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ADVERTISING AND COMPETITION IN PRIVATIZED SOCIAL SECURITY: THE CASE OF MEXICO

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ABSTRACT

This paper examines how advertising impacts 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 a model of fund manager choice, price and advertising competition (in terms of sales force deployment), nesting models of informative and persuasive advertising. We find evidence in favor of the persuasive view; exposure to sales force lowered price sensitivity and increased brand loyalty, 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

Individual-account systems where management firms compete for employees' retirement funds 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 systems in search of efficiencies, starting with Chile in 1981. Current 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]

Efficiency may not follow privatization if consumers respond weakly to prices, however. Recent field-and lab-experimental evidence shows that individuals can be overly responsive to information framing, brand names and short-term incentives when choosing products like financial investments, credit, and insurance. They may focus on the wrong attributes, such as one salient fee, an incorrect measure of price, or non-price attributes if prices are complex or difficult to understand (See for example, Ausubel 1991, Choi et al. 2009, Bertrand et al. 2010, Duarte and Hastings 2012, Hastings 2013.). [2]

It is unclear whether competitive advertising works to reduce or amplify such effects. Advertising can be used to inform consumers, increasing efficiency by lowering information and search frictions (Butters 1977; Grossman and Shapiro 1984), or persuade consumers to focus on non-price attributes, real or perceived (Schmalensee 1976; Becker and Murphy 1993; Chioveanu 2008). Advertising is a prominent part of consumer financial product markets. For example, 2011 US advertising for investment and retirement products exceeded $1.1 billion; credit cards, $1.6 billion; and insurance $3.69 billion.[3] Even so, researchers find that price dispersion persists for indexed mutual funds (Hortaçsu and Syverson 2004) and mortgage brokerage fees (Hall and Woodward 2012). Evidence for consumer price insensitivity appears abundant in credit and health insurance markets (Ausubel 1991; Ponce-Rodriguez 2008; Kling et al 2009; Abaluck and Gruber 2012). Understanding the impact of advertising on demand and equilibrium prices is of increasing importance as retirement savings and health insurance markets head towards greater individual control, and regulators seek to design policies which facilitate consumer choice.[4]

This paper uses unique administrative data to examine the impact of advertising on investor choice of fund managers and equilibrium fees in Mexico's privatized social security market. Our findings

[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] Source: AdAge Insights: Financial Services Marketing. Accessed December 10, 2013 at http://gaia.adage.com/images/bin/pdf/AdAgeFinancial%20ServicesReport2012.pdf
[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.

provide a link between individual responses to advertising and market outcomes, allowing us to measure the impact of advertising on competition and simulate the benefits and potential pitfalls of oft-suggested regulations.

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. On the other hand, five years after the launch of the system, *fund managers' annual return on expenditures* averaged 39%.[6] Importantly, the government did not regulate advertising or engage in informational advertising, following the informative-advertising view that competition should lead to efficient information and pricing.

We use administrative, individual-level data to test whether advertising had an informative or persuasive impact on investor choice of fund manager, and more broadly, to measure how it shaped outcomes in this market. Our data contain administrative records for all individuals' fund manager choices, earnings and contributions. Two facts are apparent from raw data on investor choices. 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 balance (assets under management) profile. Second, firms who invested heavily in advertising and sales forces had both high prices and large market shares, suggesting that competition on advertising substituted for competition on price.

We estimate a simple yet flexible model of individual fund manager choice, allowing price sensitivity and brand value to vary with exposure to a fund manager's sales force as well as with demographic characteristics. We exploit the individual-level detail in our data to test whether higher exposure to sales-force increased or decreased the attention investors paid to management fees as expressed in their choices of fund managers.

Several features unique to our data and regulatory setting aid identification. First, we have location information for both sales agents and account holders which we use to measure advertising

[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.

exposure. Second, the costs of choosing a given fund manager varied across investors (workers), even among those with similar location and demographic characteristics. This is because 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). These differences caused the effective total cost of each fund manager to be worker-specific. 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 demand for fund manager and supply of sales agents to motivate instruments for marketing exposure. We take advantage of 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. This advertising-spillovers instrumental variables approach uses variation in sales force exposure across otherwise identical individuals due simply to the characteristics of nearby investors (Waldfogel 2007) to identify the impact of sales force on individual-level demand. In addition to the advertising spillover instrument, we also take advantage of baseline competitor brick-and-mortar bank branch presence; controlling for a fund's own bank branch presence, competing funds' bank branch presence may affect the equilibrium deployment of sales agents in a given market. We also 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.

Our results show that increased exposure to sales force decreased price sensitivity and increased brand loyalty. The results are robust across several specifications. We find that the choices of low-income consumers were most impacted by sales force, though we find significant impacts of the same sign across all demographic groups. We also find that both relatively low- and high-price fund managers' sales force had persuasive impacts on demand; being a relatively low-price firm among a particular demographic-geographic group of investors does not significantly change the impact of sales force exposure on brand preference or price sensitivity. Holding fees constant but eliminating the impact of sales force on preferences leads to a 17% decrease in total fees paid in the system, as investors sort to lower-fee firms. We find that the largest benefits accrue to higher-income investors, who are more sensitive to management fees in the absence or presence of sales force. Low-income workers do not benefit as much because they remain relatively price insensitive (although less so) even in the absence of sales force. Thus the persuasive impact of sales force resulted in workers paying higher fees and saving less for retirement.

We next develop a supply-side model of fund-manager pricing to explore key policy prescriptions and to quantify the impact that persuasive advertising had not just on choices, but on the high equilibrium fees observed in the market. Specifically, 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 of advertising to high equilibrium fees observed in the market. We find that fees would have been 61.7% lower as investors would be more price sensitive which would in turn lead to lower equilibrium prices.

