offers insurance benefits through its own funds, but works with a third-party administrator that manages the plan or plans by providing services such as claims processing and access to provider networks. Self-insurance is uncommon among small firms. In 2011, while 64% of firms with 50 or more employers that offered insurance self-insured at least one plan, only 12% of those with fewer than 50 employees did.[4] Recently Cebul et al.

[4] http://meps.ahrq.gov/mepsweb/data_stats/summ_tables/insr/national/series_1/2011/tia2a.htm. Table I.A.2.a(2011) Percent of private-sector establishments that offer health insurance that self-insure at least one plan by firm size and selected characteristics: United States, 2011. Source: Agency for Healthcare Research and Quality, Center for Financing, Access and Cost Trends. 2011 Medical Expenditure Panel Survey-Insurance Component.

(2011) showed that search frictions are pervasive among fully-insured (not self-insured) employer groups and large enough to transfer 13.2% of consumer surplus from policy-holders to insurers.

III. Conceptual Framework and Hypotheses

Our conceptual model is primarily based on insights from search theory, as well as models of "middlemen" and insurance intermediaries. As discussed above, the presence of high search and information costs implies that equilibrium prices exceed marginal costs of production and that prices are dispersed even for relatively similar products. Based on Stigler (1969), insurance intermediaries exist as a natural response to the presence of high search costs. They are match-makers in environments with asymmetric information. Because they have more sophisticated information and expertise than do individual consumers, they are more efficient searchers. As such, they have the potential to reduce search costs. They do this by narrowing the number of potential sellers (insurance products) for buyers (small firms) and helping their clients select from competing products. The general insights from intermediary models are that intermediaries reduce the buyer's search intensity, decrease the uncertainty of the match, and increase the volume of sales (Focht, Richter and Schiller, 2012, Eckardt, 2007, Biglaiser, 1993, Rubinstein and Wolinsky, 1987, Yavas, 1994, Cummins and Doherty, 2006).

Based on these theoretical models, we predict that increased broker availability and competition will reduce search costs for small firms, increase the insurance offering rate among small firms, and reduce equilibrium premiums in the small-employer market. Moreover, we conjecture that premiums will become less dispersed as search costs decrease with broker availability and competition. Large firms typically self-insure as discussed above, and they tend to have human resource departments to overcome information costs. We expect large-firm insurance offering rates and premiums are less likely to be influenced by broker market structure.

In addition to the insights from search theory, oligopoly theory offers another explanation why premiums may be related to broker market structure. As in other markets, brokers' fees – which are typically a percentage of the premiums of the health insurance products – may vary with broker market structure. In particular, brokers in less competitive broker markets may charge higher fees resulting in higher equilibrium premiums (assuming higher brokers' fees are passed on to consumers by insurers) and thus lower probability of offering insurance by small firms. Large firms, which are less reliant on brokers, are again less likely to be affected by the broker market structure.

The literature on insurance intermediaries also has extensively discussed the well-known principal-agent problem. The consumer (principal) is less informed than the broker and has limited ability to verify the broker's quality and search efforts. Because brokers are compensated most often by a percentage (from 2% to 8%) of the health insurance premium, they may not act diligently to locate products that employers want at the lowest prices (Conwell, 2002, Yegian et al., 2000). The failure of agents to act diligently on behalf of their clients has been noted in other markets (Laffont and Martimort, 2002). It is also argued that brokers rely heavily on their reputation to compete successfully and this lowers their incentives to cheat with respect to servicing their clients (Eckardt, 2007). This suggests that more competition among brokers will increase the likelihood that brokers act more diligently to search for policies that better match their clients' needs, leading to increased offer rates. While we can test whether offer rates are higher in more competitive broker markets, we are not able to test whether the policies offered in more competitive markets are better matches for small firms. The latter test would require detailed firm and employee-level data to assess the types of plans that are best suited to the needs of a given small firm. However, we investigate whether important benefit features of the policies offered (for example deductible size) varies by broker market structure.

Whether decreased search costs due to increased broker availability and competition lead to a decrease in premium dispersion is theoretically ambiguous. While some search theory models predict that a reduction in search costs will reduce the variance of prices (Reinganum, 1979), others (MacMinn, 1980) predict the opposite. Their conclusions depend on the assumptions they make about the search process. Reinganum (1979) assumes that consumers sequentially consider different sellers and obtain price quotes until they find a match such that additional search is not optimal, but MacMinn (1980) assumes that consumers commit *ex-ante* to consider a fixed number of sellers.

The relation between search costs and price dispersion also depends on the distribution of sellers' marginal costs. As consumers reduce their reservation prices as a response to lower search costs, firms with higher marginal costs are pressured to reduce their prices to the reservation price. Firms with lower marginal costs do not adjust their prices as much because their prices are already close to the reservation price. The price adjustments of high-cost firms lead to a reduction is the variance of prices.

The models' predictions also differ by whether the consumer's decision to become informed or not as search costs change is endogenous. For example, in Stahl (1989) and Varian (1980), when information costs are very high, none of the consumers chooses to become informed, and all firms charge the monopoly price (there is no price dispersion). On the other hand, if all consumers become informed and shop when search costs fall, prices for identical products converge to marginal cost and again there is no price dispersion (Baye, Morgan, and Scholten, 2006 provide a comprehensive review). The price dispersion can exist only in the middle range where some, but not all consumers become informed.

Most recently, Cebul et al. (2011) model search behavior in health insurance markets. Their model predicts a right skew in premiums because of search frictions. It also predicts that the right tail becomes thicker when search frictions increase, implying that price dispersion increases with search frictions. They also provide empirical evidence that premiums have “excess price dispersion” (unexplained premium variation) with the right skew in the fully insured market segment (where search frictions are more of a concern) relative to the self-insured segment. If broker availability and competition reduces search frictions, we would hypothesize that price dispersion in the fully insured market would be lower in markets with higher broker competition.

IV. Data and Measures

The primary data source on employers is the Medical Expenditure Panel Survey – Insurance Component (MEPS-IC) for 2008. The broker market structure measures are constructed from a novel 2008 membership database of the National Association of Health Underwriters (NAHU), the leading professional association that represents more than 100,000 licensed health insurance agents, brokers, consultants and benefit professionals. We merge firms in MEPS-IC with information on their broker market structure using the firm’s 5-digit zip-code. Because the MEPS-IC provides limited information on the employer’s workforce composition, we use demographic variables at the county level from the Area Resource File (ARF) to control for factors that may influence the demand for insurance and hence for brokers’ services. We merge ARF variables to MEPS-IC using state and county FIPS codes defined by the Census Bureau. The MEPS-IC is a confidential dataset. The Census Bureau and the Internal Revenue Service approved this study. The data are accessed through a Census Research Data Center, and statistics presented are required to go through disclosure review by the Census Bureau to protect the confidentiality of the employer information.

