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SALES FORCE AND COMPETITION IN FINANCIAL PRODUCT MARKETS: THE CASE OF MEXICO'S SOCIAL SECURITY PRIVATIZATION

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Sales Force and Competition in Financial Product Markets: The Case of Mexico's Social Security Privatization

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ABSTRACT

This paper examines how sales force impact competition and equilibrium prices in the context of a privatized pension market. We use detailed administrative data on fund manager choices and worker characteristics at the inception of Mexico's privatized social security system, where fund managers had to set prices (management fees) at the national level, but could select sales force levels by local geographic areas. We develop and estimate a model of fund manager choice where sales force can increase or decrease customer price sensitivity. We find exposure to sales force lowered price sensitivity, leading to inelastic demand and high equilibrium fees. We simulate oft-proposed policy solutions: a supply-side policy with a competitive government player, and a demand-side policy which increases price elasticity. We find that demand-side policies are necessary to foster competition in social-safety-net markets with large segments of inelastic consumers.

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1 Introduction

Privatized retirement savings systems, where management firms compete for individually owned employee retirement accounts, present a potential solution for the agency, efficiency and solvency problems of traditional pay-as-you-go pension schemes (Feldstein 2005). Several countries have partially or fully privatized social security, starting with Chile in 1981. Public pension crises in the U.S. have revived the private-accounts vs. public pension debate as state governments faced with pension fund shortfalls consider moving workers towards 401(k)-style plans.[1]

Privatization may not deliver greater efficiency if investors are price-insensitive. Most financial products, including loans, savings vehicles and insurance have costs and benefits that are difficult to calculate. Survey, field- and lab-experimental evidence show that consumers have difficulty identifying the best price when products have multiple prices or involve complex calculations such as discounting, compounding, risk and uncertainty. When choosing such products, consumers may focus on one salient fee, incorrect fee approximations, or non-price attributes. (See for example, Ausubel 1991; Choi et al. 2009; Bertrand et al. 2010; Duarte and Hastings 2012; Hastings et al. 2015a,b; Hastings 2015.)[2]

Market forces could provide a solution. Classic models of informative advertising with rational consumers suggest firms will invest in lowering search and information costs, thereby increasing transparency and competition (e.g., Butters (1977)). In contrast, several recent theory papers demonstrate that firms may find it profitable to increase price complexity or otherwise steer buyers toward non-price attributes to soften price competition. When firms can increase search costs, decrease price comparability, or engage in persuasive advertising, they can decrease price sensitivity and increase margins (Gabaix and Laibson 2006; Carlin 2009; Ellison and Ellison 2009; Carlin and Manso 2011; Ellison and Wolinski 2012; Grubb 2015a,b).[3]

In this paper we bring new empirical evidence on how sales force advertising, prices, and consumer choices interact to shape market outcomes in a competitive financial product market. Specifically, we use unique administrative data from the privatization of social security in Mexico. The data contain detailed records for all individuals' fund manager choices, earnings, contributions, and residential location as well as data on fund manager fees and local sales force deployment. We develop an empirical model of the impact of sales force on fund manager choice. The model allows fund managers' sales force to impact choices by increasing brand awareness and product salience in line with traditional informative advertising models, but it also allows sales force to impact price sensitivity as motivated by models of obfuscation and persuasive advertising. We estimate

[1] See for example, Greenhouse, Steven, "Pension Funds Strained, States Look at 401(k) Plans," *New York Times*, February 28, 2011; Lowenstein, Roger, "The Long Sorry Tale of Pension Promises," *Wall Street Journal*, October 1, 2013.
[2] For a recent review of the literature on financial investments, see Hastings, Madrian and Skimmyhorn (2013).
[3] Note that price confusion or misperception is hard to dispel through experience alone when benefits are not immediately transparent (e.g. savings for retirement or insurance).

this model to understand firms' incentives to compete on price versus non-price attributes, to quantify the impact of sales force on observed market prices, and conduct simulations of oft-suggested market interventions to increase competition in privatized social safety net markets.[4] Our study not only helps explain experiences and outcomes in one of the world's largest privatized social security markets, but also suggests broader lessons as retirement savings and health insurance markets head towards greater individual control.

Mexico launched its fully privatized, defined contribution plan in 1997. Workers were able to choose among 17 regulator-approved social security account management firms well known through their pre-existing operations in consumer financial and insurance sectors. Tight regulations on investment vehicles resulted in a homogeneous-product, low-concentration market. Despite this, fees in the newly launched system were strikingly high. One year after the system's launch, the average asset-weighted load was 23 percent: of every 100 pesos a Mexican worker contributed, only 77 were credited to his or her account.[5] In addition to loads, many fund managers charged an annual fee based on the balance in the worker's account. The asset-weighted average annual fee across the 17 firms was 0.63 percent. All told, a 100-peso deposit by a Mexican worker into an account that earned a five percent annual real return would be worth only 95.4 pesos after 5 years. In contrast, five years after the launch of the system, fund managers' annual return on expenditures averaged 39%.[6]

By 2011, despite ubiquitous advertising and sales force presence, the large majority of account holders knew the name of their fund manager, but could not answer basic questions on fundamentals such as management fees, past returns, or investment holdings (Hastings 2015). Similar results have been found in the heavily-advertised U.S. retail financial product markets where despite over 10 billion dollars in US advertising expenditures in 2011, substantial price dispersion and financial illiteracy persist (Christoffersen and Musto 2002; Hortaçsu and Syverson 2004; Bergstresser Chalmers and Tufano 2009; Green et al. 2007; Carlin 2009; Hall and Woodward 2012; Hastings, Madrian and Skimmyhorn 2013).[7]

We develop a flexible model of individual fund manager choice, allowing price sensitivity and brand preferences (salience) to vary with exposure to a fund manager's sales force as well as with demographic characteristics. Two facts, apparent in raw data on Mexican workers' fund manager choices, motivate our model. First, investors were not price sensitive; they did not choose the fund with the mix of load and balance fees that minimized management costs given their contribution (load) and assets under management (balance) profile. Second, firms who invested heavily in advertising and sales forces had both high prices and large market shares, suggesting that competition on advertising and non-price attributes substituted for competition on price. Our

[4] For example, the U.S. Consumer Financial Protection Bureau was established in 2011 and tasked with increasing financial literacy rates and oversight of advertising and disclosure practices in all personal finance sectors.
[5] In comparison, most U.S. mutual funds do not charge loads, and among the minority that do, maximum loads are around four percent.
[6] "Informe Semestral Sobre la Situación que Guardan los Sistemas de Ahorro Para el Retiro." CONSAR report to Congress, December 2003, p.41.
[7] In 2011 US advertising for investment and retirement products exceeded $1.1 billion; credit cards, $1.6 billion; and insurance $3.7 billion. (AdAge Insights: Financial Services Marketing. Accessed December 10, 2013 at http://gaia.adage.com/images/bin/pdf/AdAgeFinancial%20ServicesReport2012.pdf.) Evidence for consumer price insensitivity appears abundant in credit and health insurance markets as well (Ausubel 1991; Ponce-Rodriguez 2008; Mullainathan et al. 2012a; Abaluck and Gruber 2012).

model allows for these patterns but does not impose them, letting us both quantify the effects of sales force on Mexican workers' choices and test between possible alternative theories driving the estimated effects.

Several features unique to our data and regulatory setting aid identification of demand parameters. First, we have location information for both sales agents and account holders which we use to measure sales force exposure. Second, the costs of choosing a given fund manager varied across investors (workers), even among those with similar location and demographic characteristics, giving us arguably exogenous variation in price. While fund managers had to set loads and annual fees (i.e., expense ratios) that applied to all workers, workers differed in their incoming account balances, the flow-versus-balance profiles of their contributions as well as the fraction of the time they were in formal private sector employment and hence participating in the system (versus informal employment, government-sector employment, or unemployment). These differences caused the effective total cost of each fund manager to be worker-specific even though fee menus were set nationally. We use this variation in costs across program participants to identify price sensitivity, conditional on regional and demographic-level brand preferences.

We outline a model of supply of sales force to motivate instruments for marketing exposure. We develop three instruments. First, we use variation in sales force exposure across otherwise identical individuals due simply to the characteristics of nearby investors to identify the impact of sales force on individual-level demand (Waldfogel 2007). This advertising-spillovers instrumental variables approach exploits the fact that firms set sales force levels based on market-level aggregates while individuals choose fund managers based on their own preferences and characteristics. Second, we take advantage of baseline competitor brick-and-mortar bank branch presence. Controlling for a fund's own bank branch presence and brand-value, competing funds' bank branch presence affects the equilibrium deployment of sales agents in a given market. Third, we utilize the variation in the number of government sector employees and informally-employed workers across markets as a shifter of sales agent deployment. Since workers in these sectors did not participate in the privatized system, it may be more costly for sales agents to find potential pension account holders in the markets where a larger number of workers are employed outside of the formal, private sector.

The estimates of our demand model imply that exposure to fund managers' sales forces considerably decreased investors' sensitivity to prices. Exposure to a particular manager's sales force also increased investors' perceptions of the non-price attributes of that manager and raised the probability of investors choosing it. These effects did vary in magnitude across investors, with the largest effects observed for lower-income, male, and younger investors. The combination of these price sensitivity and non-price attribute preference effects imply that sales force exposure resulted in Mexican workers paying higher management fees and earning a lower return on their retirement investments. Our estimates imply that holding fees constant but eliminating the impact of sales force on preferences would lead to a 17% decrease in total fees paid in the system as investors sort to lower-fee firms.

We next develop a supply-side model of fund-manager pricing to explore key policy prescriptions and to quantify the impact that persuasive sales force had not just on choices, but on the high equilibrium fees observed in the market. We present three simulations. First, we measure the effect of eliminating the impact of sales force on preferences, allowing equilibrium fees to adjust. This quantifies the total (demand and supply) contribution to high equilibrium fees observed in the market. We find that fees would have been 61.7% lower, as more price-sensitive investors would cause fund managers to charge considerably lower fees in equilibrium.

We then explore the impact of two specific policy interventions to increase price competition. First, we simulate the impact of introducing a government-backed competitor that charges a low fee (akin to a discount mutual fund in the U.S.). Forcing competition through a government-backed entity has been proposed as a way to increase competition in social safety net markets from health care to pensions. We find, somewhat surprisingly, that introducing a government competitor has little impact on average fees in isolation. Indeed, several firms best-respond by *increasing* fees and selling only to the very inelastic segment of the market. This provides empirical support to theoretical results that financial firms may choose to decrease price sensitivity of consumers in order to price high to a captive market (Carlin 2009, Carlin and Manso 2011; Sun 2014). It also echoes the "generic competition paradox" in the pharmaceutical industry, where generic entry can lead to higher brand-name prices (Frank and Salkever 1992, 1997; Berndt et al 2003; Davis et al. 2004). Since low-income workers are more likely to be price-inelastic, the best-response fee increases impact this segment the most, suggesting that introducing a government competitor may be both ineffective and regressive.

Next, we examine the effects of increasing price sensitivity among the most price insensitive investors, for example through financial literacy programs for low-education workers. In this counterfactual, we calibrate changes in price sensitivities among the least elastic customers to existing field- and natural-experimental evidence on the impact of information campaigns targeting the financially illiterate (Hastings and Tajeta-Ashton 2008; Duarte and Hastings 2012). We find such programs would result in 35.3 percent lower fees. Firms no longer respond by raising prices, as they no longer have a group of highly inelastic customers from whom to capture rents. Programs that increase price sensitivity among the most inelastic are important for incentivizing competition; all socioeconomic groups benefit from this policy when overall fees drop.

Finally, when we combine demand- and supply-side policies (the government competitor, price-sensitivity, and neutral advertising counterfactuals), our simulations show a 77 percent reduction in fees paid, as firms compete on price and a substantial fraction of workers choose the inexpensive government option. Thus the demand- and supply-side interventions are complementary.

While our counterfactual analyses are stylized and exclude unforeseen costs and consequences that actual interventions could introduce, we believe they are helpful in understanding the potential benefits and pitfalls of social safety net privatization, where product characteristics are complicated and the market covers a range of individuals with varying levels of education and abilities to solve complex problems.

This paper contributes to several literatures. First, we add to the literature modeling the impact of sales force on consumer decisions by extending current consideration set models to allow sales force to impact preferences for product characteristics such as price in addition to simply increasing the salience of the overall product. Many models of consideration (salience) are applied to every-day consumer products such as groceries or home electronics where prices and attributes are easy to see and experience (Mehta et al. 2003; van Nierop et al. 2010; Goeree 2008; Ching et al. 2009). The extension of this idea to financial product markets, for which there is considerable evidence that consumers find it difficult to weigh or understand the various product characteristics when making choices, could be fruitful. Indeed, this notion has motivated recent applied theory models of strategic price complication or obfuscation to explain outcomes in financial and retail markets (Gabaix and Laibson 2006; Carlin 2009; Ellison and Ellison 2009; Carlin and Manso 2011). We incorporate key aspects of these models into an estimable extension of a classic consideration model. We take the model to the data to test if and how sales force impact price sensitivity in a major financial product market.

We also contribute to recent work looking at the influence of specific content and framing, perhaps delivered by sellers' agents, on consumers' decisions in financial markets. Ausubel (1999) and Ponce-Rodriguez (2008) use credit card industry-run field experiments to show that individuals are overly responsive to teaser rates, resulting in increased debt and interest payments. Cronqvist (2006) presents evidence that mutual fund flows respond positively to advertising expenditures. Choi et al. (2009) find high sensitivity of investment decisions to brand name in the lab, even among financially educated subjects). Bertrand et al. (2010) show that borrowers are overly responsive to peripheral and emotional appeals in credit offers and insensitive to interest rates. Mullainathan et al. (2012b) use an audit study to show that U.S. mutual fund advisers reinforce biases of potential investors (rather than de-biasing them) and downplay the importance of management fees. Egan (2015) finds that brokers steer investors towards high-fee versions of otherwise identical funds, explaining high demand for high-fee fund offerings. Gurun et al. (2015) show that the content of direct mail advertising for sub-prime mortgages obfuscated fees and prices often by claiming low prices which were in fact not true. Several papers have demonstrated in field experiments within privatized social security markets specifically that investors are sensitive to information framing and irrelevant information (Hastings and Tajeda-Ashton 2008, Hastings and Mitchell 2011, Duarte and Hastings 2012). Our framework not only lets us test for these directional effects, but also quantify them and explore how they would shape outcomes under proposed alternative policies.