We then explore the impact of two specific policy interventions. 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 competitor has been proposed as a way to increase competition in social safety net markets from health care to pensions. We next examine the effects of increasing price sensitivity among workers among the most price insensitive investors for example, through financial literacy programs for low-education workers.

Our analysis yields several important insights. First, introducing a government competitor has little impact on average fees in isolation, as many private firms best-respond by increasing fees and selling only to the very inelastic segment of the market. This echoes a similar phenomenon in the pharmaceutical industry, the "generic competition paradox," where generic entry can lead to higher brand-name prices (Frank and Salkever 1992, 1997; Berndt et al 2003; Davis et al. 2004). As low-income workers are more likely to be inelastic, the best-response-fee-increases impact this segment the most. In the absence of limits on advertising, introducing a government competitor may be both ineffective and regressive.

In contrast, we find that programs that increase the price sensitivity of the most inelastic customers would result in 37 percent lower fees. In this counterfactual, we calibrate changes in preferences for price among the least elastic customers based on field- and natural-experimental evidence in the literature on the impact of information campaigns targeting the financially illiterate. When we add a government competitor, firms compete on price as it is no longer profitable to raise prices to a group of relatively inelastic customers. Programs that increase price sensitivity among inelastic market segments, such as the financially illiterate, are important for incentivizing competition in privatized social safety net markets. All socioeconomic groups benefit from this policy as fees in the market drop overall.

Finally, when we combine demand- and supply-side policies (the government competitor, price-sensitivity, and neutral advertising counterfactuals), our simulations show a 74 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, especially in markets with price-insensitive program participants.

This paper contributes to several literatures. First, we add to growing evidence regarding the price insensitivity of consumers and oversensitivity to advertising and framing in complex financial product markets. Several papers have shown over-sensitivity of choice to framing in privatized social security markets using field experiments with stated-choices (Hastings and Tajeda-Ashton 2008; Hastings and Mitchell 2011), and natural experiments with actual choices (Duarte and Hastings 2012). Ausubel (1999) and Ponce-Rodriguez (2008) use industry-run field experiments to show that individuals are overly responsive to teaser rates, resulting in increased debt and interest payments. Choi et al. (2009) find over-sensitivity of investment decisions to brand name in the lab (even among financially educated subjects), and Cronqvist (2006) presents evidence that mutual fund flows respond positively to advertising expenditures. Kling et al. (2009) and Abaluck and Gruber (2011) provide evidence on misperception of fees and the importance of brand name in choices of Medicare Part D insurance.

Second, we contribute to a growing literature on persuasive advertising in financial markets. Bertrand et al. (2010) study a consumer lender's direct mail field experiment in South Africa to measure how advertising content affects demand. They find that advertising content that appeals to intuition or emotion rather than to fundamentals (loan terms) is more effective in boosting demand. Mullainathan, Noeth and Schoar (2012) use an audit study to show that U.S. mutual fund advisers reinforce biases of potential investors (rather than de-biasing them). Our persuasive advertising findings are consistent with both of the findings above. Our paper adds an important dimension to this literature by estimating the impacts of advertising in the market with multiple firms and a population of customers, allowing us to explore policy implications.

In so doing we contribute to recent empirical work which adds advertising as a strategic variable firms can use to influence preferences for products or alter the perception of product attributes. The closest research to our context is that on the pharmaceutical industry. Specifically, recent papers have used aggregate data on detailing (sales force directed at medical professionals) and prices to estimate models of competition to explain, for example, cross-country differences in detailing and prices (Chintagunta and Desiraju 2005).[7] We add to this literature by using individuals' product choices and exposure to sales force to estimate how advertising impacts preferences across socioeconomic groups.

Finally, on a methodological level, to our knowledge we are the first to address non-standard firm response functions (like the "generic competition paradox") and regulatory threat in a supply model to simulate policy and regulatory impact.

[7] An additional related literature uses changes in advertising regulations and observed posted prices to infer models of advertising competition from market-level outcomes. Benham (1972) and Milyo and Waldfogel (1999) are prominent examples.

2 Background

2.1 Brief History

Mexico instituted its current privatized social security system on July 1, 1997. The system established individual ownership over retirement account contributions and was designed to reform the previous pay-as-you-go system in a way that would increase financial viability, reduce inequity, and increase the coverage and amount of pensions.[8] The government approved private investment managers, called Afores (Administradoras de Fondos para el Retiro – pronounced uh-FOR-ays), 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 – System of Retirement Savings).[9]

The privatization of the pension system was done effectively in two parts. First, 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 into the general fund. The personal accounts were held by the Banco de México and earned a two percent real annual rate of return.[10] However, accounts in this system were poorly managed, creating a multiplicity of accounts per worker, disorganization and delay in linking actual deposits to individual accounts.[11] The government decided to move towards privately managed personal social security accounts. In 1997 president Ernesto Zedillo signed into law the current SAR, moving management of accounts from Banco de México to approved private fund managers called Afores.[12]

Firms that applied to be Afores needed to meet minimum capital requirements, minimum ownership share by Mexican firms, and have experience in the financial sector in Mexico.[13] Potential

[8] PowerPoint presentation by CONSAR on "Modernization of the Mexican Pension System," New York, February, 2005.
[9] Initial reforms introduced in 1992 created private SAR accounts for workers at a bank of her choice, concurrent with participation in the partially funded scheme. 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. Assets from SAR 92 could be transferred to individual accounts in the Afores if there were bank receipts that confirmed that there were deposits regarding pension funds in those accounts. See la Ley de los Sistemas de Ahorro para el Retiro" Diario de la Federación, February 24, 1992 and IMSS (Article 183-H).
[10] "TASA de interés de los créditos a cargo del Gobierno Federal derivados del Sistema de Ahorro para el Retiro de los Trabajadores sujetos a la Ley del Seguro Social cuyos recursos se encuentran depositados en la Cuenta Concentradora a que se refiere el artículo 75 de la Ley de los Sistemas de Ahorro para el Retiro y el artículo cuarto transitorio del Reglamento de la Ley de los Sistemas de Ahorro para el Retiro." *Diario Oficial de la Federación*. Published July 31, 2002. Accessed December 3, 2012.
[11] See Sandoval (2004).
[12] "Ley del Sar", articles 18, 19 and 20. See also "Ley del Sar", Section II.
[13] "Ley del Sar", article 58.