A. Data on Employers

The MEPS-IC is a nationally representative sample of employers with information on their health insurance offerings and characteristics of the policies offered, as well as other relevant information such as the number of employees, primary industry, and workforce composition (age, gender, and income). The unit of observation in MEPS-IC is an establishment. A firm could have one establishment or multiple establishments. Multi-establishment firms could have establishments in several states that are subject to different state regulations and market conditions. In addition, the MEPS-IC may not include all establishments of multi-establishment firms, making it difficult to construct health insurance offering decisions at the firm level. Consequently, we selected firms with only one establishment. Among these, we selected firms with 50 or fewer employees because small firms are likely to rely on brokers to purchase health insurance. The MEPS-IC identifies 6,634,144 private-sector establishments in 2008 nationally, of which 5,018,251 were in one-establishment firms. Ninety-six percent of the one-establishment firms had fewer than 50 employees.[5]

Outcome variables from the MEPS-IC include an indicator for whether the employer offers health insurance[6] and total premiums for single coverage. Given that an employer can offer multiple plans (although only 18% of smaller firms with fewer than 50 employees that offer insurance offer more than one plan[7]), we examine all plans offered by the firm and consider the

[5] http://www.meps.ahrq.gov/mepsweb/data_stats/summ_tables/insr/national/series_1/2008/tia1a.htm
We are not able to report raw summary statistics of the study sample due to disclosure restrictions.
[6] Variable corresponding to survey question: “Did your organization make available or contribute to the cost of any health insurance plans for its ACTIVE employees at this location in YEAR X?”
[7] Agency for Healthcare Research and Quality, Center for Financing, Access and Cost Trend, 2008 Medical Expenditure Panel Survey-Insurance Component, Table I.A.2.d(2008) Percent of private-sector establishments that

enrollment-weighted average premium for single coverage. In additional analyses, we also examine whether the employer offers a plan with high deductible (more than $1,050 for single coverage).

As explanatory variables, we use a rich set of establishment characteristics that represent factors that influence the demand for health insurance and the cost of providing health insurance. We control for the total number of employees in the establishment (<25, 25-50), other fringe benefits offered (paid vacation, paid sick leave, life insurance, disability insurance, retirement/pension plans), flexible spending accounts offered for health care, number of years the business has been in operation (business tenure), indicators for business industry, non-profit status, and measures of workforce composition (percent employees female, percent older than 50, percent union members, and percent with earnings more than $26 per hour).

B. Data on Brokers

NAHU is a national organization of health insurance agents and brokers organized into over 200 chapters across the U.S. Each chapter roughly corresponds to one or two metropolitan statistical areas (MSAs) in the same state. We obtained counts of NAHU's members in 2008 by 5-digit zip-code for brokers servicing small firms and those that do not service small firms.

The NAHU data are unique in several aspects. First, NAHU is the only national association that exclusively represents health insurance brokers. A second national organization that represents brokers is the Independent Insurance Agents and Brokers of America, but this organization represents other types of brokers in addition to health insurance (e.g. automobile and property insurance). Second, NAHU members likely represent active, practicing brokers which we could not capture with simple counts of brokers licensed in the state. Third, the NAHU

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offer health insurance that offer two or more health insurance plans by firm size and selected characteristics: United States, 2008, http://www.meps.ahrq.gov/mepsweb/data_stats/summ_tables/insr/national/series_1/2008/tia2d.pdf data allow us to extract counts of health insurance brokers that serve small businesses, the primary focus of our study.

While NAHU's membership is large, representing about one-third of active brokers (Alderman, 2010), it does not represent all licensed health insurance brokers; consequently, our measure undercounts the actual number of brokers. To capture the universe of brokers, we considered obtaining lists of state-licensed brokers, but these would be measured with error because we don't know if licensed brokers are actively practicing, whether they serve small businesses, and because these lists would contain accident and casualty brokers as well as health insurance brokers. Moreover, such a list would limit the variation in the broker competition measure to the state level, which may not properly capture the relevant geographic market for brokers. We also investigated the possibility of acquiring the number of brokers from the Census's zip code business patterns. However, the Census classification of brokers under NAICS code 524210 (SIC code of 6411) is not limited to health insurance brokers. For example, it also includes real estate insurance agents and brokers as well as brokers for other insurance categories such as fire, life, property and casualty insurance. Similarly, the Dun & Bradstreet database does not identify brokers who sell health insurance. Nevertheless, to investigate whether NAHU's coverage of health insurance brokers is representative, we compared NAHU's health insurance brokers (aggregated to the county level) to the broader category of brokers represented under NAICS code 524210 in the U.S. Census County Business Patterns (CBP) data. First, the variation of the two measures between counties is similar (coefficient of variation is 3.96 for the NAHU's health insurance brokers and 3.05 for the CBP's broader category of brokers). Second, the number of brokers in CBP is highly correlated with the number of NAHU brokers (coefficient of correlation between the two measures is 0.87). Third, the count of CBP brokers is a strong predictor of NAHU brokers even after controlling for a large set of county-level socioeconomic and demographic factors (Appendix Table 1). These tests suggest that the number of NAHU brokers is representative of the universe of health insurance brokers, even though it undercounts the actual number of brokers.

C. Data on Market Characteristics

We use the Area Resource File (ARF) to control for economic and demographic factors that may influence the demand for insurance and hence for brokers' services at the county level. These variables include population estimates by age (percent of children, percent of adults under 65, percent over 65) and ethnicity/race (i.e. percent of white, black, Asian and so on), share of foreign-born population, unemployment rate, percent population in urban areas, share of women in the labor force, number of households, average household size, percent of households with a married couple, percent of population in poverty, median household income, Medicare managed care penetration rate, inpatient days per capita, outpatient visits per capita, and emergency department visits per capita. Most of these variables have been shown to influence geographic differences in health insurance coverage (Chernew, Cutler, and Keenan, 2005). In addition, we use the rural/urban continuum codes of 2003 from ARF to identify the degree of urbanization of each county. We categorize urbanization into metropolitan area, urban area with population ≥ 20,000, urban area with 2,500-19,999 population, and rural area with < 2,500 population.