Finally, we make an additional methodological contribution by being, to our knowledge, the first to address in an estimable supply-side model two non-standard—though empirically relevant in our setting and, we believe, other settings as well—behaviors. One allows for firm best-response pricing functions where firms with market power may operate on inelastic portions of their demand curves, such as may be the case in the "generic competition paradox" or other situations where firms face regulatory threat (Frank and Salkever 1992, 1997; Berndt et al. 2003; Davis et al. 2004). The other allows firms to differ in their planning horizons when they make

their choices. As we show, these additional elements are consistent with basic patterns in the data and considerably improve the ability of the model to explain observed behavior in the market.

2 Background

2.1 Brief History of Social Security Privatization in Mexico

Mexico instituted its current privatized social security system on July 1, 1997. The system established individual ownership over retirement account contributions to replace the previous pay-as-you-go system. The government approved private investment managers, called Afores (*Administradoras de Fondos para el Retiro*), to manage the individual accounts. It established CONSAR (*Comisión Nacional del Sistema de Ahorro para el Retiro* [National Commission of the Retirement Savings System]) to oversee this new *Sistema de Ahorro para el Retiro* (SAR).

The privatization was done in two parts. In 1992, the government created private accounts for all pension holders in the system. From this point forward, social security contributions were placed into personal accounts rather than the general fund. The personal accounts were held by the Banco de México and earned a two percent real annual rate of return. However, the scope of privatization was largely limited to administrative tasks, such as record keeping and account statement generation, as all investment decisions were still made in a manner similar to the older system. To improve efficiency in account management, the government fully privatized the system in 1997, moving official account management from Banco de México to the private Afores. Assets from the 1992 system could be transferred to individual accounts in Afores if bank receipts confirmed that there were deposits regarding pension funds in those accounts.[8]

To be an Afore a firm needed to meet minimum capital requirements, minimum ownership share by Mexican firms, and have experience in the financial sector in Mexico.[9] Potential Afores submitted business plans including fee schedules to CONSAR for approval. Of the twenty-four firms that submitted applications and business plans, seventeen were approved to operate. Two of the rejected applicants entered the market several years later.[10]

The government took several steps to structure a competitive, low-cost market. The law stipulated that no Afore could have more than a 20 percent market share.[11] The financial characteristics of Afores' portfolios were strictly regulated; we detail this below. Afores had to submit any proposed fee changes for approval by CONSAR.

[8] Ley de los Sistemas de Ahorro para el Retiro" Diario de la Federación, February 24, 1992 and IMSS (Article 183-H), "Ley del Sar," articles 18, 19 and 20, and "Ley del Sar," Section II. See also Sandoval (2004).
[9] "Ley del Sar", article 58.
[10] Online Appendix section 6 describes the business plan submissions and the firms who submitted them in more detail. The Online Appendix can be found here: http://www.justinehastings.com/images/downloads/HHS_NBERWP_OnlineAppendix.pdf.
[11] We are unaware of this policy ever being enforced.

To take advantage of scale economies while ensuring against a natural monopoly in account management, a single, centralized processor (selected by CONSAR through a bidding process) handled database management and processed and recorded contributions, fees, and transactions.[12]

2.2 Fees and Investment Structure

Mandatory contributions to a worker's retirement account come from two places: payroll taxes (from the worker and the employer) and government contributions. The worker automatically contributes a mandatory 1.125% of her base salary from her paycheck, the employer adds an additional 5.15%, and the government contributes 0.225% so that each month, 6.5% of a worker's wages are contributed to the account.[13] The worker chooses the Afore that manages the funds in her account. At the inception of the system, each Afore was required to offer one specialized investment fund, limited to holding Mexican government bonds and Mexican corporate bonds with at least AA- rating (the latter was capped at 35% of assets, including a 10% cap on financial sector corporate bonds in particular). Thus Afores' portfolios were primarily composed of Mexican government bonds. Tests for persistent outperformance using monthly returns show no significant difference between fund manager returns (see Online Appendix, Section 2).[14]

Afores charged management fees on both automatic salary contributions (load fee) and on assets under management (balance fee). Because the load fee was only charged on inflowing contributions from automatic salary deductions (there was no load fee for transferring funds from one Afore to another), it was referred to as "the flow fee." It was quoted as a percent of the worker's *salary* instead of as a percent of the worker's contribution to the account. Hence a flow fee of 1% was actually a 15.4% load (1% is 15.4% of 6.5%). In 1997, flow fees ranged from 0 to 1.70% (i.e., 0% to 26.1% loads). In addition to the flow fee, firms charged balance fees ranging from 0% to 4.75%.[15]

The existence of these two separate fees implied that the relative cost ranking of Afores varied across individuals with their relative wage-to-balance ratio. This ratio depends on the worker's 1) wage rate, 2) balance at the system inception, and 3) probability of working in the formal private sector versus in the informal sector,

[12] See "Ley del Sar", Articles 25 and 26; Article 37, and Section IV, Articles 57-58. The fees paid by Afores for the centralized processor were as follows: registering a new account, 25.99 pesos; processing each contribution into the account, 0.62 pesos; switching an account's Afore, 5.47 pesos (charged to the Afore accepting the account). One dollar is approximately 12 Mexican pesos.

[13] As in the U.S there is a cap on the base salary, so that over a set cap, there is no longer a social security tax. In addition to these contributions, the government added a "social contribution" of 5.5% of the inflation-indexed Mexico City minimum wage that is available under certain conditions for unemployment insurance withdrawals, and the employer paid another 5% of the worker's base salary to a housing account for the worker. See "Ley de Seguro Social," Section V, Article 168. *Diario de la Federación*, 21 December 1995, and"Ley del ISSSTE", article 167 for details.

[14] The Online Appendix can be found here: http://www.justinehastings.com/images/downloads/HHS_NBERWP_OnlineAppendix.pdf.

[15] The Afore Inbursa started with only a fee as a percent of returns. We convert this to a fee on assets under management to facilitate comparison. Inbursa converted their return fee to a fee on assets under management and added a flow fee soon after the inception period and their acquisition of Captializa.

public sector or not working.[16] Because of inherent wage variation, differences in work histories, and even problems with accounting and management in the SAR 1992 system that created additional variation in the account balances at the inception of the system, workers' costs of using a particular Afore varied considerably even within relatively fine demographic cells. For example, for a worker who contributed consistently under the 1992 system and is currently and expects to remain employed in the public or informal sector, the cheapest Afore would be one with a zero balance fee, regardless of how high its flow fee is. Conversely, for a worker who did not have a 1992 account but has high and steady contributions from current employment, the best Afore would be one with a low flow fee, even if it might have a high balance fee.

2.3 Information, Financial Education, and Advertising Content

To find the Afore with the lowest cost, workers had to perform a fairly complex calculation: gathering and digesting information on fees, projecting their future contributions, and incorporating their current SAR 92 balance. As of 2011, a household survey of account holders found that only approximately 40% of survey respondents were financially literate (able to answer basic questions about compounding, inflation and return risk) despite a college educated rate of 30%.[17]

The government engaged in a broad informational campaign to explain to workers the system change and how and why to sign up with an Afore, but did not provide information on fees or financial literacy programs. We collected all television advertisements from the Nielsen-Ibope advertisement archive. [18] According to this archive, CONSAR ran eleven unique advertisements about the new SAR system beginning in late 1996. The ads highlighted facts about the new system and how to choose an Afore but avoided mentioning specific Afore characteristics, fees or investment profiles in an effort to remain impartial. Advertisements informed people that they had to sign up with an Afore, and strongly suggested that one would not have money for retirement if one failed to do so.[19] They provided a phone number to call for information on registration. They emphasized the individual's ownership over their account and their right to choose any Afore. They recommended choosing the right Afore for you. "Right" was not defined, but implied match quality (e.g., one ad presented choosing the right fitting glove as an analogy to choosing an Afore).

Thus, to determine the best Afore, investors were substantially reliant on the Afores themselves for information on the specific choices. In part, this information was delivered through Afore ad campaigns on radio and television. However, the most intensive marketing mechanism used by the Afores were Agentes Promotores

[16] Mexico has a strong informal sector, a large public sector with a separate pension system, and fluid movement of workers of all income and education levels among them. For example, approximately 30% of SAR account holders with a college education and 60% of workers with non-college backgrounds spent time in both the formal and informal employment sectors between 2005 and 2010.
[17] Results from the 2010-2011 *Encuesta de Empleo, Ahorro y Retiro* (EERA), Hastings (2015).
[18] Nielsen IBOPE (IBOPE AGB México, S.A. de C.V.) is a Nielsen affiliate in Mexico that that monitors and measures the advertising that consumers are exposed to, and the products that they buy. They have built a database of 35 years of television advertising in Mexico, which they make available to researchers for academic purposes through their website Publicity Tracks (Huellas de la Publicidad), at http://youspot.ibopeagb.com.mx/. (Date last accessed: June 8, 2015).
[19] See for example Advertisement ID Numbers 53655, 54846, 53460, 54738, 57229, 58039,134003, 134087.

(referred to as "agents" going forward). Agents were hugely important to the Afore choice process, in part because these agents were Afores' "faces on the ground" who were having the face-to-face conversations with workers about their choices, and because once a worker decided on an Afore, they had to sign up with an agent representing that Afore.

While it is difficult to fully reconstruct a picture of sales tactics from the late 1990s, we researched and document three sources for descriptive evidence on advertising content and approach. First, we located and interviewed agents from the system startup period and obtained copies of one Afore's historical agent training materials. The training materials we reviewed were substantial but did not discuss fees or other financial fundamentals. Instead, they focused how agents could establish relationships and appeal to workers' personal fears or hopes.[20] The training materials included a recommended reading list for being a successful sales agent. No books on financial investment or financial education appear on the list. Recommended titles include *The Six-Hat Salesperson*, *Emotional Intelligence*, and *Selling the Invisible*. Our interviewees recalled sales strategies that primarily appealed to company characteristics rather than financial fundamentals. For example, sales agents from Banamex and Bancomer would emphasize that their parent companies were the largest Mexican banks, while agents from Santander (a Spanish bank) would discuss its "international experience." Both appeal to an intuitive or emotional representation of firm quality, echoing findings from Bertrand et al. (2010) and Mullainathan et al. (2012a). None of our interviewed agents reported ever explaining risk, diversification, how to understand or calculate price or any other fundamentals. Moreover, they reported that sales agents were recruited for experience in sales, not for experience with financial products.

Second, we collected historic advertisements from Afores also using the Nielsen-Ibope advertisement video archive and print media from newspapers. The roughly 80% of ads by Afores focused on emotional appeals, with allusions to strength, experience, innovation and skill, as well associations with winning sports teams and celebrities. Online Appendix Section 5 lists the advertisements along with a classification and description of their content. Among over 200 video advertisements run between 1997 and 1999, less than 20% mentioned anything about costs or returns specifically. Among those that mentioned costs, the actual cost levels were typically unclear or irrelevant. For example, in one advertisement featuring apples, HSBC/Bancrecer/Dresdener stated that they do not "take a bite" out of your savings apple as other firms do, perhaps alluding to (but not stating explicitly) their zero flow fee.[21] That firm, however, had by far the highest balance fee (4.75%). Santander advertised that it was free to sign up your account with them, a statement that is true for all Afores.[22] Banamex stated in one ad that they are the only Afore to offer a "near zero" fee at 0.20%, which, given Banamex's 26% load, could only be correct under very particular and non-representative assumptions about incoming balances and contribution flows (which

[20] An English translation of a historic Agente Promotore training handbook is in Online Appendix Section 5.
[21] Nielsen-Ibope advertisement 51666.
[22] Nielsen-Ibope advertisement 53332.

were not disclosed or explained).[23] Of those mentioning returns, they would state facts about high returns in other investment markets the parent company owned (for example, savings funds in Chile). In sum, the large majority of ads did not mention fees or returns, and those that did were most likely to do so in a way that made comparing fees across firms difficult or made fees look low even though they were not. This complication of fee information is consistent with recent applied theory models of price obfuscation when at least some consumers are naïve or uninformed (Carlin 2009, Ellison and Ellison 2009).

Third, a 2010-2011 household survey of 7,500 account holders provides some additional support of consumer's lack of information. By this date, the government had undertaken several major reforms to the system accompanied by information campaigns to increase worker knowledge and fee sensitivity.[24] However, survey results showed that the agents were still the most relied-on sources of information when selecting an Afore for workers from all education backgrounds (though those without a college degree were the least likely to rely on government-based information sources introduced in later years).[25] While nearly 80% of individuals could correctly name the Afore who managed their account (survey responses were compared to administrative records), less than 10% of workers knew information about financial fundamentals like the fraction of their salary contributed to the account or their Afore's fees.

2.4 Choosing and Changing Fund Managers

When the new system officially began on July 1, 1997, workers could choose between any one of the seventeen approved Afores to manage their rolled over SAR 92 account balances and their pension contributions going forward. Officially, if a worker did not choose any Afore after two years, their pension account was to be turned over to a consolidated account held by Banco de México for up to four years. If the worker still had not claimed their account at the end of the four year period, the account was to be assigned to an Afore by CONSAR.[26] CONSAR's information campaign was effective in that almost all account value was claimed and reassigned to an Afore attached to a worker.

To choose an Afore, workers could contact CONSAR who would provide them with information on contacting Afores. They could contact Afores to seek information, or they could be contacted directly by Afore sales agents on the street, at their home or near their office. Based on our interviews with agents and sales force managers from the inception period, agents sought investors by canvassing malls, other public places, as well as offices and neighborhoods. Some set up stands in local public spaces, much like credit card solicitors do in the

[23] Nielsen-Ibope advertisement 52401.
[24] See Duarte and Hastings (2012) for a summary of later policy changes in the system.
[25] See Hastings (2015) for further survey results from the 2010-2011 *Encuesta de Empleo, Ahorro y Retiro* (EERA).
[26] The allocation process took place on 01/01/2001. Subsequent allocations took place every two months. The assignment rules change periodically, but the unclaimed accounts never sum to a large enough amount of money to be effective in generating price competition. In fact, in 2006, the sum total of the value in all unclaimed accounts was less than 5% of assets under management (Duarte and Hastings 2012). For details on the assignment policy, see "Ley del Sar", articles 75 and 76, and Article 7th transitional. See also Press release BP_02082000 (Aug 2nd, 2000) and Circular Consar 07-13.