Afores submitted business plans including fee schedules to CONSAR for approval to operate as an Afore in the market. Twenty-four firms submitted applications and business plans, and of those seventeen were approved to operate. Two of the rejected applicants entered the market several years later.[14]

The government took several steps to structure the supply side to increase the likelihood of a competitive market. First, they aimed to have enough firms so that no one firm would have more than a 20 percent market share (though the implicit market share cap has never been enforced).[15] Second, they stipulated a single, centralized processor to handle database management, process and record contributions, fees, and transactions.[16] This was done to take advantage of scale economies and ensure that the market did not gravitate towards a natural monopoly. The government puts out multi-year contracts for bid to private companies to run the central database. Afores pay small, regulated fees for centralized account processes.[17]

On July 1, 1997, the new system officially began. Account holders as well as new workers had to choose one of the seventeen approved Afores to manage their existing SAR 92 account balances and their pension contributions going forward. If a worker did not choose any Afore when the new system started, their pension account was to be turned over to a consolidated account ("Cuenta Concentradora") 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.[18]

2.2 Fees and Investment Structure

Mandatory contributions to the retirement account come from two places: income and 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.[19] In addition, the government contributes a "social contribution" of 5.5% of the inflation-indexed

[14] 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.
[15] "Ley del Sar", articles 25 and 26.
[16] "Ley del Sar", Section IV, Articles 57-58.
[17] For example, internal information from CONSAR staff indicated that in 2008, fees for registering a new account were 25.99 Mexican pesos, 0.62 pesos for processing each contribution into the account, and 5.47 pesos for each switching of accounts (fee charged to the Afore accepting the account). One dollar is approximately 12 Mexican pesos.
[18] 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.
[19] 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.

Mexico City minimum wage.[20] 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, called a *Siefore* (*Sociedades de Inversión Especializadas en Fondos para el Retiro*, pronounced see-FOR-ay). The Siefore was limited to 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).[21] Thus Siefores were primarily composed of Mexican government bonds. Not surprisingly, tests for persistent outperformance using monthly returns show no significant difference between fund manager returns (full regression results available in the Online Appendix, section 2).[22]

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 therefore 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%.[23]

Importantly, 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. In Mexico, where there is a strong informal sector and also a large public sector that has a separate pension system, workers of all income and education levels regularly move in and out of employment in the formal private sector. Thus, the relative wage to balance ratio depends on the 1) wage rate, 2) probability of working in the formal private sector versus in the informal sector, public sector or not working, 3) balance at the system inception.[24]

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[20] "Ley de Seguro Social," Section V, Article 168. *Diario de la Federación*, 21 December 1995. Workers can withdraw unemployment insurance from the account of 1-3 months of salary depending on the amount available in the account and their contribution history. Workers must have 3 years of contributions to the account to qualify for unemployment insurance withdrawals. This benefit can be used once in every five-year period. In addition, another 5% of the worker's base salary is contributed to a housing account. The employer pays this contribution. See "Ley del ISSSTE", article 167 for details.

[21] In the mid-to-late 2000s, a series of reforms were introduced to loosen investment restrictions. The system moved from a 1-fund system to a 2-fund system and later to the current 5-fund system, where workers are moved by default from less and less risky funds over their life cycle. For more discussion of investment reforms please see Duarte and Hastings (2012) and Hastings (2010). See also press release BP_003_01 (Oct 19th, 2001) for more details.

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

[23] 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.

[24] In Mexico, there is an active informal labor sector with 30% of SAR account holders with a college education or more (overall 27% of investors) spending time in both the formal and informal employment sectors from 2005 through 2010, and 60% of workers with non-college backgrounds spending time in both sectors over the same time period. These statistics are based on authors' calculations from the 2010-2011 Encuesta de Empleo Retiro y Ahorro, a household survey with field experiments of approximately 7,500 SAR account holders randomly sampled from the National Database of the SAR and residing in Distrito Federal.

These three factors vary considerably across workers within relatively fine demographic cells. This is due to Mexico's fluid informal labor market as well problems with accounting and management in the SAR 1992 system (creating additional variation in the account balance at the inception of the system). For example, for a worker who contributed consistently under the 1992 system (and whose full account balance was retrievable in one account) and is currently, and expects to remain, employed in the public sector or the 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 with high and steady contributions from current employment who did not have a 1992 account, 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

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%.[25]

The government did not provide information on fees or financial literacy programs. It did not advertise Afore characteristics nor did it regulate Afores' communication and advertising. Instead, the government made a directed decision to trust that competitive pressures would lead to competition for accounts with generous information provision and forward-looking choices by consumers. It was assumed that profit-maximizing firms would charge a low price to compete for consumers and use advertising to inform consumers about their low prices.