D. Measures of Broker Market Structure

The existing literature does not define the geographic market for health insurance brokers. However, limited evidence indicates that small firms rely heavily on in-person contacts with local brokers rather than internet brokers. In a survey focusing on health savings accounts (HSAs), Gates et al. (2010) found that 62.2% of small firms offering HSA-eligible insurance plans purchased these plans through a local insurance broker. Less frequently used for quotes were benefit management companies (19.5%) and insurance companies (14.6%). No firm in the sample of 228 purchased an HSA from an internet-based broker. Similarly, Dennis (2007) suggests that small employers rely heavily on brokers for purchasing health insurance and for consulting on health insurance-related matters. Seventy-one percent of small firms that offered insurance in 2007 purchased their plans from an insurance broker, while only one percent purchased directly from an insurer over the internet. This suggests that small firms value the services offered by local brokers (e.g. advice on coverage choices and resolving claims-related problems). Assuming such services require building close relationships between brokers and their clients, it is likely that geographic proximity of the broker and the client is important.

We approached this issue by considering alternative definitions of the geographic market. All markets were defined using the zip codes of broker locations, and linked to MEPS-IC using the zip code of the employer. We considered the following definitions of the relevant broker geographic market for the employer:

1) County: The zip code of each establishment is assigned to a county. For zip codes that overlap counties, the county that makes up the largest portion of the zip code is used. This definition results in 3,130 geographic markets in the U.S.

2) CBSA: The zip code of each establishment is assigned to its metropolitan Core Based Statistical Area (CBSA). CBSAs, released in 2003, replace previous definitions of metropolitan statistical areas (MSAs). For zip codes that overlap CBSAs, we used the CBSA of the zip code centroid, and for zip codes outside any CBSA, we used the county or PUMA, whichever is larger in geographic area. A PUMA (Public Use Microdata Area) is a Census-created contiguous geography that does not cross state lines and encompasses

the residences of at least 100,000 people. The Census Bureau has relied on the PUMA definition since 1990 to present descriptive statistics from the decennial census and the American Community Survey (ACS). The 100,000 person threshold was chosen because any geography below this threshold would subject ACS estimates to disclosure risk.[8] The iterative assignment of this definition results in 1,196 mutually exclusive geographies.

3) Fixed Radius: Each zip code has a unique market that includes all zip codes within 25 miles of the establishment.

4) Variable Radius (<1 million population): Each zip code has a unique market that includes all zip codes within 25 miles or the nearest zip codes within 25 miles that have a cumulative population of 1 million people, whichever is smaller in geographic area. By constraining the population at 1 million, we avoid mega-markets in major cities that have more than 1 million people within a 25-mile radius.

Figure 1 presents an example of zip code boundaries for two zip codes in Minnesota (55413 in Minneapolis, 56701 in Thief River Falls). For each zip code multiple market measures are created. Since the definitions are overlapping, the map shows the portions they do not have in common. As can be seen, the CBSA measure generally captures a larger area than the county or other measures. The fixed and variable radius will be the same (and therefore only the variable radius is shown) if the population is less than 1 million, which is the case for Thief River Falls but not for Minneapolis where the fixed radius is larger in area than the variable radius.

For each geographic market, our ultimate measure of broker competition is the number of brokers that serve small firms per 100,000 people in the market.[9] Table 1 describes the broker

[8] http://www.census.gov/geo/puma/2010_puma_guidelines.pdf, http://www.census.gov/geo/puma/puma_guide.pdf

[9] An alternative denominator could be the number of small firms rather than number of people in the geographic market. In a specification based on the "county" geographic market, we examined the broker competition measure

competition measures across different definitions of the geographic market for brokers. Due to disclosure restrictions by the Census Bureau, we can report the means by quartile but not the lower and upper bounds for the number of brokers per population within each quartile. The first quartile typically represents very low broker availability with nearly zero brokers per 100,000 people, on average. The second quartile has on average one broker per 100,000 people; the third quartile has 2-3 brokers per 100,000 people; and the fourth quartile has 6-7 brokers per 100,000 people.

Studies that use the number of sellers to measure competition usually focus on what happens when the number of sellers increases from a baseline of 1. In other words, what happens when a monopolistic market becomes more competitive? However, in our application, the number of brokers in a market can be zero (see Table 1, average number of brokers in quartile 1).[10] Hence, employers in these markets may not have an opportunity to buy health insurance through a NAHU member broker. Employers may find better access to health insurance in a market with 1 broker, even though that broker is a monopolist, than in a market with no brokers.

The Hirschman-Herfindahl Index (HHI) is a commonly used measure of market concentration. However, the NAHU data do not provide information on the number or value of policies sold by brokers, so we cannot compute the HHI. Furthermore, the HHI is considered a suitable measure to model Cournot competition among homogenous firms, which may not necessarily fit the broker market if firms have non-symmetric cost structures and sell differentiated products. Finally, using the number of firms to capture competition in the market is consistent with recent precedents in the empirical industrial organization literature. Bresnahan

as counts of brokers that serve small firms per 1,000 small firms (where we extracted the number of small firms from the Census County Business Patterns). Our findings were robust to this modification.

[10] Brokers could be present, but there are no NAHU members in those markets.

and Reiss (1991), Mazzeo (2002) and Dranove, Gron and Mazzeo (2003) provide methods to infer incremental effects of additional entrants on incumbents' profits.

V. Empirical Specification

The unit of observation in our analyses is an establishment in the MEPS-IC. We restrict our attention to firms with one establishment and fewer than 50 employees (small firms). We estimate models that relate our outcome variables to the market structure for health insurance brokers while controlling for other factors that may influence the demand and cost of insurance at the employer level as discussed above.

A general concerns is reverse causality due to market selection of brokers. If brokers locate in areas with strong unobserved demand for insurance, the effect of competition on offering insurance would be biased upward (away from zero). Markets with higher unobserved search costs would also increase the value of brokers' services and attract broker entry. However, offering of insurance could be lower in markets with such costs because of high premiums. This would bias the association between broker competition and offering toward zero. *A priori*, it is not possible to determine the direction of the bias.

The reverse causality concern could also apply to the model of total premiums. More broker competition could reduce premiums, but if broker competition is positively related to unobserved demand conditions that increase premiums, we might not detect that effect (bias toward zero). Similarly, if unobserved search costs increase both broker entry and premiums, this would also bias the association between premiums and broker competition toward zero.