U.S. They did not have targeted names and addresses and characteristics of account holders (such private information would have been illegal to possess). They instead had to search for account holders in publically accessible areas and solicit their business. Such practices motivate our advertising spillovers instrument, explained in further detail in Section 4: conditional on own characteristics, an individual living near others who are attractive clients for a particular Afore will have a higher exposure to sales force, all else equal.

Overall, most Afores gained some market share in every municipality. Using our data on affiliates in the system during the inception period, the number of Afores with affiliates in a given county ranged from nine to seventeen, with a twenty-fifth percentile of fifteen, and a median of seventeen. Once a worker registered with an Afore, it was difficult to switch. Although workers were technically allowed to switch fund managers at their discretion, the right to switch the account and all of the paperwork resided with the Afore they *currently belonged to*, not the one they wanted to switch to. Thus, switching Afores was a long and difficult process until reforms in the early 2000s, and the fraction of workers who switched Afores between the system's inception in 1997 and 2005 was close to zero.[27]

Given the difficulty and absence of switching, it is reasonable to assume that firms played an essentially static one-shot game to attract market share at the start of the system. Figure I plots the level of agents in the market over time; the average as well as the maximum across Afores. Both statistics decline substantially after the inception period. Figure II shows the average and median flow and balance fees across Afores. Both are nearly constant if not slightly increasing. It is clear that Afores recruited account holders while expecting to hold them going forward. As noted above, this belief was borne out by the near absence of switching. Afores substantially reduced their sales force numbers after the first two years of the system and could then hold fees roughly constant.

3 Data and Descriptive Statistics

3.1 Data

We compile data from several sources to form a detailed picture of workers' characteristics, pension fund balances and contributions, fund administrator choices, Afores' prices, and deployments of sales agents across localities. We use administrative data stripped of individual identifiers and provided under a confidentiality agreement with CONSAR. The data include each contribution made into each account on a bimonthly basis from 1997 to 2007 for all workers in the system as well as their account balance at the start of the system (imported from the SAR 1992 system). The data record gender and date of birth, which allow us to construct age and future

[27] See Circular 28-5, July 2002. In the years following the switching reforms, several new Afores entered the market and sales force increased once more.

date of retirement. The data also include the zip code of residence for most workers, which we use to link workers to measures of sales force concentration by afore and geographic location.

We use the contribution and balance data to calculate the expected cost to every worker of placing her account under the management of each Afore. We do so by computing the average contributions (earnings and days worked in the formal sector) in each year going forward for workers with very similar baseline characteristics to the worker in question. We use this expected cost measure rather than the worker's actual realized costs because it avoids the measurement error and potential endogeneity biases associated with using realized values (Hyslop and Imbens (2001)).[28]

We construct local measures of sales force deployment and exposure using the official agent registration database from CONSAR. This registration panel provides us with monthly information from 1997 to 2007 on all agents (registration is required): their status (e.g. active or inactive), the Afore they worked for, and a zip code of work. Our data do not record which sales agents contacted which individuals, but the administrative accounts data do record which agent was responsible for bringing in each account. We observe in these data that agents are most likely to recruit individuals who live in their municipality (municipio). Hence we define municipality as the geographic market of interest.[29] Our measure of workers' exposure to local sales force activity is the ratio of the number of agents in each municipality to the number of social security account holders in that municipality.

We complement these data with additional statistics on accounts' annual returns and investment vehicles, Afore ownership structure, and historic bank branch data by municipality from the late 1990's to early 2000's from the archives of the Mexico's National Commission of Banking and Securities.[30] We augment our findings with the aforementioned household retirement savings survey conducted in 2010-2011. This includes information on savings behavior, labor force participation, education, family structure, financial literacy, and knowledge of Afore and savings system characteristics (see Hastings 2015 for details). While these survey data were obtained more than a decade after the system's inception, they are linked to and randomly sampled from the administrative records and therefore offer useful context to our analysis.

3.2 Descriptive Statistics

[28] The Online Appendix Section 4 describes the expected cost construction in more detail. For our demand analysis we will use this cost, following the literature analyzing markets where prices for products may vary with expected usage (See for example, Miravete 2003, Heiss et al. 2010, Abaluck and Gruber 2011, Handel 2012, Einav et al. 2013, Grubb and Osborne 2012, Jiang 2012, and Duarte and Hastings 2012). *A priori,* fund manager choice is much less like likely to cause future labor force participation than health care plan choices are to cause subsequent use of different health services or cell phone plan choices are to cause calling behavior. However, we find that as expected our estimated demand elasticities calculated using actual (perfect-foresight) costs are smaller in absolute value than those using predicted costs.

[29] Because we know both the worker's zip code of residence and the sales agent's zip code of work registration, we can measure the typical distance between agents and the workers who "sign" with them. We found that the probability of having a worker using an sales agent in their same zip code is small (0.05), suggesting this is far too narrow an area to consider a market. Matches become more systematic, however, at higher levels of aggregation. The probability of a worker signing with a sales agent from the same county is about 0.40. This suggests the municipality is capturing most of the geographic match between sales-force and their customers.

[30] http://portafoliodeinformacion.cnbv.gob.mx/bm1/Paginas/infoper.aspx.

The relationship between sales force, demand and price is apparent in raw aggregate statics. Table I shows Afores' flow and balance fees, national market shares, and the size of their sales forces. Afores are sorted in descending order by sales force size. Several patterns stand out. First, many Afores are dominated in cost terms by other choices, meaning both their flow and balance fees are higher than both the flow and balance fees of at least one other Afore. For example, Santander charges a 1.70% flow fee (a 26% implied load on contributions) as well as a 1% balance fee, and is dominated at least by Banamex and Bancomer, which both charge the same high load fee but a zero balance fee. Those three firms' fees are dominated in turn by several firms who charge lower load fees and zero balance fees. There is also substantial price variation in this market even though all the firms were large, well-known institutions selling essentially homogenous, regulated investment products.[31]

Despite this variation in fees, many of the highest-fee ("dominated") firms have the highest market shares. The three firms mentioned above, Santander, Banamex and Bancomer, had the three highest market shares at inception. This is consistent with the classic brand value effect—workers perceived these Afores to have a product of high enough quality on non-price/non-return attributes to garner large market shares despite high fees. Looking at the final column of the table, we see that these high-fee, high-share firms are also those with high numbers of sales agents, suggesting that advertising had the effect of building brand value rather than increasing price sensitivity. In particular, Santander had the second largest market share and the largest number of sales agents among all Afores. Overall, the correlation between the market share an Afore garnered during the market's inception phase and the number of agents it deployed is 0.78.

We calculate the cost ranking for each Afore for each individual (rank 1 to 17, with 1 being the least expensive Afore for a given individual) as well as each worker's expected savings had they switched from the Afore they actually chose to the cheapest Afore for them based on their expected balance and flow profile (calculated over a ten year horizon or to retirement, whichever comes first).[32] Table II presents summary statistics of expected cost rank and potential savings by Afore for a random 10% sample of account holders. The first column gives the average rank of the Afore over people who actually chose that Afore. The second column gives the average rank of the Afore over all people in the system. If Mexican workers were acting on their personal information to minimize costs, we would expect to see much lower values in column 1 than in column 2. This is not the case. Rather, the two columns closely resemble each other despite large variation in relative rank for most Afores across workers.

Overall, the average rank is very high for Afores with substantial market share such as Santander, Profuturo GNP, and Banorte, suggesting that investors' Afore choices were driven by factors other than the fees they would pay. Interestingly, one of the highest cost Afores on average is XXI (Twenty-one), the Afore that is

[31] See Online Appendix Section 2

[32] We focus on a 10-year horizon because it is a natural target holding period based on current structures in the Mexican and Chilean privatized pension fund systems (each have a five-fund system moving workers into funds with lower regulated risk at approximately 10 year age intervals.

co-branded with the Mexican social security system, IMSS. This is reminiscent of findings for AARP co-branded Medicare Part D plans (Abaluck and Gruber, 2011; Mullainathan et al. 2012a).

Column 3 translates the relative rankings into a 'days of salary' measure. It shows the average number of days' wages that could be saved by workers (over a period of 10 years or through their expected retirement age, whichever comes first) if that Afore's clients switched instead to the Afore that was cheapest for them. These days of wages are non-negligible—on average, Mexicans work over three days a year just to pay the extra fees from holding accounts with higher-cost Afores—suggesting that real money is at stake and that demand may not be very price elastic, particularly for Afores with high levels of sales agents.

Figure III combines statistics from Tables I and II to graphically illustrate a key point: higher cost Afores (using Table II, column 2) both had larger market shares and employed larger sales forces. The figure plots Afore market share from Table I column 4 against Afore total sales force from Table I column 5. There is clearly a positive relationship between market share and sales force (a correlation of 0.78). In addition, each Afore's point on the graph is proportional in size to its average cost to workers (using Table II, column 2), so larger circles represent higher costs. Higher-cost Afores are predominantly in the higher-market-share-higher-sales-force region of the graph. This graph suggests a persuasive and price-competition-detracting impact of sales force advertising.

We also see a similar high-cost/high-share/high-sales-force pattern looking across municipalities. We calculate Afore market share by municipality and the mean cost ratio for each Afore's clients (equal to the cost of the chosen Afore relative to the average cost of all Afores). If we simply regress municipality market share and mean cost ratio on local Afore sales force levels, we find that a one standard deviation increase in an Afore's sales force is associated with a 2 percentage point increase in its market share and a 3 percentage point higher mean cost ratio among clients. Of course, Afores could send sales force to areas where they expect higher (lower) demand and lower (higher) price elasticity, leading to an upward (downward) biased estimate of the impact of sales force on demand. To estimate the causal impact of sales force on preferences and demand, we exploit individual and geographic detail in our data, using a model of demand and sales force supply to motivate instruments for sales force and to estimate parameters of interest.

4 Model and Estimation Approach

4.1 General framework

We develop a model that rationalizes a simple conditional logit specification for an investor's Afore choice and captures key features of firm and investor behavior described in Sections 2 and 3. In light of the institutional facts discussed in Section 2, a benchmark case of the model is one in which sales agents can be viewed as sales outlets,

or "mobile kiosks," dispersed around geographic markets.[33] In particular, Afore j employs N_j agents in a geographic market. Agent A_j represents the Afore, j, that she works for and whose fund she attempts to sell to investors. A client investor i who chooses Afore j receives a utility associated with the Afore along with an agent-client specific "match utility." This match utility can simply reflect the physical distance between the agent and the client, the quality of the idiosyncratic interaction between the parties (as reflected, e.g. in the TV advertisements emphasizing finding the "right" Afore), or even whether the client ever became aware of this particular agent. Hence, we model the indirect utility that client i receives from buying Afore j from agent A_j as:

$$u_{iA_j} = \lambda_i C_{ij} + \delta_j + \varepsilon_{iA_j} \tag{1}$$

where ε_{iA_j} is the "match utility" between the agent A_j and client i; C_{ij} is the management cost for i at Afore j, which depends on the client's expected future wage profile, incoming balance and j's flow and balance fees; δ_j accounts for all the non-cost components (e.g. expected return, brand value, availability of bank branches and complementary services, etc.) of Afore j. The elements of δ_j observed by clients are not necessarily those observed by the econometrician.

Given this indirect utility specification, and assuming that ε_{iA_j} is drawn iid from a Type 1 Extreme Value distribution,[34] the probability that client i buys from Afore j becomes:

$$\Pr(i \text{ chooses } j) = \frac{N_j \exp(\lambda_i C_{ij} + \delta_j)}{\sum_k N_k \exp(\lambda_i C_{ik} + \delta_k)} \tag{2a}$$

which can be rewritten as:

$$\Pr(i \text{ chooses } j) = \frac{\exp(\lambda_i C_{ij} + \delta_j + \ln(N_j))}{\sum_k \exp(\lambda_i C_{ik} + \delta_k + \ln(N_k))} \tag{2b}$$

Thus, we obtain an observationally equivalent indirect utility representation

$$\tilde{u}_{ij} = \lambda_i C_{ij} + \tilde{\delta}_j(N_j) + \varepsilon_{ij} \tag{3}$$

[33] We thank the editor, Liran Einav, for suggesting this analogy.

[34] We allow ε_{iA_j} to have a common component within Afore j across agents, with the Afore-specific common component absorbed into δ_j, which is a demographic-geographic cell-level fixed effect. Thus the correlation would be at the demographic-geographic cell level.

where the non-cost "intercept" component of the utility $\tilde{\delta}_j(N_j)$, depends explicitly on the number of agents that Afore *j* employs in the geographic market.

Note that the above model encompasses a pure "consideration set" model in which the role of sales agents is to increase the probability that a client will consider the Afore that they are affiliated with.[35] In such a model, sales force does not have a "persuasive" role, only an informative role. An alternative interpretation also consistent with this model is that agents are simply passive sales outlets who are spatially differentiated, without any informative or persuasive role, and the ln(N_j) term merely reflects the "density" of Afore *j* in the space surrounding client *i*. Thus, the "intercept" term $\tilde{\delta}_j(N_j)$ in the indirect utility equation allows for explanations where larger numbers of agents generate higher utility/convenience for clients or make their Afore more salient and likely to be considered. Once a client considers an Afore, they observe costs correctly, and decide based on fund characteristics and relative importance they intrinsically place on those characteristics.