Advertising and account recruitment was left almost entirely to the Afores, and complaints or questions were handled by CONDUSEF, the regulatory arm for the Mexican financial sector. Investors relied on Agentes Promotores (literal translation is "promoting agents," i.e., the Afores' sales forces; referred to as "agente(s)" going forward) and general advertisement campaigns through radio and television to gain information and make their Afore choice.[26]

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 approach. First, we found

[25] Results from the 2010-2011 *Encuesta de Empleo, Ahorro y Retiro* (EERA), Hastings (2013).
[26] See Duarte and Hastings (2012) for the impact of government mandated information on demand and prices in the Afore market during surrounding information reforms in 2004-2006. The government took important steps in later years, after the first several years of the system that we examine here, to develop a mandate for information on fees and importantly required that this mandated information be placed in account statements and presented by Agentes to potential clients.

archived television and print advertisements from the system's launch. They reveal that Afores did not engage in informative advertising by disclosing or highlighting fees, or teaching clients about fee structure, returns, diversification, or risk. Instead, they appealed to general themes associated with quality and ability, such as their firm's experience in the financial industry. If fees were mentioned at all, it appears that Afores combined the two fees in an undisclosed way that obfuscated the situation-dependency of relative Afore expense and minimized the size of the advertised fee through assumptions on tenure length and relative wage-to-balance ratios (Online Appendix, Section 5 provides English translations of prominent television advertisements during the first year of the system.).

Second and third, we located and conducted interviews with Agente Promotores from the 1997-2000 period and obtained copies of one Afore's historical agente training materials (the materials used for sales force training sessions). Both add further qualitative evidence consistent with persuasive advertising.[27] Based on the interviews, Agentes 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 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 then solicit their business. Such practices motivate our advertising spillovers instrument, explained in further detail in Section IV: 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.

Further buttressing the notion that advertising was primarily persuasive in nature, rather than informative, is the fact that our interviewees reported that Agentes were recruited for experience in sales, not for experience with financial products. Moreover, the training materials we reviewed did not discuss fees or fundamentals, but instead focused on establishing relationships and appealing to personal fears or hopes.[28] The training materials were substantial and 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*. Interviewees recalled sales strategies that primarily appealed to company characteristics rather than 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. (2012). Agents from neither firm

[27] We interviewed five sales agents who worked during the inception of the system. Summary notes of the interviews are in the Online Appendix along with historic training materials from one of the larger Afores, Santander, which was provided to us by one of our interviewees who happened to have saved a copy.
[28] An English translation of a historic Agente Promotore training handbook is in Online Appendix Section 5.

explained risk, diversification, how to understand or calculate price or any other fundamentals, consistent with theoretical models of obfuscation (Gabaix and Laibson 2006; Ellison 2005, 2006).

Finally, a 2010-2011 household survey of 7,500 account holders provides some additional support, even after several major reforms to the system and large government information campaigns which took place from 2005-2008. Survey results showed that the Agente Promotores were the most relied-on sources of information when selecting an Afore for individuals from all education backgrounds (and those without a college degree were the least likely to rely on objective sources of information from the government introduced in later years).[29] While nearly 80% of individuals could correctly name the Afore who managed their account (when survey responses were compared to administrative records), only small minorities of workers (e.g. less than 10%) knew information about fundamentals such as the fraction of salary contributed to the account, fees charged for management (post-2008 only balance fees were allowed, so workers only needed to remember one fee), or which fund they were currently in (called Siefore 1, 2, .. 5 within each Afore in a post-2008 five-fund system based on 10 year age groups with increasing risk).

2.4 Changing Fund Managers

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. As an empirical matter, the fraction of workers who switched Afores between the system's inception in 1997 and 2005 was close to zero.[30]

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 agentes in the market over time, and Figures IIA and IIB show the average flow and balance fees. It is clear that Afores recruited account holders while expecting to hold them going forward, as they substantially reduced their numbers of hired agentes after the first two years of the system. As noted above, this belief was borne out by the near absence of switching.

[29] See Hastings (2013) for further survey results from the 2010-2011 *Encuesta de Empleo, Ahorro y Retiro* (EERA).
[30] See Circular 28-5, July 2002. In the years following the switching reforms, several new Afores entered the market and the number of Agentes increased once more.

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 (imported from the SAR 1992 system) at the start of the system. The data record gender and date of birth, which allow us to construct age and future 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)).[31]

We construct local measures of sales force deployment and exposure using the official agente registration database from CONSAR. This registration panel provides us with monthly information from 1997 to 2007 on all agentes (registration is required), their status (e.g. active, inactive, on probation), 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 agente was responsible for bringing in each account. We observe in these data that agentes are most likely to recruit individuals who live in their municipality (municipio). Hence we define municipality as the geographic market of

[31] 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 our estimated demand elasticities calculated using actual (perfect-foresight) costs are smaller in absolute value than those using predicted costs as expected.

interest.[32] 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 Siefore annual returns and investment vehicles, Afore ownership structure, and historic bank branch data by municipio in the late 1990's to early 2000's from the archives of the Mexican Comisión Nacional Bancaria y de Valores (CNBV – National Comission of Banking and Securities).[33]

3.2 Descriptive Statistics

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.[34]

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 firms 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

[32] We define geographic markets by county based on information we have about the geographic reach of agentes. Specifically, for all workers who switched Afores, we know the identity of the agente who recruited their account. We also know both the worker's zip code of residence and the agente's zip code of work registration, so we can measure the typical distance between worker-agente pairs. We found, for example, that the probability of having a worker using an agente 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 matching with an agente 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.

[33] http://portafoliodeinformacion.cnbv.gob.mx/bm1/Paginas/infoper.aspx. CNVB falls under the Secretaría de Hacienda y Crédito Público (SHCP - Secretariat of Finance and Public Credit).

[34] See Online Appendix, section 2

correlation between the market share an Afore garnered during the market's inception phase and the number of agentes it deployed is 0.78.