Our models control for economic and demographic factors related to the demand for insurance at the county level as well as state fixed effects. Such controls likely lessen the endogeneity concern. In addition to responding to county-level demand factors, brokers may be more likely to enter markets where employers offer more generous benefits in general. To capture this, our models control for a rich set of fringe benefit offerings (sick leave, paid vacation, disability insurance, life insurance, retirement pension and so on) at the employer level. Generous non-health benefits should be positively related to generous health benefits.

As a more complete approach we use an instrumental variable that is correlated with broker competition, but uncorrelated with unobserved factors that influence our outcome measures. Our instrumental variable is the number of brokers in the market that do not serve small firms (also obtained from NAHU) per 100,000 population. The counts of brokers that do not serve small firms would be correlated with the counts of brokers that serve small firms due to similar market conditions, but uncorrelated with insurance outcomes (offering decisions and premiums) of small firms.

If some unobserved market-level factors simultaneously affect insurance demand in the small-firm and large-firm markets, the validity of the instrument would be of concern. While we cannot completely rule out this possibility, we undertake several sensitivity tests that alleviate this concern (described in the Results section).

We estimate the models using the two-stage residual inclusion method (Terza, Basu and Rathouz, 2008). The empirical specification for the probability of offering health insurance coverage is:

$$\Pr(Y_{im} > 0) = \Lambda(\gamma_1 + \gamma_2 B_m + \gamma_3 X_m + \gamma_4 Z_{im} + \eta_s) \tag{1}$$

where Y_{im} is the outcome variable for establishment i in market m. The vector B_m captures the market structure of brokers that serve small firms. Our measure of broker competition is the number of brokers that serve small firms per 100,000 people in the market. We categorized this measure into quartiles and included three indicator variables (with the first quartile as the reference category) to capture non-linear effects. The vector X_m captures other county-level demographic factors that impact the cost and demand for health insurance. The vector Z_{im} captures the establishment's characteristics, as described above. We control for systematic differences between states, for example, different health insurance regulations for small firms, with state fixed effects (η_s).[11] Next, we estimate a model of the enrollment-weighted average premium for single coverage (ordinary least squares)[12] conditional on offering health insurance using the same explanatory variables.

To investigate whether the dispersion of premiums varies by broker market structure, we model:

$$\mathrm{Pr}emium_{im} \sim Normal(\mu, \sigma) \text{, where}$$

$$(2)\quad \mu = \gamma_1 + \gamma_2 B_m + \gamma_3 X_m + \gamma_4 Z_{im} + \eta_s \text{, and}$$

$$(3)\quad \sigma = \theta_1 + \theta_2 B_m + \theta_3 X_m + \theta_4 Z_{im} + \eta_s \text{.}$$

We estimate the parameters in (2) and (3) jointly using maximum likelihood estimation.

Using the two-stage residual inclusion methodology, we first predict the number of brokers that serve small businesses per capita. Because broker competition B_m is modeled as a vector to indicate the quartiles of the number of brokers that serve small firms per capita, we estimate an ordered logit model at the establishment level where the categorical outcome variable takes on four values that correspond to the quartile of the broker market the establishment faces. The key explanatory variable is our instrumental variable: the number of brokers that do not serve small firms per 100,000 population. The empirical specification includes all other control variables

[11] Ideally we would like to control for market fixed effects. However, given our geographic market definitions, we often observe only one firm per market.
[12] In a sensitivity test, we estimated the model with generalized linear models, using a log scale and gamma family distribution.

discussed above. Next, we predict the probability of each outcome and the residual corresponding to that prediction. Finally, our models for offer and premiums include three additional explanatory variables corresponding to the residuals from the second, third and fourth quartiles of the broker competition measure. Because these residuals are predicted from the first-stage model, the standard errors need to be corrected in the second stage. We compute standard errors using 500 bootstrap replications. All analyses utilize survey design variables (strata, primary sampling unit and survey weights) using STATA version 12's survey commands.

VI. Results

Because MEPS-IC is a confidential data set that can be accessed only at a Census RDC, all output for public use must go through a disclosure review. All explanatory variables described in the Data section are included in the models, but the tables report estimates for a limited number of variables due to disclosure reasons. We present estimates by alternative definitions of the geographic market for brokers. Model 1 uses the county definition, model 2 uses the CBSA definition, model 3 uses the fixed radius definition, and model 4 uses the variable radius definition.

A. Instrumental Variable and the First Stage

Table 2 presents the variation in the instrumental variable, number of brokers that do not serve small firms per 100,000 population, across different definitions of the geographic market for brokers. As in Table 1, we report only the means by quartile rather than the lower and upper bounds due to disclosure restrictions. A comparison of Table 1 (number of brokers that serve small firms) and Table 2 reveals that brokers that do not serve small firms are more numerous. Such brokers would typically sell policies to large firms or to individuals in the Medicare or long-term care insurance markets. The first quartile represents 1 broker per 100,000 people on average (rather than zero brokers that serve small firms). The second quartile has 2 brokers per 100,000 people on average; the third quartile has 5 brokers per 100,000 people; and the fourth quartile has 10-13 brokers per 100,000 people.

In Table 3, we present the first stage of the two-stage residual inclusion estimates to predict the number of brokers that serve small businesses per capita using the instrumental variable and all other control variables discussed above. The statistical significance of the instrumental variable and the correspondingly large F statistics verify the strong correlation of the number of brokers that serve small firms and those that do not serve small firms. Based on the reported marginal effects for the "county" geographic market definition, a unit increase in the number of brokers that do not serve small employers per capita is associated with statistically significant declines of 0.037 and 0.016 in the probabilities that the small firm is in a broker market in the first and second quartiles of brokers that serve small firms, respectively. On the other hand, it is associated with statistically significant increases of 0.015 and 0.038 in the probabilities of the third and fourth quartiles of brokers that serve small firms. An examination of the marginal effects for other geographic market definitions reveals similar findings.

B. Offer Models

Table 4 reports marginal effects of a select number of firm characteristics and the broker competition measures (quartiles of the number of brokers that serve small firms per capita) on the probability that the small firm offers health insurance, based on the second stage of the two-stage residual inclusion estimation. Standard errors are computed using 500 bootstrap replications. Not surprisingly, the probability of offering health insurance increases by firm size – even within this group of firms with 50 or fewer employees. In addition, offering health insurance is strongly associated with offering other fringe benefits (paid vacation, sick leave, life insurance, disability insurance and retirement pension).