In both the consideration set and spatial differentiation models, the cost or "slope" component of the indirect utility, λ_i, does not depend on sales force exposure. In econometric specifications, however, one can, and we do, allow λ_i to depend on the intensity of agent deployment in a market. If cost information is difficult to obtain or process, informative agents may make clients more or less cost-sensitive. If agents financially educate consumers or make fees easier to find and understand, then in observably similar markets where (exogenously) larger numbers of such informative Agents are employed, we would expect that more agents raise cost sensitivity. Alternatively, clients' cost sensitivity could decline with increased exposure to sales force. While this would be difficult to rationalize with a model in which agents' role is to provide correct information about Afores' costs, it is consistent with a model in which agents provide incorrect information or otherwise obfuscate costs (e.g. Gabaix and Laibson 2006; Ellison and Ellison 2009; Carlin 2009) and with audit and advertisement studies documenting such obfuscation (Bertrand et al. 2010; Mullainathan et al. 2012b; Gurun et al. 2015).

The more difficult clients find calculating the Afore-specific cost C_{ij} that will accrue to them, the noisier are the perceived costs upon which they would actually base their choices, and the less sensitive to actual costs they will be. To illustrate, consider an extreme case where clients know their C_{ij} values perfectly before meeting an agent but agents introduce noise or doubt about these costs per the advertisements described in Section 2. Assume that where (exogenously) more agents are involved, the variance of noise is higher.[36] This would in effect create attenuation bias in our econometric specification (we utilize the client's true C_{ij} for estimation, but clients make choices with noisy cost measures). We would find lower cost sensitivities in observably similar markets where (exogenously) larger numbers of "obfuscating" agents are operating.

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[35] Models in which advertising helps to place products in a consumer's consideration set have been utilized e.g. by Goeree (2008). To achieve an equivalent econometric specification as these models, we could, for example, replace the N_j and N_k in Equation (2a) with a "probability of sampling *j*" term, $\pi_j = N_j/(N_1 + \ldots + N_J)$.

[36] This example is motivated by the model of Carlin (2009), who offers an example of oligopolistic financial product sellers who choose both prices and "complexity," where higher equilibrium levels of complexity results in a greater share of price insensitive consumers that support non-zero margins even in a homogeneous good market.

Alternatively, or in addition, sales force could persuade consumers to care more about the non-cost attributes of the retirement product compared to its cost through, for example, sales tactics that minimize the importance of compounding or convince individuals that low costs do not translate into higher wealth at retirement (e.g. returns are important instead). In this case, agents act on clients' cost sensitivities directly rather than on their perception of costs. Both models – impact on cost perception or valuation of costs – are observationally equivalent. In the context of a discrete choice framework, heterogeneous errors in variables and heterogeneous preferences are in general not separately identified (Borghans et al. 2008; Train 2013).

Because multiple mechanisms may be consistent with our data and model, and we do not have survey data on individual-level price perception or valuation before and after sales force exposure, we maintain an agnostic view towards the specific micro mechanism(s) that underlie the effects of sales force on investors' revealed preferences and price sensitivity. Indeed, we also refrain from conducting explicit welfare calculations based on our demand-side estimates, as the different models discussed above may have very different implications about welfare. Generally, mixed-methods approaches which combine stated perceptions surrounding advertising exposure and resulting choices are needed to shed further light on exact psychological mechanisms (e.g. Karlan 2005; Ashraf et al. 2006; Fehr and Goette 2007; Ashraf et al. 2010; Jensen 2010; De Los Santos, Hortaçsu, Wildenbeest 2012; Hastings 2015; Hastings et al. 2015a). However, such data are typically not available at scale, making it difficult to measure market impacts and simulate policy counterfactuals as we are able to do with market-wide micro data. To the extent we focus on any "social outcome" in the analysis below, it is on the total management fees paid by workers in the forced savings-for-retirement system. Strictly speaking, these are transfers from the workers to the Afores and as such represent no net change in social welfare. However, much of the political and policy discussion around privatized systems focuses on the total costs of a system for distributional or other reasons, and as such we feel is worth explicitly quantifying.

4.2 Estimation and Identification

4.2.1 Estimating Demand Parameters

To estimate a tractable version of (3) and allow for flexible preference heterogeneity among investors, we follow a two-step approach. First, we estimate conditional logit models separately using demographic-by-geographic cells, and then estimate the impact of sales force on the resulting preference parameters using least squares and instrumental variables.

We break the population into 32 demographic groups, categorized by age (of which there are four categories), gender, and wage quartile. These demographic groups are interacted with investors' municipality (county) of residence. This yields 3,699 distinct demographic-group-municipality cells. We estimate the following random utility model for individuals in each of these cells:

(4) $$u_{ij} = \left(\alpha_c + \gamma_c w_i\right) C_{ij}\left(y_i, b_i, p_j\right) + \delta_{c,j} + \varepsilon_{ij}$$

where $\alpha_c + \gamma_c w_i = \lambda_i$, the cost sensitivity parameter. Using equation (4), we estimate for each demographic-group-and-municipality cell a portion of utility that varies with management cost (the first term), and a mean value for each Afore which includes all characteristics of the Afore, both observed and unobserved to the econometrician.[37] We can then use the thousands of resulting utility parameter estimates for λ_i (= $\alpha_c + \gamma_c w_i$) and $\delta_{c,j}$ to examine the impact of Afores' advertising/marketing efforts as measured in their ratio of sales agents to potential clients (sales force concentration) in each local market, *m*, on demand parameters of individuals in various demographic groups.

We next estimate the following linear relationship between sales force exposure and price sensitivity,

(5) $$\alpha_c = \alpha_0 + \tilde{\alpha} A_{c,m} + \sigma_c$$

where α_c is the cell-specific estimate of mean price sensitivity, and $A_{c,m}$ is a measure of total sales-force concentration in municipality *m* corresponding to cell *c* for all Afores. Additional specifications include demographic group dummies, cuts by demographic groups, and differential impacts of sales force from different Afores. Standard errors are clustered at the municipality level.

We estimate the impact of sales on brand value as

(6) $$\delta_{c,j} = \delta_c^0 + \tilde{\delta} a_{c,m,j} + \beta X_{c,m,j} + v_{c,j}$$

where $\delta_{c,j}$ is the cell-specific estimate of mean brand value; δ_c^0 is a cell-specific intercept, $a_{c,m,j}$ is a measure of total sales-force concentration in municipality *m* for Afore *j*; $X_{c,m,j}$ are other characteristics of the Afore such as bank-branch concentration that can vary at the Afore and municipality level , and $v_{c,j}$ is a mean-zero residual value of Afore *j* to the average investor in cell *c*.

4.2.2 Sales Force Endogeneity and Instrumental Variables Strategy

Sales force may be correlated with unobserved components of preferences for Afore *j*, $v_{c,j}$. We develop an instrumental variable strategy motivated by a model of sales force deployment choice.

[37] Note that within a cell, price sensitivity λ_i is allowed to vary linearly with individual *i's* current wage, so that price sensitivity varies smoothly with a measure of income within income quartile, age quartile, gender and county of residence.

Afores choose the number of agents to hire in a market based on the expected marginal revenue and the marginal cost of hiring an agent. Let $q_{i,j,m}$ be the probability that i chooses Afore j from equations (2b) and (3). This probability is a function of the number of sales force j hires in market m, $N_{j,m}$, the hiring decision of competitor Afores in municipality m, $N_{-j,m}$, prices for j and its competitors, p_j and p_{-j}, the vector of individual preferences, β_i, and personal characteristics, θ_i, for individuals in market m. Let $\Pr_{i,N_j,m}$ be the probability that the agent from Afore j finds and engages in a dialog with (delivers a sales pitch to) investor i in municipality m. T_m is the total number of individuals the marginal sales agent can approach and engage given time constraints. Agents are paid a base salary plus commission. Let mc denote the marginal cost of sales agents based on the commission rate $\tau_{j,m}$, the base rate $base_{j,m}$, and other cost factors such as available hiring and screening staff and office space $\kappa_{j,m}$. Afore j will hire sales agents in municipality m until the expected increase in revenue equals the marginal cost:

$$(7) \qquad \sum_{i \in T_m} \Pr_{i,N_j,m} \frac{dq_{i,j,m}\left(N_{j,m}, N_{-j,m}, p_j, p_{-j}; \beta_i, \theta_i\right)}{dN_{j,m}} C_{ij} - mc\left(\tau_{j,m}, base_{j,m}, \kappa_{j,m}\right) = 0$$

To identify the impact of sales force on individual *i's* preferences for price and Afore *j's* mean characteristics (brand name, etc.), we need instruments for *j's* sales force in *i's* municipality of residence which are arguably excluded from *i's* preferences for j. Equations (4) and (7) suggest three instruments.

First, sales force is increasing in average costs of account holders in the local geographic area, $\overline{C}_j$ (note that account holders' costs are Afores' revenues). Conditional on person *i's* demographics and personal costs, living in a municipality where members of other demographic groups are relatively high-revenue to Afore j will increase *i's* exposure to j's sales force, all else equal. The individual considers personal factors when choosing an Afore, while Afores choose sales force based on market-level factors. The exclusion restriction is that the cost that neighboring investors pay for Afore j enters *i's* utility function only through its impact on *j's* sales force decision and therefore *i's* sales force exposure. This is a classic advertising spillover instrument; the products a particular consumer is exposed to depend in part on the preferences of nearby consumers, even if there is no correlation between the preferences of this consumer and her neighbors (Waldfogel 2007).

Second, because sales agents were sent out to recruit individuals from the general population, a higher proportion of formal-private-sector workers (government workers and the self-employed do not participate in this system) in a particular demographic group should, all else equal, increase the yield rate per individual approached and the probability of a person with a SAR account being reached by a sales agent ($\Pr_{i,j,m}$). If individuals with SAR accounts are easier to find per the recruiting strategies described in Section 2, yield rates per time spent

should increase. To use the vernacular: holding fixed the number of needles (SAR account holders), smaller haystacks (fewer non-SAR workers) offer higher expected revenues to sales agents per individual approached.

Third, if having more local bank branches reduces costs of hiring sales agents, $\kappa_{j,m}$, then the number of bank branches in *m* owned by competitor Afores, *–j*, changes the competitors' sales force decisions. This in turn shifts *j*'s equilibrium sales force decision independently of client *i*'s preferences for *j* absent sales force. The exclusion restriction is that *–j*'s branch concentrations do not enter u_{ij} directly, only *j's* bank branch concentration directly affects investor's brand value for *j*.

We present results using combinations of these three instruments. The results are consistent across specifications.

Hence we instrument for sales force

$$N_{c,m,j} = a_c + \beta Z_{c,j} + \omega_{c,j}, \tag{7}$$

where $Z_{c,j}$ is a combination of the instruments described above: an advertising spillovers measure, the share of the municipality working-age population for cell *c* that has formal-sector pension benefits, the share of municipality working-age population employed in the formal public (government) sector, and the bank branch concentration of other Afores. We interact each instrument with Afore dummies to allow the impacts to vary across Afores.

Note that we could estimate the utility parameters in one step using a simple transformation of the market share for each Afore in each demographic-municipality cell as a dependent variable and instrumenting for sales force in a similar way (Berry 1994). However, doing so would implicitly assume that all individuals in a demographic group and municipality face the same relative costs for each Afore, which does not hold in our data. Using individual choice data adds a step to the estimation, but allows us to take advantage of variation in personal costs to identify price sensitivity as well as provide added instruments and exclusion restrictions to identify the impact of sales force on demand.

Our advertising spillover instrument rests on an assumption that person *i's* idiosyncratic preferences for Afore *j* are uncorrelated with the relative cost of *j* to other demographic groups living in *i*'s municipality. As a check, we estimate the correlation between mean costs (i.e., mean Afore revenues) of individuals in each demographic group with the mean costs of other demographic groups in their municipality for each Afore. In regressions of $\overline{C}_{cj}$ and $\overline{C}_{-cj}$ run separately by Afore, we find R^2 ranging from 0.001 to 0.006 across Afores (see Online Appendix Section 1 for further detail). Therefore, the observable profitability of workers in one demographic cell is essentially orthogonal to the observable profitability of other demographic cells in the same

municipality, and there is variation in market-level costs across individual workers with the same demographic characteristics.[38]

4.3 Estimation Results

Table III shows the results of regressing our cell-level estimates of Afore-specific brand effects δ_{cj} on measures of sales force for Afore *j* in municipality, *m*. We use the number of sales agents for Afore *j* in municipality *m* divided by the total number of SAR affiliates (workers) in *m* (in thousands) as our measure of sales force exposure. Hence our measure is the number of sales agents per 1,000 potential clients in a given municipality. We also allow Afore brand effects to vary with the Afore's municipality-level brick–and-mortar bank branch presence (measured as number of branches per 1000 adults), and an indicator if the Afore is a bank, as bank branch data are only available for banks.

Column 1 presents OLS estimates with standard errors clustered at the municipality-Afore level. Column 2 presents instrumental variables estimates using the advertising spillovers instrument (mean costs in same-municipality-other-demographic-group cells for Afore *j* interacted with Afore fixed effects). Column 3 adds competitor bank branches in the municipality and its interaction with Afore fixed effects as instruments. Column 4 adds fraction of the working-age cell population who are IMSS account holders interacted with Afore fixed effects as an additional instrument. The first-stage relationships between the instruments and sales force concentration appear in the Online Appendix. (First-stage F-statistics are reported in Table III.)

The OLS impact of sales force concentration on brand value is positive and significant, in line with the market share correlations presented in Figure II. IV estimates are larger than the OLS estimates for all specifications, indicating that Afores send sales force to areas where their baseline brand value is lower rather than where the customer base is already brand-captive. This is consonant with predictions from equation (7) if areas with lower baseline brand value for *j* are areas where *j*'s marginal sales agent can have a larger impact on demand. Using the point estimate from column 2, a one standard deviation increase in sales force (0.312) would increase an Afore's brand value by 51% of the mean, all else equal. In comparison, a one standard deviation increase in bank branches per thousand adults would have a 7.9% increase on an Afore's brand value. Bank-run Afores per se have a higher mean value to investors, equivalent to about a third of a standard deviation increase in sales force. This is more likely attributable to familiarity and street presence than to a desire to have banking and SAR accounts at one institution, as the large majority of SAR account holders save in co-ops and credit unions,

[38] If, as is plausible, observable and unobservable profitability factors are correlated, this low correlation between own and average-neighbor's costs implies that the unobservable components of profitability are also likely uncorrelated (Altonji et al., 2005).

and less than 15% of surveyed SAR participants list unified banking as one of the top three reasons for choosing their current Afore.[39] All of the major banks operating in Mexico entered the Afore market.