We calculate the ranking for each Afore for each individual (rank 1 to 17, with 1 being the least expensive Afore for a given individual), and the expected savings each person could have made if they switched from the Afore they actually chose to the cheapest Afore for them using our expected cost measure calculated over a ten year horizon or to retirement (whichever comes first).[35] 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 people 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 or Veinte-uno), the Afore that is co-branded with the Mexican social security system, IMSS. This is reminiscent of findings for AARP co-branded Medicare Part D plans (Kling et al. 2009, Abaluck and Gruber, 2011).

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 (either over a period of 10 years or their expected retirement age, whichever comes first) if that Afore's clients switched instead to the Afore that was cheapest for them. These average days of wages are non-negligible, 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

[35] 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). In the U.S., "lifecycle" mutual funds, which have become especially popular in 401k and 503b plans, are based on age categories. When they were first introduced, many mutual fund families had 10-year categories (e.g., "Retirement 2025 fund", "Retirement 2035 fund", "Retirement 2045 fund", etc.), though some families have added in-betweens to make them 5-year categories. Though even there, looking at Vanguard's lifecycle funds, for example, the in-between decade funds have notably lower total assets than the original 10-year gap funds. Importantly, alternative uniform horizon assumptions yield similarly low selection based on price. See for example Duarte and Hastings (2012).

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 see a similar pattern looking at variation in Afore market share and relative costs 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 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. We use 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 Model

Investors choose an Afore to maximize utility. Let the utility of investor *i* choosing Afore *j* be given by

$$u_{ij} = \lambda_i\left(a_{m,j},\theta_i\right)C_{ij}\left(y_i,b_i,p_j\right)+\delta_{ij}\left(a_{m,j},\mathrm{X}_{m,j},\theta_i\right)+\varepsilon_{ij} \tag{1}$$

where expected management cost for investor *i*, C_{ij}, is a function of her expected formal labor sector income, y_i, her incoming SAR 92 balance, b_i, and Afore *j's* flow and balance fees, p_j; *i's* disutility from management costs, λ_i, is a function of Afore *j*'s sales force in *i*'s municipality of residence *m*, $a_{m,j}$, and *i*'s demographic characteristics, θ_i; *i's* preference for *j's* non-price characteristics, δ_{ij}, is a function of *j's* sales

force in *m*, *j's* characteristics in *m*, $X_{m,j}$, such as local bank branch concentration, and *i's* demographic characteristics; and ε_{ij} is an *iid* extreme value idiosyncratic utility component.[36]

As the number of sales agents Afores hire in a municipality $a_{m,j}$ is endogenous, when estimating (1) we will use instrumental variables. A straightforward model of Afores' sales force choices suggests several potential instruments.

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 equation (1). This probability is a function of a_m, the vector of all Afores' sales force in municipality *m*, the matrix of all prices of all Afores, *p*, the vector of individual preferences, β_i, and personal characteristics, θ_i. Let $\Pr_{i,j,m}$ be the probability that the agente from Afore *j* finds and engages in a dialog with (delivers a sales pitch to) investor *i* in municipality *m*. N_m is the total number of individuals the marginal sales agent can approach and engage given time constraints. Agentes Promotores 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 choose to hire Agentes in municipality *m* until the expected increase in revenue is equal to the marginal cost:

$$(2) \qquad \sum_{i \in N_m} \Pr_{i,j,m} \frac{dq_{i,j,m}\left(a_m, p; \beta_i, \theta_i\right)}{da_{j,m}} C_{ij} - mc\left(\tau_{j,m}, base_{j,m}, \kappa_{j,m}\right) = 0$$

[36] The model in Equation (1), where advertising enters utility directly, is observationally equivalent to a "consideration set" model where advertising renders some alternatives more salient than others. To see how, write the vertical component of utility as $\delta_{ij}\left(a_{m,j}\right) = \bar{\delta}_{ij} + \hat{\delta}_{ij}\left(a_{m,j}\right)$; i.e., a component that does not depend on advertising and a component that does. (The component that does not depend on advertising, $\bar{\delta}_{ij}$, could reflect, for example, the number of branches of the bank that owns the Afore.) With ε_{ij} having *i.i.d.* Type 1 Extreme value distribution, the probability of client *i* choosing Afore *j* can then be written as

$$s_{ij} = \frac{\exp\left(\lambda_i C_{ij} + \delta_{ij}\left(a_{m,j}\right)\right)}{\sum_k \exp\left(\lambda_i C_{ik} + \delta_{ik}\left(a_{m,k}\right)\right)}, \text{ or equivalently, } s_{ij} = \frac{\pi_{ij}\left(a_{m,j}\right)\exp\left(\lambda_i C_{ij} + \bar{\delta}_{ij}\right)}{\sum_k \pi_{ik}\left(a_{m,k}\right)\exp\left(\lambda_i C_{ik} + \bar{\delta}_{ik}\right)}$$

where we can interpret

$$\pi_{ij}\left(a_{m,j}\right) = \frac{\exp\left(\hat{\delta}_{ij}\left(a_{m,j}\right)\right)}{\sum_k \exp\left(\hat{\delta}_{ik}\left(a_{m,k}\right)\right)}$$

as the probability with which alternative *j* enters into *i*'s consideration set, where advertising is the main shifter of this probability. Without information on the consideration sets of consumers, it is difficult to precisely separate between these two interpretations of δ. In general heterogeneous perceptions of choice set characteristics and heterogeneous preferences can produce the same observed choices (Borghans, Duckworth, Heckman and Weel (2009), Della Vigna (2009)).

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 (1) and (2) 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, since 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 an agente ($\Pr_{i,j,m}$). 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 agentes per individual approached.[37]

Third, if having more local bank branches reduces costs of hiring agentes, $\kappa_{j,m}$, 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 presence directly affects investor's brand value for *j*. We present results using combinations of these three instruments. The results are consistent across specifications.

4.2 Estimation Approach

[37] We will interact this instrument with Afore dummies with Afore dummies to allow the impacts to vary across Afores.