To evaluate the impact of broker market competition on insurance offering, the reference category is the first quartile (almost no brokers on average). Across all geographic market definitions, firms in higher quartiles of broker competition are more likely to offer health insurance, except for the second quartile (about one broker). This suggests that the presence of the second broker makes a difference. The marginal effects of broker market structure on the probability of offering health insurance are remarkably stable across different geographic market definitions. Using the "county" as an example, the probability of offering is larger by 0.062 for firms in the second quartile of broker market structure (about 2 brokers) and by 0.082 for those in the fourth quartile (about 7 brokers) relative to firms in markets with no brokers. The adjusted probability of offering increases from 0.38 in the first quartile to 0.43 in the second quartile, 0.44 in the third quartile, and 0.46 in the fourth quartile (Table 6). Predictions of the adjusted probability based on other geographic market definitions are very similar. Estimates of the model without endogeneity correction yield similar qualitative results although the magnitude of the broker competition on the probability of offering is smaller across all geographic market definitions (Appendix Table 2). As we argued earlier, the sign of bias without endogeneity correction for the offer model is ambiguous *ex ante*.

C. Premium Models

Table 5 reports marginal effects of select firm characteristics and broker market structure on premiums of firms that offer insurance. Firms with 25-50 employees have lower premiums compared with firms with fewer than 25 employees. Similar to our findings for the probability offering, the estimates present a gradient beyond the second quartile with lower premiums for firms in higher quartiles of broker competition. The second quartile effect is not statistically significant for any of the geographic market definitions. While the fourth quartile effect is statistically significant across all geographic market definitions, the third quartile effect is statistically significant only for the county and the fixed radius definitions. Marginal effects are similar across different market definitions. Estimates based on the county geographic market predict adjusted premiums of $5,173 for quartile 1, $4,741 for quartile 2, $4,553 for quartile 3, and $4,495 for quartile 4 (Table 6). Estimates based on other geographic market definitions are very similar. In addition, a sensitivity test with a log scale and gamma family distribution revealed very similar estimates (not reported in tables). For example, for the county definition, marginal effects (standard errors) on broker competition for 2nd, 3rd and 4th quartiles respectively were -357 (368), -640 (270), and -629 (302). We also estimated the models without endogeneity correction (Appendix Table 2). Firms in the fourth quartile of broker competition have lower premiums except for the variable radius definition. The magnitudes of the marginal effects are smaller compared with the endogeneity-corrected two-stage residual inclusion models. This is consistent with a bias toward zero as discussed earlier.

Having shown that small firms in more competitive broker markets have lower premiums, we investigated whether this reduction was because policies offered in those markets had different benefit designs. For example, high-deductible health plans (HDHPs) (individual deductible $\geq$ $1,050) typically have lower premiums, and as we argued earlier, brokers may be more likely to advocate HDHPs in more competitive broker markets. In Table 7, we present estimated marginal effects of broker competition on the probability of offering a high-deductible plan among firms that offer insurance. We do not find evidence that broker competition matters for offering high-deductible plans. In an additional sensitivity analysis, we estimated the premium models controlling for several benefit design characteristics: the deductible, the presence of an out-of-pocket (OOP) maximum, office visit copay and inpatient visit copay. Only the deductible and the OOP maximum were associated with premiums (negatively) with p-values of $\leq$0.05 (not reported in tables). The marginal effects of broker competition quartiles were remarkably similar to estimates presented in Table 5. The marginal effect (standard errors) of the 2nd, 3rd, and 4th broker quartiles for the county specification were -444 (364), -591 (263), and -686 (293), respectively. These findings suggest that policy benefit designs – at least the deductibles – do not differ by broker market competition, and that premiums are lower in markets with high broker competition regardless of the key benefit design features.

Next, we investigated whether the dispersion of premiums varies by broker market structure. Table 8 presents parameter estimates of equations (2) and (3) for the county geographic market definition. The marginal effects of broker quartiles on average premiums are very similar to those presented earlier in Table 5 (equation 2). The marginal effect of the fourth broker quartile on the standard deviation of premiums is negative and statistically significant (p=0.04), suggesting that premiums become less dispersed in the most competitive broker markets (lower search costs). While different search models predict an ambiguous relation between search costs and price dispersion, this finding is consistent with the prediction of Cebul et al. (2011) for fully-insured health insurance markets.

D. Sensitivity Analysis of the Instrumental Variable Validity

As we discussed earlier, if some unobserved market-level factors simultaneously affect insurance demand in the small-firm and large-firm markets, the validity of the instrument would be of concern because the number of brokers that do not serve small firms would be spuriously correlated with insurance demand of small firms. We present several findings that alleviate this concern.

First, we estimate our offer and premium models for different definitions of the geographic market (which vary by population size and geographic boundaries). The problem of common market-level unobservables would likely be most pronounced in smaller geographic markets (such as a county), and less so as the geography widens (for example, the CBSA). Therefore, if important common unobservables influence insurance demand in small and large-firm markets, we would expect even our instrumental variables estimates of the broker market structure to vary across different geographic market definitions. However, Tables 4 (offer models) and 5 (premium models) show that our findings are remarkably consistent across different geographic market definitions.

Next, as a sensitivity test, we excluded county-level characteristics (from ARF) and firm-level fringe benefit offerings which are likely related to insurance demand. As reported in Table 9, their omission does not substantially change the parameter estimates reported in Tables 4 and 5. While this is not a formal test of endogeneity or instrument validity, it suggests that the results are robust to omission of important observed market characteristics and thus the extent of unobservable characteristics affecting demand is likely limited (Altonji, Elder and Taber, 2005).

Also in Table 9, we report estimates that include fixed effects for large CBSAs (those with at least 200 observations of small firms) when we define the geographic market as a county. These fixed effects capture unobserved factors at the CBSA level, such as the insurer market structure, that could influence demand for insurance and the availability of insurance products. Again, the estimates are very similar to those reported in Tables 4 and 5.