Table IV presents instrumental variables results by demographic groups using the full set of instruments from Table III, column 4 (similar results are found using the instruments in columns 1 and 2 of Table III). Sales force concentration has a 25% larger (4.594/3.662) impact on brand value for low income workers than for high-income workers (defined as below vs. above median daily wage). Bank branch presence has about half the value to low-income workers. This makes sense as low-to-middle income workers are much less likely to save in a bank.[40] Sales force have a similarly larger impact on men's valuation of Afore brands relative to women's. Younger workers are more affected by sales force than older workers. Older workers value local branches slightly more than younger workers.

Note that because we only observe data on sales force deployment, and not on which individuals each sales agent approached and the outcome of each sales attempt, higher impacts of sales force by subgroup could be either be because the individual was more responsive to a received sales pitch or because sales force targeted them more often for approach. We can look at whether sales force characteristics (zip code location and age) vary systematically with individual characteristics of those accounts for which they signed up (recall the data do record which sales agent was responsible for signing which account). Systematic differences would indicate selective targeting. We do not find evidence of this; geographic proximity and age of sales agent are nearly identical across individuals of different incomes, genders and ages.

We also create an indicator if an Afore is one of the four lowest-cost (lowest-quartile) Afores for account holders in a demographic-group-municipality cell. We label these "Low Cost" Afores. Because costs vary based on local demographic and labor profiles, the identity of the Low Cost Afores varies from cell to cell and county to county. Each Afore appears as one of the cheapest between 3% and 15% of the time. We test if Afores' sales agents have less of a persuasive effect on brand value in cells where the Afore is Low Cost, a possible indicator of Afores' sales agents emphasizing non-price attributes less when they held a price advantage. However, we find that sales force for Low Cost Afores has a similar effect on brand value to that of other Afores within a cell; it does not seem that the lower-cost Afores market themselves this way.

Table V examines the impact of sales force on estimated price sensitivity in an OLS regression of α_c on total sales force concentration (summing across all Afores within a municipality).[41] The findings further support the view that sales force makes investors less sensitive to costs. Overall exposure to sales force increases α_c towards zero (i.e., reduces price sensitivity). The estimates in column 1 imply that a one standard deviation increase in total sales force concentration (2.504) reduces the absolute value of α_c by 30% (0.046*2.504/0.388).

[39] Authors' calculations from the 2010-2011 Encuesta de Empleo Retiro y Ahorro.
[40] Author's calculations from the 2010-2011 *Encuesta de Empleo, Ahorro y Retiro* (EERA).
[41] Note that brand value may be endogenous with unobserved preferences for an Afore, per equations (5) and (6). However price sensitivity is identified off of differences in Afore price ranks across individuals controlling for brand fixed-effects at the cell level. Accordingly, we estimate equation (4) with OLS and note that instrumenting for sales force in this equation using the additional instruments in Table III column 4 does not change the parameter estimates.

Column 2 allows for a separate additional effect of sales force concentration for the cheapest four Afores. The coefficient is positive but insignificant, again indicating that agents of lower-cost Afores are not emphasizing costs to investors. Columns 3 through 8 estimate the impact of sales force by demographic group. The decrease in price sensitivity is stronger for low-wage workers, men, and younger workers—the same groups for which sales force had stronger persuasive impacts on brand value.

Taken together, Tables IV and V support a view of advertising where Afores' sales forces acted to decrease price sensitivity and increase focus on brand in choice of Afore, particularly among men, younger workers, and lower-income workers. Utility parameters are difficult to directly and quantitatively interpret as they are unitless and work together (rather than separately) to determine choice and demand elasticity. To quantify the magnitude of the impact on Afore choice and management costs paid, we use our parameter estimates to compute counterfactual demand elasticities and Afore choices. Figure IV shows what the demand elasticity for each Afore would have been if the effects of sales agents on workers' preferences were set to zero. This graph is generated as follows. First we calculate the demand elasticity for each individual for each Afore using the observed prices, characteristics and sales force exposure levels.[42] Then we take the average demand elasticity for each Afore across all individuals in the market. To quantify the impact of sales force on demand, we repeat this process after setting the estimated impact of Agents on price sensitivity and brand value to zero ($\tilde{\alpha}$ and $\tilde{\delta}$ from equations 5 and 6, respectively). We refer to this counterfactual as the "Neutral Agents" counterfactual, as it imposes that sales force has no impact on price sensitivity or brand value.[43] This counterfactual is not meant as an evaluation of an alternative policy as it does not incorporate a supply-side response (though we do this in Section 5), but rather as a way to quantify the demand-side impact of sales force on investors' Afore choices.

Figure IV plots the mean elasticities for each Afore at the demand estimates (Base Model) and at the Neutral Agents counterfactual against mean sales force concentration. The Online Appendix presents tables of mean elasticities and market shares under each model. The model fits extremely well in sample; the actual shares and predicted shares from the Base Model are almost identical. Figure IV shows that baseline elasticites calculated at the demand estimates are on average negative, but less than one in absolute value, with the exception of Bancrecer/Dresdner/ HSBC (whose mean elasticity is -1.076). This implies that the average investor has inelastic demand for each Afore when evaluated at current prices, characteristics, sales force exposure and estimated preferences.[44]

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[42] Demand elasticity is $\frac{C_{ij}}{q_{ii}} \times \frac{\partial q_{ij}}{\partial C_{ij}}$ where C_{ij} is the management cost as defined above, and q_{ij} is the choice probability given by the logit demand equation. We hold cost constant and calculate this elasticity at the parameter estimates as well as in the counterfactual case where sales force has zero impact on preferences.

[43] To do this, we also zero out the impact of Garante's (the reference brand value Afore) sales agents.

[44] These elasticities are averaged across investors without weighting each investor by their potential revenue. They summarize individual behavior, but do not correspond to the objective function of the Afore. The Afore would weight each individual by expected revenues, as the elasticity of each peso, not each person, is what matters for revenue. Preferences of those with larger potential accounts matter more for Afore's optimal fees.

In contrast, demand is substantially more price elastic under the Neutral Agents counterfactual. The average price elasticity more than doubles, from -0.75 to -1.93. There is also nontrivial variation in the size of the increase in the elasticity across Afores; overall those Afores with the largest sales force concentration show the largest increase in price elasticity between the baseline model and the Neutral Agents counterfactual. This suggests that a substantial portion of the price insensitivity in the market can be attributed to the impact of sales force on choices; without this effect, demand would have been much more elastic across the board.

While we cannot determine if, in the absence of sales force, worker's price perception would have been correct (e.g. unbiased estimates of expected costs), or whether workers would have placed correct (unbiased) weights on price versus non-price attributes, we note that the impact on demand elasticity is similar in size to impact estimates from mandatory fee disclosures, such as the one implemented by CONSAR in 2005 and analyzed in Duarte and Hastings (2012). Here the government created a specific fee index from the flow and balance fees, and required a standardized table of fees to be shown by agents to customers at the time of sale. It required a signature from the customer stating they read and understood the simple comparative fee table. Duarte and Hastings (2012) show that this had a sizeable impact on demand elasticity, similar to what we find here.

Finally, while we are able to estimate the impact of sales force on choices and the weight placed on management fees given our identification strategy above, we note that whatever impact television and print advertising discussed in Section 2.3 had on choices remains. Note that overall, the number of television advertisements registered for an Afore in the Neilsen-Ibope database is correlated 0.68 with total sales force, suggesting that sales force size is strongly positively correlated with Afores' broader sales and marketing efforts.

We can also simulate expected management costs paid from increasing price elasticity under the Neutral Agents counterfactual.[45] Table VI presents simulation results of mean change in elasticity and percentage change in total cost paid ([Neutral Agents model cost / Base model cost] – 1) by demographic group. Overall, expected management fees paid in the system are 17.3% lower under the Neutral Agents counterfactual. This is one way to quantify the impact of sales force on the price workers/investors paid: holding fees constant, it tells us how much less expensive the chosen Afores would have been if sales force had zero impact on preferences.

Results by demographic group reveal several interesting patterns. First, although Tables IV and V showed a stronger percentage impact of sales force on preferences for low-income workers, in terms of costs, low-income workers gain the least (a 5.3% reduction in total management costs) in our Neutral Agents counterfactual. This is because while sales force have a strong persuasive impact on choices among low-income workers, in the absence of sales force low-income workers would still pick Afores based on brand-specific factors or idiosyncratic preferences. They are less demand-elastic in the absence of sales force; their simulated demand elasticity is the

[45] Expected costs paid by individual i are simply the choice-probability-weighted management costs over a ten year horizon for person i in Afore j: $E(C_i \mid \theta_i) = \sum_{j=1}^{J} C_{ij} q_{ij}(\theta_i)$ where C_{ij} is the management cost, and q_{ij} is the logit choice probability that i chooses j given preferences θ_i. Preferences are held at our demand estimates and costs are calculated to get baseline expected costs. We then set the impact of sales force on preferences to zero and recalculate choice probabilities and expected costs.

lowest among all of the demographic groups in both the baseline and the counterfactual. This is consistent with survey evidence from the 2010-2011 *EERA* which shows that less-educated and lower-income workers are less financially literate and less likely to know facts about their accounts and the savings and retirement system in general.

Overall, higher-wage workers benefit the most in the absence of sales force in terms of their percentage reduction in fees (men and older workers also benefit slightly more on average than women and younger workers). This is driven by the fact that when we zero-out the impact of sales force on preferences, higher-wage worker demand is very price elastic. This may seem counterintuitive, as financial literacy is generally positively correlated with income and age (Hastings, Madrian and Skimmyhorn 2013). While higher earners may be more sophisticated in that they understand the fundamental importance of compounding and how fees and returns impact account growth, several studies show that they are also more likely to chase returns, over-emphasize brand, and ignore fees when brand or returns are emphasized (see e.g. Hastings and Tajeda-Ashton 2008; Choi et al. 2010). For example, Hastings and Tajeda-Ashton use conjoint analysis experiments in a convenience sample of Mexican social security participants and find that while financially literate place more weight on fees when evaluating Afores, if also given information on returns, they lower the importance they place on fees and chase past returns instead.

In the Online Appendix, we show how market shares and revenues change for each Afore between the Base Model and the Neutral Agents counterfactual.[46] Market concentration is lower in the Neutral Agents counterfactual because investors have weaker brand preferences. Market share drops the most among the market leaders (those with the largest sales force). For example, Santander, the Afore with the largest baseline market share and largest sales force, has an 85% lower market share (falling from a predicted share of 13.4% to a new share of 1.9%). Bancomer, Garante, and Profuturo shares similarly decline. In contrast, market share shifts to minor players with small sales force like Zurich, Principal and Capitaliza and by the somewhat more major players, Inbursa and XXI, who had moderate sales force levels. Overall, the Herfindahl-Hirschman Index (HHI) drops from 1,088 to 940 when the impact of sales force on preferences is zeroed out.

5 Policy Simulations

The results above suggest that inelastic demand, caused in part by the impact of sales force, contributed to high fees and thus low savings for retirement. Several regulations are often proposed to accompany moves towards

[46] To calculate these shares we compute for each person the probability they would choose each Afore given the Afore's observed attributes in the data and our demand estimates. We next sum the probabilities over all consumers to calculate each Afore's demand. We then do the same calculation while setting the impact of sales agents on demand to zero.

privatization: introducing a government competitor that charges a low price to "discipline" the market, regulating marketing, and undertaking campaigns to increase financial literacy and informed choices (i.e., the government invests in informative advertising).

The demand-side estimates suggest that these policies could have resulted in lower prices. However, drawing policy implications from demand-side evidence alone is complicated by the fact that firms' choices will respond to these policies. With data for the entire market, we can both identify and quantify the impact of sales force on demand and explore policy counterfactuals in a way that is often not possible. We develop a model of price setting and competition between Afores. We couple this model with our demand estimates to simulate counterfactual prices and management fees paid under the policy scenarios outlined above, allowing firm prices to adjust strategically to changes in policy and demand.

5.1. Modeling Firm Price Decisions in a Regulated Social Safety Net Market

We assume firms compete on prices, Nash-Bertrand, in a differentiated products market.[47] Revenues for Afore *j* are:

$$\pi_j\left(f_j, b_j, A_j\right) = \sum_{i \in I}\left[q_{ij}\left(f_j, b_j, A_j^i, f_{-j}, b_{-j}, A_{-j}^i; X_i, \theta_i\right) \times \sum_{t=1}^{T_{ij}} rev_{it}\left(f_j, b_j; Z_{it}\right) \right] \tag{8}$$

where we sum over (expected) revenues obtained from each individual *i* in the system. Here f_j and b_j are flow and balance fees set by Afore *j*; A_j is the vector of region-specific sales force levels chosen by the Afore; A_j^i is the level of sales force exposure for individual *i* from Afore *j*'s agents; q_{ij} is the probability that individual *i* chooses Afore *j* given utility (per equation 3) as a function of fees, Afore characteristics, sales force exposure, personal characteristics, X_i, and preferences, θ_i; and rev_{it} is the present value of the revenue stream generated by individual *i* in year *t* assuming she does not switch to another Afore. The subscript *–j* denotes all Afores other than Afore *j*. Thus revenue is a function of *j's* fees, f_j and b_j, and a set of personal characteristics, Z_i.[48] T_{ij} is the time

[47] We model the supply side as a static game even though competition may at first glance appear to have an important dynamic element: workers can switch Afores (though at a cost), creating switching-cost-driven dynamics. However, we are comfortable approximating the market as static because it turns out that, empirically, almost all switching of Afores by workers—which as discussed above occurred at a very low rate to begin with—is driven by changes in employment status (Duarte and Hastings 2012). That is, workers who do switch appear to being doing so in response to what occurs in the labor market, not competition among Afores. We therefore think of the arrival and departure of clients as being driven by an exogenous process; firms maximize profits take this process as given.