To allow preference heterogeneity among investors in a flexible and tractable manner, 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.[38] We estimate the following random utility model for individuals in each of the 3699 distinct demographic-group-municipality cells:

$$u_{ij} = \left(\alpha_c + \gamma_c w_i\right) C_{ij}\left(y_i, b_i, p_j\right) + \delta_{c,j} + \varepsilon_{ij} \tag{3}$$

Equation (3) estimates 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.[39]

We can then use our thousands of utility parameter estimates for λ_c (= α_c + $\gamma_c w_i$) and $\delta_{c,j}$ to examine the impact of Afores' advertising/marketing efforts as measured in their sales force concentration in each local market, *m*, on demand parameters of individuals in various demographic groups.

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

$$\alpha_c = \alpha_0 + \tilde{\alpha} A_{c,m} + \sigma_c\,, \tag{4}$$

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

[38] We define geographic markets by county based on information we have about the geographic reach of agentes. Specifically, for all workers who switched Afores, we know the identity of the agente who handled the switch. We also know both the worker's and the agente's residence, so we can measure the typical distance between worker-agente pairs. We found, for example, that the probability of having a worker using an agente in their same zip code is close to the probability of matching with a random agente in the local market, suggesting this is far too narrow an area to consider a market. The same result holds true at a 4-digit zip code level. Matches become more systematic, however, at higher levels of aggregation. The probability of a worker matching with an agente from the same municipality (there are over 500 such divisions in Mexico) is closer to 0.4. Probabilities are even higher, of course, at the 2-digit zip code level (of which there are 100), but this strikes us as too aggregated a market area to allow for the rich variation in demand parameters across demographics and markets that we want in our estimations.

[39] 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.

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

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 $\nu_{c,j}$ is a mean-zero residual value of Afore *j* to the average investor in cell *c*.

As mentioned above, sales force may be correlated with unobserved components of preferences for Afore *j*, $\nu_{c,j}$. Hence we instrument for sales force,

(6) $$a_{c,m,j} = a_c + \beta Z_{c,j} + \omega_{c,j},$$

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.[40]

[40] 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 and Taber, 2005).

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.

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 brand value is lower rather than where the customer base is already brand-captive. This is consonant with predictions from equation (2) if areas with lower baseline brand value for *j* are areas where *j*'s marginal Agente Promotore 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. Banks themselves 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, and less than 15% of surveyed SAR participants list unified banking as one of the top three reasons for choosing their current Afore.[41] All of the major banks in Mexico entered the Afore market.

[41] Authors' calculations from the 2010-2011 Encuesta de Empleo Retiro y Ahorro, a household survey with field experiments of approximately 7,500 SAR account holders randomly sampled from the BDNSAR and residing in Distrito Federal.

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 or to save in a bank.[42] Sales force have a similarly larger impact on men's valuation of an Afore brand 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 agente 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 sales pitch or because sales force approached them more often. This would be particularly true for observable demographics such as gender or age given the general approaches sales force took described in Section 2.3. We can look at whether sales force characteristics (zip code location and age) vary systematically with individual characteristics of those accounts they signed up (recall the data do record which agente was responsible for signing which account). Systematic differences would indicate selective targeting. We do not find evidence of this; geographic proximity and age of agente 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, thus suggesting that Afores' sales agents may use an informative rather than a persuasive advertising strategy when they have 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. This suggests that sales force did not guide account holders to lower cost alternatives, and even when holding a price advantage had a predominantly persuasive effect on choice by increasing brand value.

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).[43] The findings

[42] Author's calculations from the 2010-2011 *Encuesta de Empleo, Ahorro y Retiro* (EERA).

[43] 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 rank 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.

further support the persuasive rather than informative role of Afores' sales agents. Overall exposure to sales force increases the coefficient on costs (i.e., price sensitivity) towards zero. The estimates in column 1 imply that a one standard deviation increase in total sales force concentration (2.504) increases mean coefficient on costs (measured in thousands of pesos) by 30% (0.046*2.504/0.388). Column 2 allows for a separate additional effect of sales force concentration for the cheapest four Afores. A negative sign would imply these sales agents act to increase workers' attention to management fees. The coefficient is positive but insignificant, indicating a similar impact to sales agents of higher cost Afores. 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 persuasive 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 unit-less 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 how the demand elasticity for each Afore would have changed in the absence of the effects of sales agents on workers' preferences. 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.[44] 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 Agentes on price sensitivity λ_c and brand value $\delta_{c,j}$ to zero. We refer to this counterfactual as the "Neutral Agentes" counterfactual, as we impose that sales force has no impact on preferences.[45] Note this is not a policy counterfactual *per se*, but rather a way to decompose the impact of sales force on choices (sorting across Afores), fees paid, and demand elasticity holding fees constant.

Figure IV plots the mean elasticities for each Afore at the demand estimates (Base Model) and at the Neutral Agentes counterfactual against mean sales force concentration. The Online Appendix presents tables of mean elasticities and market shares under each model. The actual shares and predicted shares from the Base Model are almost identical (the model fits extremely well in sample). Figure IV shows that baseline elasticites calculated at the demand estimates are on average negative, but less than one in

[44] Demand elasticity is $\frac{C_{ij}}{q_{ii}} \bullet \frac{\partial q_{ij}}{\partial C_{ij}}$ 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 and in the counterfactual world where sales force has zero impact on preferences.

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

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.[46]

In contrast, under the Neutral Agentes counterfactual, average elasticities change considerably. The average price elasticity more than doubles; dropping from an average of -0.75 to an average of -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 Agentes counterfactual. This suggests that a substantial portion of the price insensitivity in the market can be attributed to the impact of sales force on brand loyalty and price sensitivity; without their effect demand would have been much more elastic across the board.