In addition, we explored the number of loan agents and brokers per 100,000 capita as an alternative instrumental variable. From the Census County Business Patterns (CBP) of 2008, we extracted county-level counts of mortgage and non-mortgage loan brokers (NAICS 522310), and re-estimated our benchmark models using the two-stage residual inclusion model with this alternative instrumental variable. The market presence of loan brokers and insurance brokers are correlated likely because of common market conditions and preferences toward brokers. The first stage verifies this correlation (F-stat=556.94), although our primary instrumental variable based on health insurance brokers that do not serve small firms certainly has a stronger correlation with the brokers that serve small firms (first stage F-stat=1365.04, Table 3). The advantage of the alternative instrumental variable is that after controlling for various county-level demographic and socioeconomic characteristics, small firms' insurance offering decisions likely do not respond to the market structure of loan brokers. As presented in Table 9, this alternative instrumental variable yields similar results to the original instrumental variable. As before, a specification not corrected for endogeneity is biased downward both for the offer and premium models.

Finally, as a falsification exercise, we hypothesized that larger firms will not respond to the market structure for agents and brokers that serve small firms. However, if common market-level unobservables influence both the small and the large-group markets, we would expect large firms' insurance offering rates and premiums to be spuriously correlated with the market structure of brokers that serve small firms. Accordingly, we estimated all our models for larger firms with at least 200 employees including the same set of explanatory variables except substituting firm size indicators for 500-999 employees and 1,000 or more employees (reference category of 200-499 employees). Table 10 shows that large firms do not respond to the market structure for agents and brokers that serve small businesses, lessening concerns on common unobservables.

VII. Conclusions

Brokers potentially play an important role in reducing search costs and helping small employers shop for health insurance, yet little is known about the market structure for brokers, nor how variation in market structure affects small firms' decisions with respect to health insurance. In this paper we constructed measures of market structure for brokers serving small firms from a unique data base – the membership directory of the National Association of Health Underwriters.

We used confidential employer data from the Medical Expenditure Panel Survey- Insurance Component, and in models with state fixed effects and an instrumental variable, we found that small firms in more competitive broker markets are more likely to offer health insurance to their active employees. We also found evidence that competition among brokers is associated with lower premiums, and that premiums are less dispersed in the most competitive broker markets.

Our findings have implications for two policy areas. First, small firms do not offer health insurance as frequently as larger businesses, and reducing this disparity by increasing the offering rate among smaller firms has been a long-standing goal of health care reform. Our findings identify a previously unexplored channel for accomplishing that goal. Greater availability of brokers and more competitive broker market structure play an important role in reducing search costs and improving offer rates in small firms.

A second policy area impacted by our study relates to the provisions of the ACA that will be effective 2014. The ACA specifies a minimum, standard benefit package with varying levels of cost sharing. It also calls for electronic, state-based health insurance exchanges designed to facilitate informed consumers choice among health insurance policies. These changes will improve transparency and reduce search costs. As yet to be determined is the role of brokers in these exchanges. Two models appear to be the Utah Health Exchange, which began operating in 2011 for small employers (2 to 50 employees), and the Massachusetts Health Connector, which dates to 2006.

Brokers play an active rule the Utah exchange model. Employers are encouraged[13] to designate a broker in their application and participating brokers receive commissions of $37 per covered employee per month. Employers that do not designate brokers are still charged the $37 fee to fund a consumer service center to support groups participating in the exchange. In its first year, the Utah exchange had 100 small employers with 3,000 covered lives.

The Massachusetts Health Connector offers a much smaller incentive for brokers to participate. Commissions for small employers that purchase unsubsidized insurance policies are currently capped at $10 per employee per month for employers with 1-5 employees and 2.5 percent of the total premium for employers with 6-50 employees. If a broker is not used, the amount of the commission is used to fund Connector administrative costs. Brokers' commissions in the exchange are less than commissions for the same products sold outside the exchange. As of late 2010, fewer than 25 brokers had chosen to participate in the program and most of the 36,000 members in the unsubsidized health plan had non-group policies.

If more states follow the broker-friendly Utah exchange model, our results suggest that a competitive broker market structure will contribute to enrollment of small employers in the exchange. States might assess the level of broker density before deciding to adopt that model. Additional monitoring of the policies sold through brokers in the exchange also might be helpful.

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[13] The Utah exchange features a "broker of the month" on its web portal, http://www.exchange.utah.gov.

If brokers tend to sell the more-expensive policies to small firms, this might be a sign that they are not acting as agents for small employers.

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Table 1: Average number of brokers that serve small firms per 100,000 population by quartiles of the broker geographic market definition

	Broker Geographic Market Definition			
Quartile	County	CBSA	Fixed Radius	Variable Radius
1	0.00	0.12	0.09	0.06
2	0.90	1.15	1.17	1.05
3	2.31	2.35	2.43	2.55
4	6.68	5.62	5.97	6.57

Table 2: Average number of brokers that do not serve small firms per 100,000 population by quartiles of the broker geographic market definition

	Broker Geographic Market Definition			
Quartile	County	CBSA	Fixed Radius	Variable Radius
1	0.84	0.77	0.78	0.74
2	1.89	2.53	2.41	2.08
3	4.64	4.30	4.66	5.13
4	11.93	10.37	11.07	12.58

Table 3: First Stage Model - Ordered logit to predict the quartile of brokers that serve small employers per 100,000 population

	Broker Geographic Market Definition			
	Model 1	Model 2	Model 3	Model 4
	County	CBSA	Fixed Radius	Variable Radius
Instrumental Variable:	Dependent Variable: Quartiles of brokers that serve small employers per 100,000 population (Categorical: 1,2,3,4)			
	Coefficient (Std. Error)			
Number of brokers that do not serve small employers per 100,000 population	0.46***	0.86***	0.82***	0.68***
	(0.013)	(0.018)	(0.016)	(0.014)
Adjusted Wald Test F-stat	1365.04	2433.32	2878.52	2423.62
	Marginal effect (Std. Error) of the number of brokers that do not serve small firms on the probability of each category of the dependent variables			
1st Quartile	-0.037***	-0.067***	-0.064***	-0.056***
	(0.001)	(0.001)	(0.001)	(0.001)
2nd Quartile	-0.016***	-0.015***	-0.017***	-0.014***
	(0.0005)	(0.0007)	(0.0007)	(0.0006)
3rd Quartile	0.015***	0.025***	0.025***	0.028***
	(0.0007)	(0.001)	(0.0009)	(0.0007)
4th Quartile	0.038***	0.058***	0.056***	0.043***
	(0.0008)	(0.001)	(0.0008)	(0.0005)

Notes:

*** p<0.01, ** p<0.05, * p<0.1

All firm and market characteristics listed in the Data section are included in the model but not reported in the Table.