[48] We set marginal costs of account management to zero. The Afore's profits also include the costs of hiring sales agents. We could include this term in our analysis, but it would not change anything, as the counterfactuals we compute either leave marketing (i.e., agent) spending constant or shut it down completely. Hence we never need to know sales force hiring costs, as we do not need to compute new optimal sales force levels in any counterfactual.

horizon over which the Afore calculates profits from an individual. This is the minimum of the years to retirement for individual i and a free parameter T_j that we estimate separately for each Afore. Specifically, T_j is the Afore's profit horizon – the horizon over which it calculates profits when setting fees.

Our specification with a "profit horizon" is motivated by the regulatory constraints and uncertainty in this and other policy-important markets (like pharmaceuticals or health insurance). We know that Afores made fee decisions under a regulatory approval process; they had to submit fees, along with a 10 year forecasted demand and profitability business plan to the regulator before being allowed to enter the market (see Online Appendix Section 6 for details about the application process gathered from historic CONSAR documents). Afores may have feared threat of regulation or been uncertain about the longevity of this new system.[49] This regulatory threat may have affected their fee strategy (e.g., Glazer and McMillan 1992, Stango 2003). To capture regulatory threat, we allow firms to vary in the time-horizon over which they calculate profits, T_j. This allows them to up-weight current revenues (that is, shift their relative fee structures toward flow fees and away from balance fees) if the future of the market is uncertain. Indeed, approximately 10 years after the inception of the system, the government regulated and capped fees.

In the Online Appendix, we report the estimated T_j's that best rationalize observed fees given our supply model and demand estimates. In supply and demand models there is typically one unknown factor, either marginal cost or conduct, which allows the model to fit the data. In this regulated setting, the time horizons are an additional feature of conduct that is estimated to best fit predicted prices to actual observed prices given demand.

A Nash equilibrium of this game is a vector of balance and flow fees and regional sales force levels such that each firm's choices are best responses holding other firms' decisions as given. However, characterizing this Nash equilibrium for counterfactual parameter values is rendered computationally difficult due to the large number of regional sales force decisions that need to be made by each firm. Therefore, our analysis using the supply-side model is limited to situations that can be reasonably analyzed without re-solving for the regional sales force deployment decisions of the firms. Thus, in all of the analyses below, we either keep the sales force deployment levels fixed at their observed values, or we neutralize the effect of advertising by zeroing out the effect of sales force on preferences.

Given a vector of sales force levels A and a vector of expected account horizons $\left(T_j\right)_{j\in J}$, a Nash-Bertrand equilibrium in this game is a vector of fees $\left(f_j, b_j\right)_{j\in J}$ such that

$$(9) \qquad \left(f_j, b_j\right) \in \arg\max_{\left(f_j, b_j\right)\in\left[0,\bar{f}\right]\times\left[0,\bar{b}\right]} \pi_j\left(f_j, b_j, A_j, f_{-j}, b_{-j}, A_{-j} \mid \mathrm{T}_j\right)$$

[49] Examples of instances where governments halted social pension privatizations include Argentina and Venezuela's nationalization of pensions and private industry. See Duarte and Hastings (2012) for evolution of reforms in Mexico's system.

for each afore $j \in J$, where $\overline{f}$ and $\overline{b}$ represent implicit regulatory approval caps on fees.

Note that firms' maximization problems with respect to prices need not be convex in our setting. In markets with heterogeneous preferences and enough price-inelastic consumers, a firm may respond to a competitor's low price by ceasing to compete on price, raising price, and selling only to a small inelastic base.[50] This discontinuous best-response function implies that instead of following the traditional methodology of estimating the supply-side parameters that minimize smooth, continuous first-order conditions given demand, we use a best-response iteration algorithm.

We employ a best-response iteration algorithm (henceforth, BR iteration) to solve for the equilibrium fees, and we find an intuitively appealing solution that survives the iterative best-response test. The Online Appendix describes the algorithm and sensitivity analysis we performed to demonstrate robustness of our solution to initial starting points and simulation approach. To summarize, we use a Gauss-Seidel BR-iteration algorithm in which Afores simultaneously best respond at every iteration, and find no convergence issues in any of our numerical implementations. We conduct several robustness checks, including changing the order in which firms best respond as well as initial starting values. The solution found under the sequential best-response algorithm is robust across these checks. Note that our numerical solution does not preclude the existence of other equilibria that are not found under the sequential best-response algorithm. However, in the Online Appendix we show that the existence of an equilibrium where some Afores choose to compete for the individuals with inelastic demand and charge the highest possible fees (as we find in our analysis) eliminates the possibility of an equilibrium where firms compete for the majority of the account (i.e., an equilibrium where no firms best respond on the upper boundaries).

Online Appendix Table IX shows the estimated time horizons T_j for which simulated equilibrium fees best fit Afores' observed fees. The table includes *ex-post* realized time horizons – the length of time the Afore actually remained in the market – out to ten years, simulated fees, actual fees, predicted market shares at the simulated fees, and actual market shares. The estimated equilibrium fees and market shares evaluated at the fitted time horizons are highly correlated with actual fees and market shares (0.80 to 0.98 correlation). This is much higher than if we force Afores to use a uniform horizon of 10 years; it is clear that most Afores charge flow fees that are far too high and balance fees that are too low to be consistent with a horizon of a decade or more. Moreover, the estimated time horizons also fit *ex-post* industry evolution fairly well; we generally predict short horizons for firms who exited the market during the first few years of the system and longer horizons for the firms that remained.

[50] Though this issue has not been incorporated in the prior literature, we note that such non-convexities in best-responses may be present in many traditional and social-safety-net markets outside of ours. For example, it would cause the "generic competition paradox" in the pharmaceutical industry, where generic entry can lead to higher brand-name prices (Frank and Salkever 1992, 1997; Berndt et al. 2003; Davis et al. 2004). It could also, for example, lead to mom-and-pop stores to increase prices in response to competition from Wal-Mart. It could also appear in models of competition between schools in voucher markets if demand is similar to Hastings Kane and Staiger (2009).

5.2 Counterfactual Results

We use our supply-side parameters and the demand estimates from Section 4 to conduct several counterfactual policy simulations. For each simulation, we present key summary statistics in the main tables, and the Online Appendix provides the full simulation results by Afore.

The first counterfactual scenario we analyze completes the calculations in Section 4.3, but now allows prices to respond to the change in demand caused by zeroing-out the impact of sales force on workers' preferences. This measures the full demand-and-supply impact of "Neutral Agents" as we allow prices to readjust to the substantially higher demand elasticity. While this counterfactual does not reflect a particular proposed policy (such as introducing a government competitor), it quantifies the full contribution of sales force on equilibrium prices, and illustrates how increased price elasticities can affect equilibrium outcomes. Results are in Table VII. In contrast to the 17.3% drop in costs in Table VI, total system costs fall by 61.7%. Given that they now face substantially more elastic demand, Afores find it optimal to cut their fee levels substantially. As in Table VI, low-income workers' costs fall by less than high-income worker's costs (-55.1% vs. - 64.0%), due to the fact that they remain fairly price insensitive even in the absence of sales force impact on preferences. However, a substantially greater share of the cost savings accrues to lower-income workers here when firms must compete more aggressively on price.

The next counterfactual scenario we analyze has XXI (the Afore which co-branded with the social security administration) behaving as a "public option" that charges a price near marginal cost in the market in order to increase competition. We assume marginal cost pricing is a flow fee of zero and a balance fee of ten basis points (0.10% annually), fees typical of the most popular index mutual funds (e.g. Vanguard) in the U.S. Table VIII presents the simulation results. The first two simulation columns show the impact that XXI playing (0.00, 0.10) has on other Afore's prices, market shares, and management costs paid by different demographic groups under the assumption that sales force deployment levels and preferences are fixed at their observed levels (the Base Model). We find that a government player can have unintended consequences, leading to increased rather than decreased prices. This happens for two reasons. As noted above, the best responses may be complicated due to groups of very price inelastic customers. If a competitor such as XXI lowers its price, Afores may find it optimal to match price decreases up to a point. However, for large enough price cuts by XXI, an Afore's best response may be instead to charge a very high price to a captive base of inelastic customers. We find this does in fact occur.

We impose regulatory caps on fees and show results at each cap.[51] In column 1 we set the cap at 2% flow and 2% balance fee, even though currently fees exceed that on at least once dimension for some market

[51] Private sector mutual funds in Mexico faced an annual fee cap of 500 basis points (5%) of assets in this period (Institutional Investors in Latin America, OECD Publishing, 21 July 2000, p. 81).

participants. With this cap imposed, we find that overall fees decline only slightly, and all other firms price at the imposed regulatory cap. XXI's market share only increases from 2.7% to 5.8% despite having by far the lowest fees in the market. Column 2 shows that any modest cost savings in column 1 is driven by regulatory fee caps. If we allow the caps to increase to 3.2% flow fee and 5% balance fee, we find that approximately 20% of Afores respond to XXI by increasing their prices to the cap. Despite its low fee, XXI garners only 6.4% market share, while Afores pricing at the cap for at least one fee manage to win over 23.5% of the investors in the market. Because of this, having XXI act as a low-cost government option actually *increases* total cost paid in the market, rather than decreases it. The higher fees charged by firms who best-respond to XXI by increasing fees outweighs the low-fees paid by the relatively small set of elastic customers who choose XXI. For the most part, costs decline on average only among older workers, who on average have a higher baseline preference for the government-run firm. Importantly, costs increase substantially – by 20.2% – among low-income workers, as they are the most likely to be the inelastic subgroup of investors in Afores who raise fees in response to XXI's low prices. Thus in the absence of other policies, a government competitor could actually lead to higher prices being charged to low-income workers with low price sensitivities and who are strongly influenced by persuasive advertising.

Column 3 shows how the simulation results change under the assumption that the effect of sales agents on preferences has been zeroed out – the Neutral Agents assumption. Now, in the absence of persuasive advertising, XXI's share increases 504%, from 2.7% to 13.6%. Thus without the influence of persuasive advertising, a substantially larger fraction of customers choose the low-price government option. No firms best respond by pricing at the cap in this case. Overall, management costs in the system decrease by 64.0% as firms instead respond to price competition and elastic demand by lowering, not raising prices. Gains are large for all workers, as even the still-relatively-inelastic benefit from competition and lower overall fees. Therefore inducing a critical amount of price elasticity can benefit all segments of workers. In fact, adding the government competitor does little to further lower fees (comparing -61.7% from Table VII to -64.0% here), as elastic demand in the absence of sales force sufficiently disciplines prices in the market.

Neutralizing the impact of sales force on preferences is not a well-defined policy. However, the simulation results indicate that raising price sensitivity among low-income or price-inelastic market segments is key to improving price competition. This motivates our second counterfactual simulation: increasing price sensitivity in the marketplace. Financial illiteracy, for example, has been linked to consumer confusion and price insensitivity, prompting calls for increased financial education. These calls have made their way into sweeping financial reforms in the U.S. with the Dodd-Frank Act and the Consumer Financial Protection Bureau's Office of Financial Education.[52] Hastings and Tejeda-Ashton (2008) find that simplified information leads to a 25-50% increase in mean price elasticity measured from stated preferences in a convenience sample of account holders in Mexico. Duarte and Hastings (2012) show that a simplified fee index introduced in the system in 2005 (several

[52] For a recent review of the literature on financial education and financial literacy, see Hastings, Madrian and Skimmyhorn (2013).

years after the inception period we study here) and widely advertised by the government increased sensitivity to that measure of price fourfold or more.

We take these two estimates and interpret them as reflecting a direct change in price sensitivity among the most inelastic quartile of investors. To implement this counterfactual, we decrease λ_i, the coefficient on total costs in the indirect utility function, by one standard deviation for the least price sensitive quartile of the population. This increases the mean demand elasticity each Afore faces by between 50 and 75%—substantial but not unreasonable given the results cited above.

Table IX, column 1 presents the results. Under this counterfactual, we find that total system costs decline by 35.3%. This policy is much more effective at reducing costs than deploying a government competitor, but less effective than the hypothetical world with neutral advertising. Costs for low-income workers still decline the least, but now by a substantial 28%. These workers are the most affected by the demand-elasticity-improvement.

The second column adds a government competitor. In contrast to Table VIII columns 1 and 2, no firms price at the cap, and costs decline by 38.9%. Increasing price sensitivity among the most inelastic customers eliminated the profitability of responding to competition by raising price, as there are no longer enough sufficiently captive customers. High-income workers still benefit more in this case because they substitute in greater proportion to XXI.

Finally, for comparison, column 3 sets the impact of sales force on preferences to zero. All three changes combined (government competitor, targeted financial literacy education, and zeroing out sales force effects) lead to a 73.5% decline in costs. All workers benefit from across-the-board declines in prices. To put this in perspective, we calculated costs if all Afores were forced to charge a 0.75% balance fee and no flow fee. (The average management fee for bond mutual funds in the U.S. at the time of the SAR inception was approximately 75 basis points.) Under such a uniform cap, total costs would be approximately 75% lower. Direct price regulation is often seen as a blunt or inefficient policy mechanism compared to designing markets to be more efficient based on economic behavior and principles (Lowenstein et al. 2014). In our simulations, demand side and supply side interventions bring estimates equilibrium fees in line with sensible benchmarks.

Overall, the results of the counterfactual simulations suggest that Afores' marketing efforts, particularly in the form of an agent-based sales force, contributed substantially to high equilibrium fees in Mexico's social security system. Sales force had a substantial impact on price sensitivity, leading to high equilibrium fees in a subscription good market where all individuals have to purchase the good (like in education, health care, and pensions) and where firms charge a uniform price across customers. In the absence of policies that address inelastic demand, a government competitor may be likely to be ineffective, and costs could increase to low-income workers in particular if they are on average less price sensitive, as many firms respond to competitive entry by raising prices on their brand-captive consumer segments. In general, policies that address price insensitivity and the potentially persuasive impacts of advertising are effective at increasing competition and lowering equilibrium prices.

6 Conclusion

We used a new data set with rich detail on pension fund choices in Mexico's privatized social security system to examine how sales force can affect prices, competition, and efficiency in a private pension market. The Mexican system's inception period gives us a unique opportunity to examine the role that sales force advertising can play in a highly important and policy-relevant market. Fund management firms in the system set market-wide prices, but chose sales force locally. Using measures of sales force exposure, we develop and estimate a very flexible model of demand for fund managers (Afores) and find that Afores' agent-based sales forces were a key competitive channel used to gain customers at high fees by simultaneously increasing brand value and decreasing price sensitivity.