We can also simulate expected management costs paid from increasing price elasticity under the Neutral Agentes counterfactual.[47] Table VI presents simulation results of mean change in elasticity and percentage change in total cost paid ([Neutral Agentes model cost / Base model cost] – 1) by demographic group. Overall, expected management fees paid in the system are 17.3% lower under the Neutral Agentes counterfactual. This is one way to quantify the impact of sales force on the price worker/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 (-5.3%) in our Neutral Agentes 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 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

[46] 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.

[47] 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: $E\left(C_i \mid \theta_i\right) = \sum_{j=1}^{J} C_{ij} q_{ij}\left(\theta_i\right)$ 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.

sales force. Men and older workers also benefit slightly more on average than women and younger workers.

In the Online Appendix, we show how market shares and revenues change for each Afore between the Base Model and the Neutral Agentes counterfactual.[48] Investors are less brand-loyal in the Neutral Agente counterfactual, and market concentration is lower. 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 1088 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 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

[48] 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 agentes on demand to zero.

We assume firms compete on prices, Nash-Bertrand, in a differentiated products market.[49] Revenues for Afore *j* are:

$$(7) \qquad \pi_j\left(f_j, b_j, A_j\right) = \sum_{i \in I}\left[q_{ij}\left(f_j, b_j, A_j^i, f_{-j}, b_{-j}, A_{-j}^i; X_i, \theta_i\right) * \sum_{t=1}^{T_{ij}} rev_{it}\left(f_j, b_j; Z_{it}\right)\right]$$

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 agente levels chosen by the Afore; A_j^i is the level of agente exposure for individual *i* from Afore *j*'s agentes; 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.[50] T_{ij} is the time 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. T_j is the Afore's profit horizon – the horizon over which it calculates profits when setting fees.

Our specification for the "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

[49] 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 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.

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

longevity of this new system.[51] 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 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. We note that the observed time horizons fit *ex-post* industry evolution fairly well, and equilibrium fees and market shares evaluated at the fitted time horizons are highly correlated with actual fees and market shares. 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.

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 will either keep the sales force deployment levels fixed at their observed values, or we will neutralize the effect of advertising by zeroing out the effect of advertising on preferences.

In addition, firms' maximization problems with respect to prices need not be convex. 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.[52] 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. The Online Appendix describes the algorithm and sensitivity analysis we performed to demonstrate robustness of our solution to initial starting points.

5.2 Counterfactual Results

[51] Examples include Argentina and Venezuela's nationalization of pensions and private industry. See Duarte and Hastings (2012) for evolution of reforms in Mexico's system.

[52] 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).

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, now allowing 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 Agentes" as we allow prices to readjust to the substantially higher demand elasticity. 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. Note that this overall drop in fees benefits the cost paid to all workers, in contrast to the simulations in Table VI. Low-income worker's costs still 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, all fees are lower as firms compete on price. This benefits elastic and inelastic investors alike.

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. We return to this point below.

The next counterfactual scenario we analyze has XXI (the Afore which co-branded with the social security administration) behaving as a "government player" 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 XII 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. We find that 22% of Afores respond to XXI by increasing their prices to the cap. Despite the low XXI fee, it garners only 6.5% market share (up from 2.7% under its baseline fee), while 20.8% of the investors in the market continue to

choose very high price Afores who charge the highest allowable price on at least one of their fees. Because of this, having XII 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 by increasing fees outweighs the low-fees paid by the relatively small set of elastic XXI 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 20.8% – among low-income workers, as they are the most likely to be the inelastic subgroup in firms who raise fees in response to XII's low prices. In the absence of other policies, a government competitor could lead to higher prices charged to low-income workers with low price-sensitivity and who are strongly influenced by persuasive advertising.

Column 2 shows that allowing a higher fee cap increases the perverse problem of the high-advertising, high-brand-value firms increasing their fees in response to competition. XXI's market share increases only slightly in response, and total costs paid by workers in the market increase further.

Columns 3 and 4 show how the simulation results change under the assumption that the effect of sales agents on preferences has been zeroed out – the Neutral Agentes assumption. Now, in the absence of persuasive advertising, XXI's share increases 526% from 2.7% to 14.2%. Thus without persuasive advertising, a substantially larger fraction of customers choose the low-price government option. No firms best respond by pricing at the cap. Overall, management costs in the system decrease by 64.7% as firms 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 now does little to further lower fees (comparing -61.7% from Table VII to -64.7%), 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 solution. However the simulation results suggest 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 US with the Dodd-Frank Act and the Consumer Financial Protection Bureau's Office of Financial Education.[53] 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)

[53] For a recent review of the literature on financial education and financial literacy, see Hastings, Madrian and Skimmyhorn (2012).

show that a simplified fee index introduced in the system in 2005 (several 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 is much more effective at reducing costs than the government competitor in isolation, but less effective than the hypothetical world with neutral advertising. Costs for low-income workers still decline the least, but now by 28%. Costs fall because these workers are the most impacted by the demand-elasticity-improvement, and higher-income workers benefit from lower overall fees in the system.

The second column adds a government competitor. In contrast to Table VIII, (1) and (2), no firms price at the cap, and costs decline by 39.4%. Increasing price sensitivity among the most inelastic customers eliminated the strategy of responding to competition by raising price, as there are no longer sufficiently captive customers. Here, high-income workers benefits more than low income workers, substituting in larger share to XXI. Low-income workers fare slightly worse as the government competitor draws the most elastic customers, and some firms charge slightly higher prices, but non charge the cap.

Finally, for comparison, column 3 sets the impact of sales force on preferences to zero. All three policies combined lead to a 74.2% decline in costs. All workers benefit from across-the-board declines in prices.