Table 4: Probability of Offering Insurance

	Logit estimates with two-stage residual inclusion			
	Broker Geographic Market Definition			
	Model 1	Model 2	Model 3	Model 4
	County	CBSA	Fixed Radius	Variable Radius
Independent Variables:	Change in probability of offering (Std. Error)			
Firm size (ref: < 25 employees)				
25-50 employees	0.148***	0.149***	0.149***	0.148***
	(0.015)	(0.015)	(0.015)	(0.015)
Firm fringe benefit offerings				
paid vacation	0.186***	0.185***	0.185***	0.186***
	(0.01)	(0.01)	(0.01)	(0.01)
sick leave	0.035***	0.036***	0.036***	0.035***
	(0.008)	(0.008)	(0.009)	(0.008)
life insurance	0.285***	0.286***	0.286***	0.286***
	(0.012)	(0.012)	(0.012)	(0.012)
disability insurance	0.084***	0.084***	0.084***	0.084***
	(0.012)	(0.012)	(0.012)	(0.012)
retirement pension	0.123***	0.122***	0.123***	0.123***
	(0.009)	(0.009)	(0.009)	(0.009)
Number of brokers that serve small employers per 100,000 pop (ref: 1st quartile)				
2nd quartile	0.055	0.057*	0.036	0.015
	(0.038)	(0.034)	(0.035)	(0.033)
3rd quartile	0.062**	0.05**	0.036	0.056**
	(0.032)	(0.026)	(0.024)	(0.024)
4th quartile	0.082***	0.06**	0.063**	0.057**
	(0.032)	(0.027)	(0.028)	(0.028)
Observations	18,345	18,345	18,345	18,345
Hausman test F (p-value)	0.77 (0.51)	0.79 (0.5)	0.77 (0.51)	1.55 (0.2)

Notes:
*** p<0.01, ** p<0.05, * p<0.1

All firm and market characteristics listed in the Data section are included in the model but not reported in the Table
Standard errors are computed using 500 bootstrap replications.

Table 5: Premium for single coverage weighted across all plans conditional on offering

	OLS estimation with two-stage residual inclusion			
	Broker Geographic Market Definition			
	Model 1 County	Model 2 CBSA	Model 3 Fixed Radius	Model 4 Variable Radius
Independent Variables:	Change in single coverage premium (Std. Error)			
Firm size (ref: < 25 employees)				
25-50 employees	-288.61***	-285.58***	-285.15***	-283.41***
	(79.56)	(79.54)	(79.1)	(79.3)
Firm fringe benefit offerings				
paid vacation	243.88*	252.88**	247.26*	240.63*
	(131.37)	(131.18)	(131.05)	(131.31)
sick leave	-66.05	-65.52	-57.16	-53.07
	(94.64)	(93.96)	(94.63)	(95.04)
life insurance	-21.28	-38.9	-37.22	-38.83
	(84.63)	(84.78)	(84.57)	(84.62)
disability insurance	-93.48	-93.3	-91.72	-96.92
	(80.49)	(81.12)	(80.59)	(80.25)
retirement pension	81.4	91.54	90.01	90.51
	(78.6)	(78.93)	(78.61)	(78.69)
Number of brokers that serve small employers per 100,000 pop (ref: 1st quartile)				
2nd quartile	-432.11	-560.98*	-411.9	-452.96
	(333.84)	(305.5)	(295.86)	(295.34)
3rd quartile	-619.56**	-477.84*	-464.41**	-233.66
	(272.35)	(254.75)	(236.59)	(232.28)
4th quartile	-677.89**	-570.26**	-604.04***	-495.15**
	(292.47)	(263.48)	(237.41)	(241.4)
Observations	7,666	7,666	7,666	7,666
Hausman test F (p-value)	1.34 (0.26)	0.97 (0.4)	1.11 (0.34)	2.12 (0.096)

Notes:
*** p<0.01, ** p<0.05, * p<0.1

All firm and market characteristics listed in the Data section are included in the model but not reported in the Table
Standard errors are computed using 500 bootstrap replications.

Table 6: Adjusted Predictions of Insurance Offering and Premiums by Broker Market Structure

	Broker Geographic Market Definition			
	Model 1 County	Model 2 CBSA	Model 3 Fixed Radius	Model 4 Variable Radius
Number of brokers that serve small employers per 100,000 pop:				
	Probability of Offering			
1st quartile	0.38	0.39	0.4	0.4
2nd quartile	0.43	0.44	0.43	0.41
3rd quartile	0.44	0.44	0.43	0.45
4th quartile	0.46	0.45	0.46	0.45
	Premium for Single Coverage ($)			
1st quartile	5173	5119	5091	5010
2nd quartile	4741	4558	4679	4558
3rd quartile	4553	4641	4627	4777
4th quartile	4495	4549	4487	4515

Note: Predictions are based on two-stage residual inclusion models presented in Tables 4 and 5.

Table 7: Probability of offering a high-deductible plan conditional on offering

	Logit estimates with two-stage residual inclusion			
	Broker Geographic Market Definition			
	Model 1 County	Model 2 CBSA	Model 3 Fixed Radius	Model 4 Variable Radius
Independent Variables:	Change in probability of offering a high deductible plan conditional on offering (Std. Error)			
Number of brokers that serve small employers per 100,000 pop (ref: 1st quartile)				
2nd quartile	0.024	0.095	0.05	0.042
	(0.08)	(0.075)	(0.074)	(0.079)
3rd quartile	-0.004	0.069	0.06	0.06
	(0.065)	(0.058)	(0.054)	(0.055)
4th quartile	-0.055	0.012	0.039	0.017
	(0.07)	(0.062)	(0.059)	(0.063)
Observations	6,079	6,079	6,079	6,079
Hausman test F (p-value)	0.28 (0.84)	0.33 (0.81)	0.13 (0.94)	0.36 (0.78)

Notes:

*** p<0.01, ** p<0.05, * p<0.1

All firm and market characteristics listed in the Data section are included in the model but not reported in the Table.
Standard errors are computed using 500 bootstrap replications.