The system's regulators at the time made an explicit decision to follow a hands-off approach regarding information provision. The expectation was that reasonably unconcentrated market would result in price-driven competition for fully-informed clients. We find in contrast that competition with advertising instead led to lower price sensitivities, especially among lower-wage workers. Rather than serving to inform workers about the effective prices of the options available to them, advertising served to weaken price sensitivity. As a result, prices were at levels well above marginal cost.

We explored whether two hypothetical policies would foster greater price competition. One focused on the supply side of the market by having the existing government-co-branded fund manager act as a low-cost public option. The other was a demand-side policy that increased workers' sensitivity to price differences across account managers. Perhaps surprisingly, the supply-side intervention had little impact on average fees in isolation. The reason is that there are enough inelastic workers in the market to cause firms to respond to the low-cost producer by raising fees and focusing on the price-insensitive segment of the market. On the other hand, a demand-side policy that increases workers' price elasticity of demand would lead to a considerable decrease in fees, as more elastic consumers raise firms' incentives to compete on a price basis. The greatest impact on fees occurs when we combine these policies. They are complements because when consumers are more price-sensitive, there is no longer an incentive for firms to respond to a government competitor by raising prices to sell to inelastic customer segments.

Our analysis demonstrates that, even in a market with a large number of firms and financially homogeneous products, price competition need not be intense in the face of sales-force-driven differentiation. Given that this market, the Mexican social security retirement system, is an example of the privatization of pension systems that have been proposed in many countries, there are important policy implications of our

findings. The results here indicate that, to the extent policymakers care about the total costs paid to operate a privatized system, it may be necessary to do more than simply set up a market with several players and free information flows. If firms can find other ways to compete than through price, they will, and it is apparent that the structures of preferences and advertising technologies in the Mexican market allowed them to channel competitive efforts into brand-oriented advertising that served to make workers less price sensitive. At the same time, our findings suggest that merely creating a low-cost public option will not necessarily foster price competition. Instead, demand-side efforts that raise workers' sensitivity to the costs they pay for management of their accounts are the most fruitful interventions. Our results may also hold broader lessons about the nature of competition in consumer financial markets more generally, when actual costs can be difficult for consumers to calculate and both brands and branding efforts are salient.

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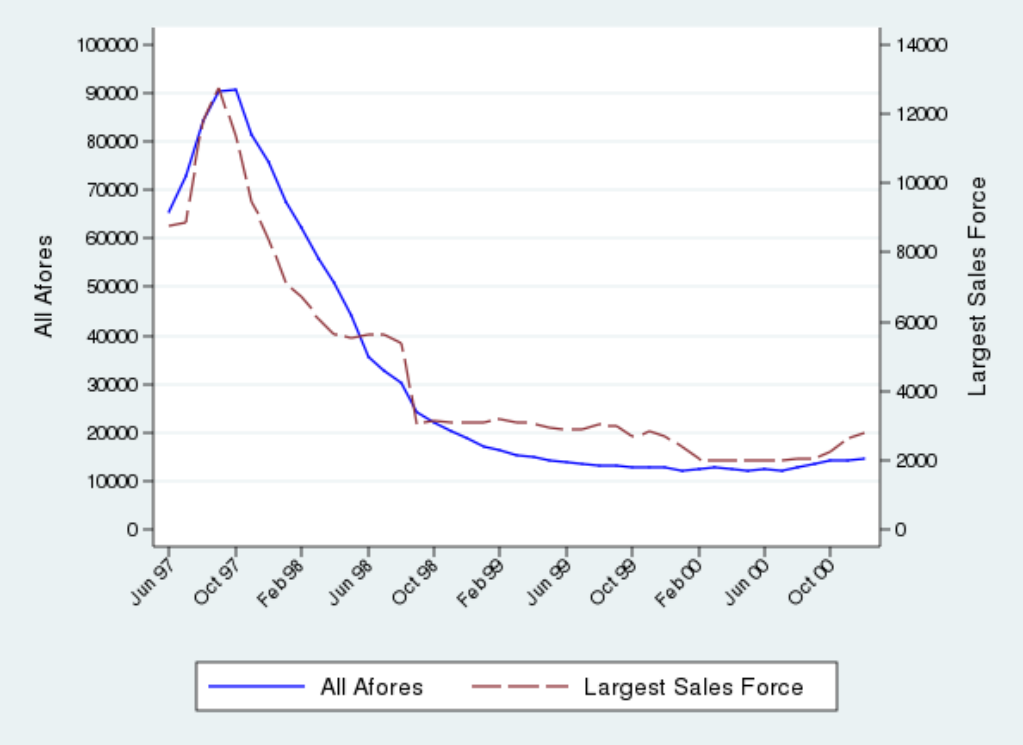
FIGURE I: DISTRIBUTION OF SALES FORCE ACROSS AFORES AND OVER TIME

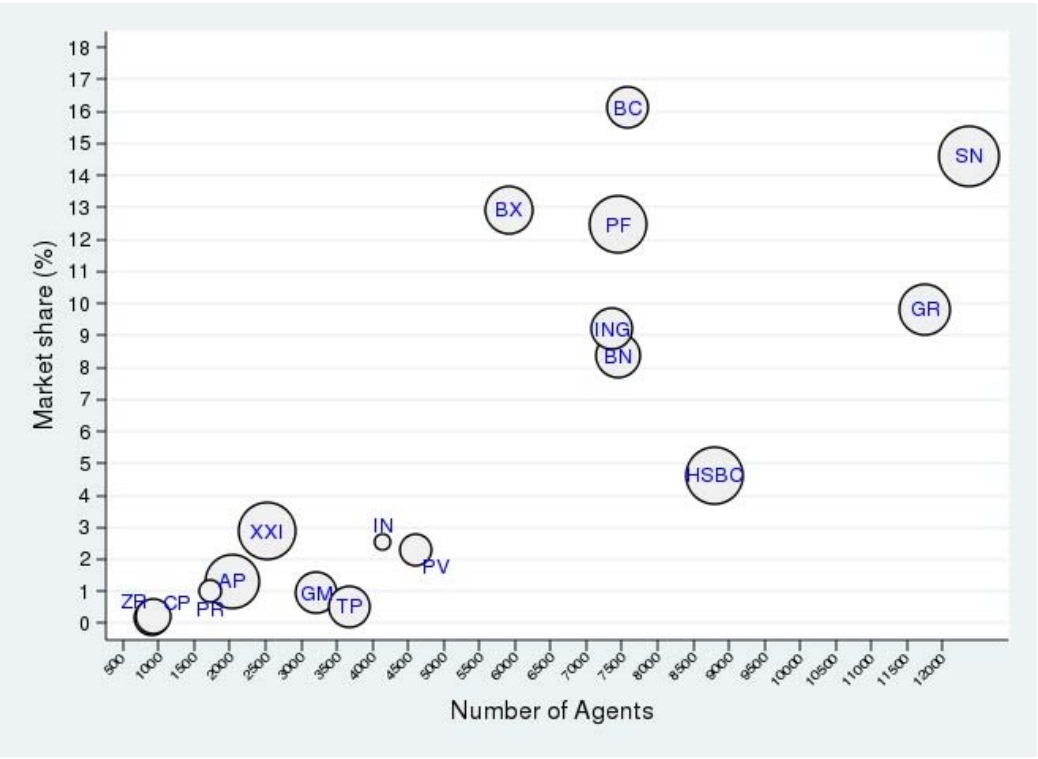


Note: Data from official Sales Agent Registration panel from CONSAR. Data record each sales agent, their current status and the Afore for whom they are working. "All Afores" series plots the total sales force across all Afores. "Largest Sales Force" series plots the maximum sales force in each year and month across all Afores.

FIGURE II: MEAN AND MEDIAN AFORE FFEES OVER TIME

Notes: Average and median flow and balance fees are reported across all Afores in the market in each month and year. Flow fees for Afores reported as a percentage of salary from May 1998 to December 2000. Balance fees are reported in percentages. A value of .5 is 0.5%.

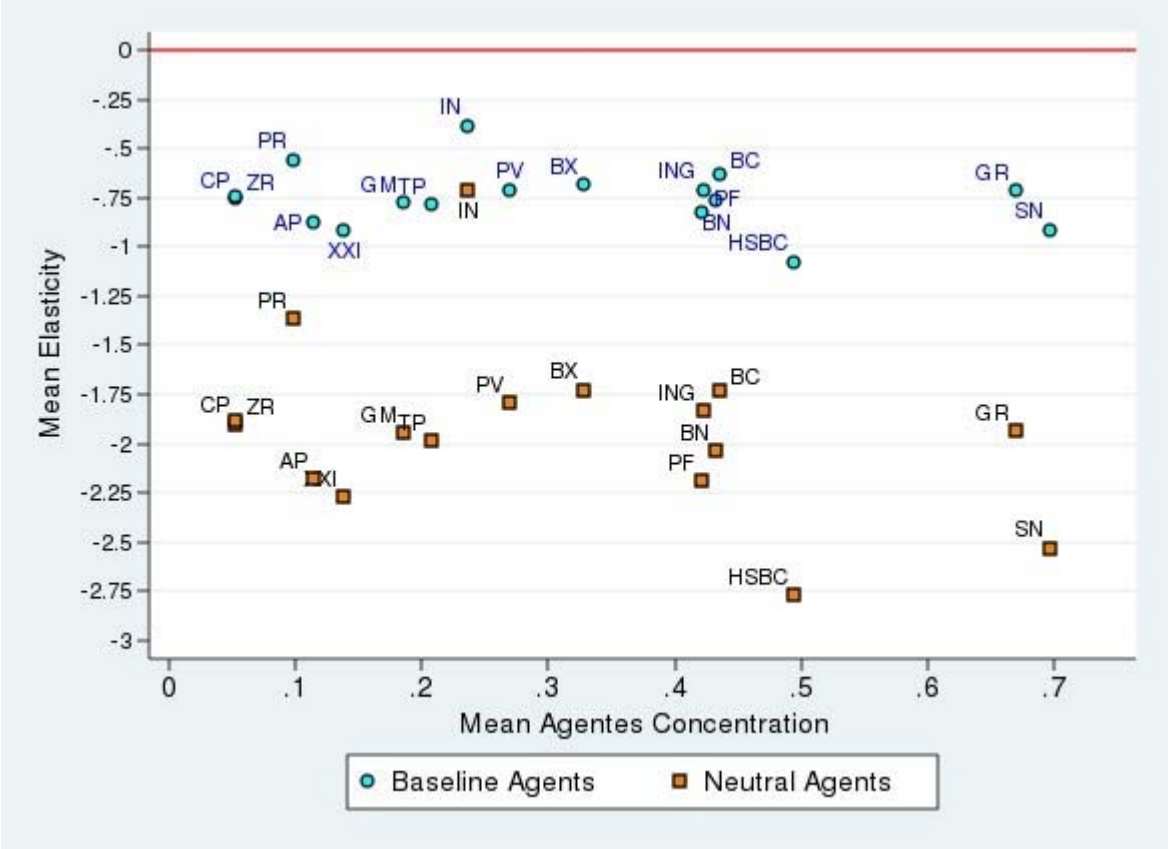
FIGURE III:
MARKET SHARE vs. AGENTS



Afore Legend:		
AP-Atlantico Promex	GR-Garante	PV-Previnter
BC-Bancomer	HSBC-Bancrecer/Dresdner/HSBC	SN-Santander
BN-Banorte Generali	IN-Inbursa	TP-Tepeyac
BX-Banamex	ING-ING / Bital	XXI-XXI
CP-Capitaliza	PF-Profuturo GNP	ZR-Zurich
GM-Genesis Metropolitan	PR-Principal	

Note: Each marker represents an Afore's market share at inception. Markers are weighted by mean Afore rank based on average expected cost per account in the system from Table II column 2. Projected costs over 10 years were calculated for each worker using their actual contributions, initial balance and wages recorded in the administrative data from 1997-2007, assuming that Afore fees were held constant going forward. Expected costs for each worker were then calculated by averaging projected costs in each year over workers with similar baseline characteristics. All costs are calculated using a 10% random sample.

FIGURE IV:
MEAN ELASTICITY: BASELINE vs. NEUTRAL AGENTS



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BN-Banorte Generali	IN-Inbursa	TP-Tepeyac
BX-Banamex	ING-ING / Bital	XXI-XXI
CP-Capitaliza	PF-Profuturo GNP	ZR-Zurich
GM-Genesis Metropolitan	PR-Principal	

Note: Elasticities are calculated at the observed fee levels and individual characteristics. Elasticities in the Baseline Agents model are calculated using estimates from equation 2 to generate the logit choice probability for each individual for each Afore. Elasticities for the Neutral Agents model use estimates for demand parameters with Neutral Agents from equations 4, 5 and 6 using the instrumental variables results from Table III column 4 and Table V column 1. Calculations are based on a 10% random sample of system affiliates.

TABLE I: DESCRIPTIVE STATISTICS OF AFORES AT THE INCEPTION OF MARKET

Afore	Flow fee	Implied Load on Contributions	Balance fee	Share of Accounts	Number of Agents
Santander	1.70%	26.15%	1.00%	14.60%	12,361
Garante	1.68%	25.85%	0.00%	9.83%	11,756
Bancrecer/ Dresdner/HSBC	0.00%	0.00%	4.75%	4.62%	8,804
Bancomer	1.70%	26.15%	0.00%	16.12%	7,583
Profuturo GNP	1.70%	26.15%	0.50%	12.45%	7,443
Banorte Generali	1.00%	15.38%	1.50%	8.35%	7,440
ING / Bital	1.68%	25.85%	0.00%	9.21%	7,369
Banamex	1.70%	26.15%	0.00%	12.94%	5,914
Previnter	1.55%	23.85%	0.00%	2.28%	4,614
Inbursa	0.00%	0.00%	1.57%	2.52%	4,150
Tepeyac	1.17%	18.00%	1.00%	0.52%	3,685
Genesis Metropolitan	1.65%	25.38%	0.00%	0.94%	3,213
XXI	1.50%	23.08%	0.99%	2.88%	2,521
Atlantico Promex	1.40%	21.54%	0.95%	1.32%	2,045
Principal	0.90%	13.85%	1.00%	1.01%	1,732
Capitaliza	1.60%	24.62%	0.00%	0.23%	925
Zurich	0.95%	14.62%	1.25%	0.18%	910
Total				100%	92,465

Note: Share of accounts is calculated using all account holders as of June 2006 who entered the SAR 1997 system before June 1998. Santander is a Spanish financial group. Garante is a Mexican insurance and financial group. Bancrecer/Dresdner/HSBC is an international financial group. Bancomer is the second largest Mexican bank. Profuturo GNP is a Mexican insurance group. Banorte Generali is a joint venture between a large northern Mexican bank, Banorte, and the largest Italian insurance company, Assicurazioni Generali S.p.A. ING/Bital is an international financial group. Banamex is the largest Mexican bank. Previnter is a France-based international insurance company, acquired by Profuturo GNP in late 1998. Inbursa is the financial arm of Telcel magnate's Slim Corporation. Tepeyac is a Mexican insurance company. Genesis Metropolitan is owned by the US-based insurance company, Metropolitan Life. It was acquired by Santander in late 1998. XXI is the Afore branded by IMSS, the former pension system administrator. Atlantico Promex is a Mexican financial group which was acquired by Principal in late 1998. Principal is an international financial group. Capitaliza is a Mexican financial group and was acquired by Inbursa in late 1998. Zurich is an international commercial insurance company.

TABLE II: DESCRIPTIVE STATISTICS OF AFFILIATES BY AFORE

Afore	Mean rank for own clients	Mean rank over system	Mean savings, days of wages	SD savings, days of wages	Mean daily wage of clients (1997 pesos)	Fraction of clients who are male
Santander	16.51	16.46	42.39	299.00	60.66	0.71
Garante	11.15	11.02	31.01	143.57	76.92	0.69
Bancrecer/ Dresdner/HSBC	14.23	14.15	59.97	1100.39	69.48	0.69
Bancomer	7.43	7.60	29.32	45.00	109.81	0.67
Profuturo GNP	14.41	14.35	34.35	115.56	59.69	0.71
Banorte Generali	8.04	9.23	34.70	153.15	64.30	0.68
ING / Bital	8.07	8.01	29.61	103.51	74.09	0.65
Banamex	9.71	10.02	28.22	38.34	97.34	0.67
Previnter	4.09	4.16	25.24	77.44	99.51	0.65
Inbursa	1.21	1.34	0.48	6.03	217.89	0.65
Tepeyac	7.19	7.62	26.88	26.51	70.32	0.71
Genesis Metropolitan	8.10	7.91	26.42	86.04	63.20	0.65
XXI	14.84	14.83	39.58	48.49	121.28	0.57
Atlantico Promex	13.02	12.92	39.57	145.09	72.79	0.66
Principal	2.36	2.33	11.59	39.33	78.63	0.67
Capitaliza	6.05	5.51	22.35	14.42	103.44	0.66
Zurich	5.91	5.55	26.22	11.93	95.67	0.83
Total			32.77	273.56	85.44	0.68

Note: Afore rank is based on expected costs. For each worker, expected costs are calculated by averaging projected costs, calculated using actual contributions, initial balance and wages over a 10 year period, in each year over workers with similar baseline characteristics. The Online Appendix provides details on the expected cost estimation. Savings in days of wages is the number of days' wages that a worker could save if she/he switched from their current Afore to the Afore with the lowest expected cost. Calculations are based on a 10% random sample of system affiliates.

TABLE III: IMPACT OF SALES FORCE ON AFORE BRAND VALUE

Dependent Variable: $\delta_{c,j}$	(1) OLS	(2) IV 1	(3) IV 2	(4) IV 3
Municipality sales force concentration for Afore *j*	2.794***	4.495***	4.400***	4.168***
	(0.136)	(0.032)	(0.031)	(0.029)
Municipality concentration of bank branches for Afore *j*	28.289***	21.579***	21.955***	22.871***
	(2.430)	(0.665)	(0.660)	(0.650)
Indicator if Afore *j* is affiliated with a bank.	0.714***	0.482***	0.495***	0.527***
	(0.056)	(0.014)	(0.013)	(0.013)
Observations	62,883	62,883	62,883	62,883
Mean $\delta_{c,j}$	-2.746			
Mean Salesforce	0.280			
StDev Salesforce	0.312			
Mean Branches	0.004			
StDev Branches	0.010			
F-Stat for Excluded Insturments	--	1425.70	1038.04	728.24
Number of cells	3,699	3,699	3,699	3,699

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the estimated mean valuation of Afore *j* for system affiliates in demographic and municipality cell *c* estimated using equation (3) in the text. It measures mean value relative to the excluded Afore, whose identity is held constant across all municipalities. All specifications include cell-level fixed effects and an indicator if the Afore had zero market share in that cell. Municipality sales force concentration for Afore *j* is defined as the number of agents for Afore *j* in municipality *m* divided by the total number of SAR affiliates in *m*. Municipality concentration of bank branches for Afore *j* is defined as the number of bank branches in municipality *m* divided by adult population in the municipality. Column 1 presents OLS estimates with standard errors clustered at the municipality-Afore level. Column 2 presents instrumental variables estimates using the advertising spillovers instrument (mean costs in same-municipality-other-demographic-group cells for Afore j interacted with Afore fixed effects). Column 3 adds competitor bank branches in the municipality and its interaction with Afore fixed effects as instruments. Column 4 adds fraction of the working-age cell population who are IMSS account holders and fraction of workers employed in the public sector, both interacted with Afore fixed effects as additional instruments.

TABLE IV: EFFECT OF SALES AGENTS ON BRAND VALUE

Dependent Variable: $\delta_{c,j}$	(1) Low Wage	(2) High Wage	(3) Male	(4) Female	(5) Younger	(6) Older	(7) Low Cost
Municipality sales force concentration for Afore *j*	4.594***	3.662***	4.651***	3.498***	4.408***	3.910***	4.557***
	(0.041)	(0.041)	(0.040)	(0.041)	(0.041)	(0.041)	(0.075)
Municipality concentration of bank branches for Afore *j*	16.247***	30.271***	20.992***	25.411***	21.446***	24.440***	36.410***
	(0.893)	(0.942)	(0.868)	(0.978)	(0.921)	(0.916)	(1.549)
Indicator if Afore *j* is affiliated with a bank.	0.395***	0.692***	0.503***	0.561***	0.559***	0.492***	0.263***
	(0.018)	(0.019)	(0.017)	(0.021)	(0.019)	(0.019)	(0.028)
Observations	34,289	28,594	39,610	23,273	32,385	30,498	14,796
Number of cells	2,017	1,682	2,330	1,369	1,905	1,794	3,699
Mean $\delta_{c,j}$	-2.989	-2.454	-2.783	-2.682	-2.805	-2.683	-3.158

Note: Instrumental variables specification from Table III, column 4, by subgroup. *** p<0.01, ** p<0.05, * p<0.1. Wage cuts are defined as below or above the median wage. Younger and older are defined as younger or older than 35 years old. Low Cost is an indicator if Afore *j* is one of the cheapest four Afores for individuals in demographic-group-municipality cell *c*. The dependent variable is the estimated mean valuation of Afore *j* for system affiliates in demographic and municipality cell *c* estimated using equation (3) in the text. It measures mean value relative to the excluded Afore, whose identity is held constant across all municipalities. All specifications include cell-level fixed effects and an indicator if the Afore had zero market share in that cell. Municipality sales force concentration for Afore *j* is defined as the number of agents for Afore *j* in municipality *m* divided by the total number of SAR affiliates in *m*. Municipality concentration of bank branches for Afore *j* is defined as the number of bank branches in municipality *m* divided by adult population in the municipality.

TABLE V: EFFECT OF SALES AGENTS ON MEAN PRICE SENSITIVITY

Dependent Variable: α_c	(1) Pooled	(2) Pooled	(3) Low Wage	(4) High Wage	(5) Male	(6) Female	(7) Younger	(8) Older
Municipality sales force concentration	0.046***	0.040***	0.060***	0.020***	0.057***	0.019	0.054***	0.035***
	(0.012)	(0.013)	(0.020)	(0.007)	(0.016)	(0.014)	(0.015)	(0.013)
Sales force concentration for four lowest-cost Afores		0.025						
		(0.033)						
Constant	-0.606***	-0.605***	-0.846***	-0.272***	-0.693***	-0.410***	-0.686***	-0.510***
	(0.081)	(0.081)	(0.134)	(0.045)	(0.103)	(0.099)	(0.100)	(0.085)
Observations	3,699	3,699	2,017	1,682	2,330	1,369	1,905	1,794
Mean Dep. Var.	-0.388	-0.388	-0.568	-0.173	-0.435	-0.308	-0.431	-0.343

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the estimate of mean price sensitivity for each demographic-group-municipality cell, *c*, from equation (4) in the text. Wage cuts are defined as below or above the median wage. Younger and older are defined as younger or older than 35 years old.

TABLE VI: SIMULATED CHANGE IN ELASTICITY AND TOTAL COST,
BASE MODEL VS. NEUTRAL ADVERTISING, BY DEMOGRAPHIC GROUP

	Mean Elasticity		Percent Change in Total Cost
Demographic Group	Base Model	Neutral Advertising	Neutral Advertising vs. Base Model
All	-0.754	-1.928	-17.3%
Low Wage	-0.621	-0.997	-5.3%
High Wage	-0.877	-2.787	-19.9%
Male	-0.796	-2.020	-17.9%
Female	-0.666	-1.736	-15.7%
Younger	-0.821	-1.678	-14.0%
Older	-0.680	-2.206	-19.6%

Notes: Computed using model estimates from equations (3) through (6), and estimated impact of sales force from Table III, column 4, and Table V, column 1.

TABLE VII: SUMMARY OF OUTCOMES FOR DEMAND AND SUPPLY-SIDE POLICIES

	Simulated Outcomes from Neutral Agents Preferences at New Equilibrium Fees
Simulated percentage change in management costs	
All	-61.7%
Low-income	-55.1%
High-income	-64.0%
Young workers	-59.9%
Old workers	-64.2%
Male	-62.1%
Female	-63.2%

Note: Equilibrium calculations are based on an 80,229 random sample plus a proportional random sample of new workers who entered the market over time, to capture growth forecasts in market size. Equilibrium fees are calculated from an iterated best response method using a 0.00025 grid for the base model while for the models with raised caps, equilibrium fees are calculated from an iterated best response method using a 0.0005 grid. See Online Appendix for details on iterated best response method. Cost is calculated over the whole account horizon and discounted at a 5% rate. Full results by Afore are available in the Online Appendix Table IV. Detailed changed in cost by demographics are calculated using the 80,229 random sample.

TABLE VIII: SUMMARY OF SIMULATIONS RESULTS WITH
DISCONTINUOUS RESPONSES TO GOVERNMENT COMPETITOR

		Base Model with Govn't Competitor		Neutral Agents with Govn't Competitor
	Base Model	(1) Cap at (2.00,2.00)	(2) Cap at (3.20,5.00)	(3) Cap at (3.20,5.00)
XXI price	(1.90, 0.00)	(0.00, 0.10)	(0.00, 0.10)	(0.00, 0.10)
XXI simulated share	2.7%	5.8%	6.4%	13.6%
Market Share of Afores Pricing at Cap	--	94.0%	23.5%	11.8%
Percent of Afores Pricing at Cap	--	88.2%	20.7%	14.3%
Percentage change in management costs				
All	--	-1.7%	7.8%	-64.0%
Low-income	--	11.9%	20.2%	-47.0%
High-income	--	-6.2%	2.3%	-69.8%
Male	--	-1.3%	7.2%	-64.7%
Female	--	-7.5%	0.9%	-68.7%
Young workers	--	6.0%	15.8%	-56.8%
Old workers	--	-9.4%	-1.7%	-72.1%

Note: Equilibrium calculations are based on an 80,229 random sample plus a proportional random sample of new workers who entered the market over time, to capture growth forecasts in market size. Equilibrium fees are calculated from an iterated best response method using a 0.00025 grid for the base model while for the models with raised caps, equilibrium fees are calculated from an iterated best response method using a 0.0005 grid. See Online Appendix for details on iterated best response method. Cost is calculated over the whole account horizon and discounted at a 5% rate. A firm is at the cap if either equilibrium flow or balance fee is set at the maximum level. Share of firms at cap denotes the total predicted market share of the Afores at the cap. Full results by Afore are available in the Online Appendix Tables VA & VB. Detailed changed in cost by demographics are calculated using the 80,229 random sample.

TABLE IX: SUMMARY OF OUTCOMES FOR DEMAND AND SUPPLY-SIDE POLICIES

	Policy Simulation		
	(1) Increased demand elasticity for most inelastic	(2) + Government Competitor	(3) + Neutral Agents
Market Share of Afores Pricing at Cap	0.0%	0.0%	0.0%
Percent of Afores Pricing at Cap	0.0%	0.0%	0.0%
Percentage change in management costs			
All	-35.3%	-38.9%	-73.5%
Low-income	-28.0%	-22.7%	-60.5%
High-income	-38.0%	-44.8%	-77.9%
Young workers	-32.2%	-28.4%	-67.6%
Old workers	-39.0%	-49.7%	-79.8%
Male	-35.7%	-39.4%	-74.1%
Female	-37.5%	-44.9%	-76.7%

Note: Equilibrium calculations are based on an 80,229 random sample plus a proportional random sample of new workers who entered the market over time, to capture growth forecasts in market size. Equilibrium fees are calculated from an iterated best response method using a 0.00025 grid for the base model while for the models with raised caps, equilibrium fees are calculated from an iterated best response method using a 0.0005 grid. See Online Appendix for details on iterated best response method. Cost is calculated over the whole account horizon and discounted at a 5% rate. A firm is at the cap if either equilibrium flow or balance fee is set at the maximum level. Share of firms at cap denotes the total predicted market share of the Afores at the cap. Full results by Afore are available in the Online Appendix Table VI. Detailed changed in cost by demographics are calculated using the 80,229 random sample.