Table 8: Premium Dispersion: Joint maximum likelihood estimation of mean and standard deviation of premiums, "county" geographic market

Independent Variables:		Mean of Premiums (equation 2)	Standard Deviation of Premiums (equation 3)
Number of brokers that serve small employers per 100,000 pop (ref: 1st quartile)			
	2nd quartile	-297.04	-578.87
		(365.71)	(385.34)
	3rd quartile	-582.7**	-305.01
		(266.87)	(296.77)
	4th quartile	-624.99**	-644.55**
		(303.8)	(313.49)
Adjusted Predictions by broker quartiles			
	1st quartile	5031	2491
	2nd quartile	4734	1912
	3rd quartile	4448	2186
	4th quartile	4406	1847

Notes:
*** p<0.01, ** p<0.05, * p<0.1
Sample is the same as in Table 5, 7,666 observations
All firm and market characteristics listed in the Data section are included in the model but not reported in the Table.
Standard errors in parentheses

Table 9: Sensitivity Tests for Assessing the Instrumental Variable, "county" geographic market

	Exclude county-level characteristics (from ARF) and firm-level fringe benefit offerings	Include fixed effects for the largest 10 CBSAs (those with at least 200 observations)	Use an alternative instrumental variable
Instrumental Variable	Number of health insurance brokers that do not serve small employers per 100,000 pop		Number of loan brokers per 100,000 pop
Number of brokers that serve small employers per 100,000 pop (ref: 1st quartile):			
	Change in probability of offering by small firms (Std. Error) - based on logit estimates with two-stage residual inclusion		
2nd quartile	0.066	0.052	0.070
	(0.035)	(0.037)	(0.046)
3rd quartile	0.068**	0.058**	0.086**
	(0.03)	(0.029)	(0.036)
4th quartile	0.112***	0.071**	0.135**
	(0.03)	(0.030)	(0.048)
Observations	18,345	18,345	18,345
	Change in single coverage premium of plans offered by small firms (Std. Error) - based on OLS estimates with two-stage residual inclusion		
2nd quartile	-289.48	-414.65	-959.28**
	(286.73)	(364.37)	(398.15)
3rd quartile	-443.18**	-543.64**	-676.21**
	(227.94)	(265.10)	(305.90)
4th quartile	-585.7***	-609.78**	-1038.54**
	(240.12)	(296.21)	(422.19)
Observations	7,666	7,666	7,666

Notes:

*** p<0.01, ** p<0.05, * p<0.1

First stage results for the alternative instrumental variable: Coefficient estimate of the instrumental variable: 0.19 (standard error 0.008). Adjusted Wald Test F-statistic: 556.94

Table 10: Falsification analyses based on large employers with at least 200 employees

	Broker Geographic Market Definition			
	Model 1	Model 2	Model 3	Model 4
	County	CBSA	Fixed Radius	Variable Radius
Number of brokers that serve small employers per 100,000 pop (ref: 1st quartile):				
	Change in probability of offering by large firms (Std. Error) - based on logit estimates			
2nd quartile	0.006	0.003	-0.005	-0.003
	(0.005)	(0.003)	(0.004)	(0.005)
3rd quartile	0.004	-0.002	-0.003	0.001
	(0.005)	(0.005)	(0.005)	(0.005)
4th quartile	0.006	0.002	-0.004	0.003
	(0.004)	(0.005)	(0.005)	(0.005)
Observations	8733	8733	8733	8733
	Change in single coverage premium of plans offered by large firms (Std. Err) - based on OLS estimates			
2nd quartile	24.954	24.232	-1.785	-7.627
	(85.593)	(75.631)	(78.416)	(75.8)
3rd quartile	-26.434	31.217	-63.234	42.698
	(80.88)	(74.05)	(75.039)	(74.692)
4th quartile	22.496	-13.654	-74.277	-78.214
	(78.613)	(79.263)	(79.203)	(83.02)
Observations	8399	8399	8399	8399

Notes:

*** p<0.01, ** p<0.05, * p<0.1

All firm and market characteristics listed in the Data section are included in the model but not reported in the Table

Appendix Table 1: Comparing NAHU health insurance brokers to County Business Patterns (CBP) broad category of insurance brokers- County Level Analyses

	Dependent Variable: NAHU counts of health insurance brokers, OLS estimation	
	Model 1	Model 2
CBP counts of Insurance Brokers (NAICS 524210)	0.055***	0.053***
	(0.00057)	(0.00074)
Include county-level demographic & socioeconomic variables	No	Yes
Number of observations	3006	3006
R-Squared	0.76	0.76

Notes

*** p<0.01, ** p<0.05, * p<0.1

CBP counts of Insurance Brokers (NAICS 524210) represents a broader category of brokers including real estate agents and brokers as well as brokers for other insurance categories such as real estate, fire, life, property and casualty insurance.

County-level demographic & socioeconomic variables in Model 2 were extracted from the Area Resource File. They included indicators for urbanization of the county (Metropolitan Area; Urban > 20,000 pop; urban <20,000; rural); county population, % Hispanic, %male, %white, % black, % Asian, %elderly, median household income, % families in poverty, % unemployed.

Appendix Table 2: Estimates of offering and premiums by small employers without endogeneity correction

		Broker Geographic Market Definition			
		Model 1	Model 2	Model 3	Model 4
		County	CBSA	Fixed Radius	Variable Radius
Number of brokers that serve small employers per 100,000 pop (ref: 1st quartile):					
		Change in probability of offering by small firms (Std. Error) - based on logit estimates			
	2nd quartile	0.022	0.014	0.016	0.018
		(0.015)	(0.014)	(0.014)	(0.013)
	3rd quartile	0.034**	0.027*	0.023	0.037***
		(0.015)	(0.015)	(0.015)	(0.014)
	4th quartile	0.042***	0.036**	0.034**	0.036**
		(0.015)	(0.016)	(0.015)	(0.015)
Observations		18,345	18,345	18,345	18,345
		Change in single coverage premium of plans offered by small firms (Std. Error) - based on OLS estimates			
	2nd quartile	-290.73**	-481.89***	-267.53**	-122.3
		(133.58)	(127.36)	(123.37)	(117.23)
	3rd quartile	-191.68	-381.88***	-261.43*	-185.06
		(136.65)	(146.71)	(137.67)	(124.51)
	4th quartile	-353.17***	-319.24**	-325.66***	-91.38
		(143.13)	(146.81)	(140.93)	(136.64)
Observations		7,666	7,666	7,666	7,666

Notes:

*** p<0.01, ** p<0.05, * p<0.1

All firm and market characteristics listed in the Data section are included in the model but not reported in the Table

Figure 1: An Example of Geographic Market Definitions