Overall, the results of the counterfactual simulations suggest that advertising contributed substantially to high equilibrium fees in Mexico's social security system. Advertising has 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. In the absence of advertising regulation or policies that address inelastic demand, a government competitor may be likely to be ineffective, and costs could increase to low-income workers if they are on average less price-sensitive as many firms respond to competitive entry by raising prices and focusing on their brand-captive consumer segments. An effective government competitor coupled with a government-based informative advertising and financial literacy initiative might be similar to our combined demand-and-supply-side policy simulation. In general, policies that address price insensitivity

and the potentially persuasive impacts of advertising are effective at increasing competition and lowering equilibrium prices. This raises consumers' effective savings in the market and complements a government competitor as private firms reduce prices to meet the added competition.

6 Conclusion

We have used a new data set with rich detail on pension fund choices in Mexico's privatized social security system to examine how advertising 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 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 estimate a very flexible model of demand for fund managers and find that advertising was a key competitive channel used to gain customers by increasing brand value and decreasing price sensitivity.

Mexican regulators at the time made an explicit decision to follow a hands-off approach; they provided no information on fees nor did they regulate communication or advertising by the Afores. The expectation was, with such a large number of players (17 firms) selling what financially speaking were essentially homogeneous products, that competitive pressure would lead to price-driven competition for accounts in a market awash with information. We find 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 foster stronger brand preferences and weaken substitution motives. As a result, prices were at levels well above marginal cost. While our model allows for sales force to increase utility (through perceived brand value, perceived or real benefits such as false expectations for higher savings or prestige, belonging, or giving business to a sales-force friend or family member), we show that such increased utility comes at substantial cost to savings at retirement through higher equilibrium fees. This is particularly important in a social safety net market intended to force minimum savings for retirement to protect against poverty in old age.

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 demand-side policy simulated the effect of an increase in 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. We find the greatest impact on fees 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 advertising-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 on 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.

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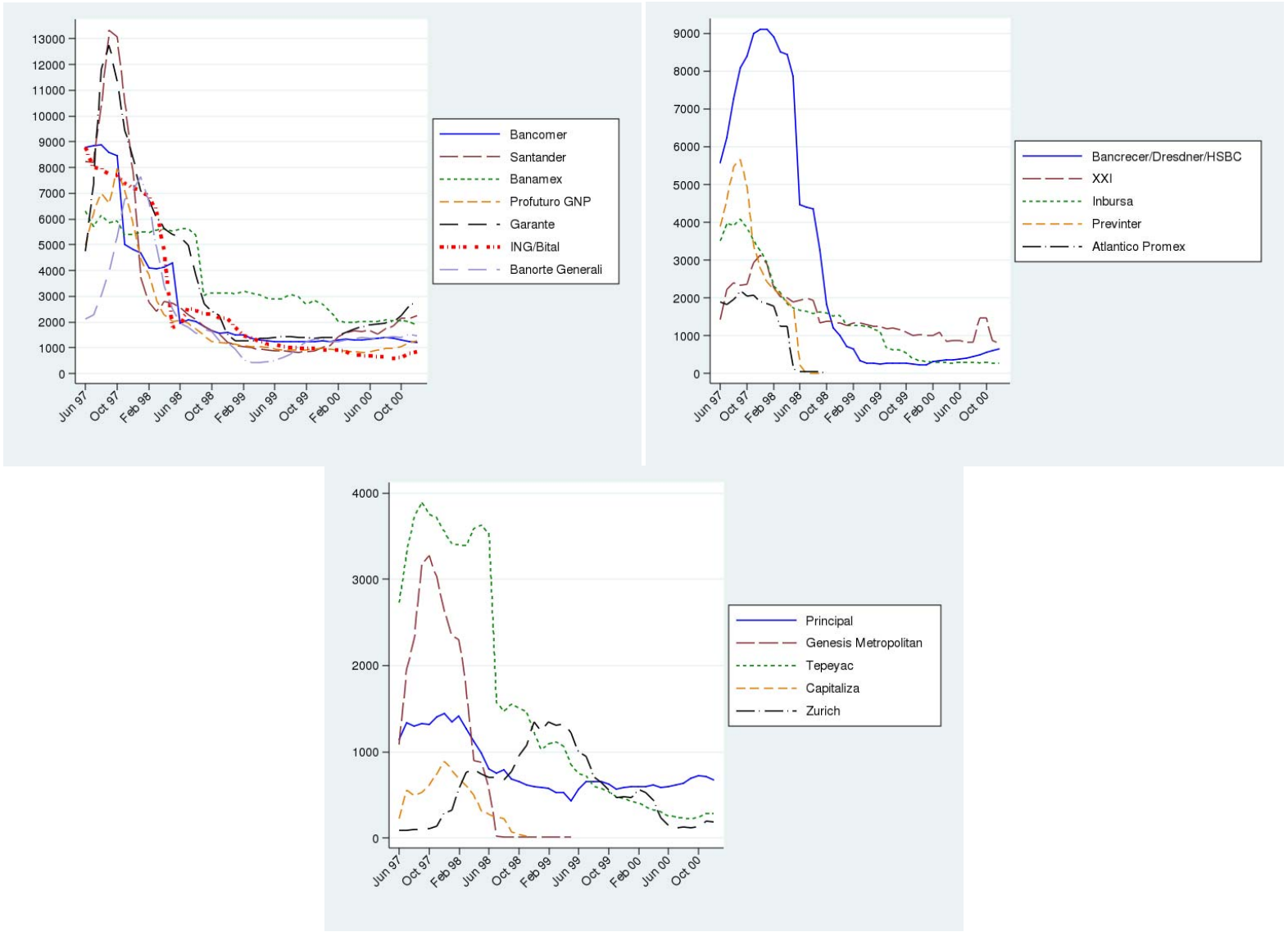
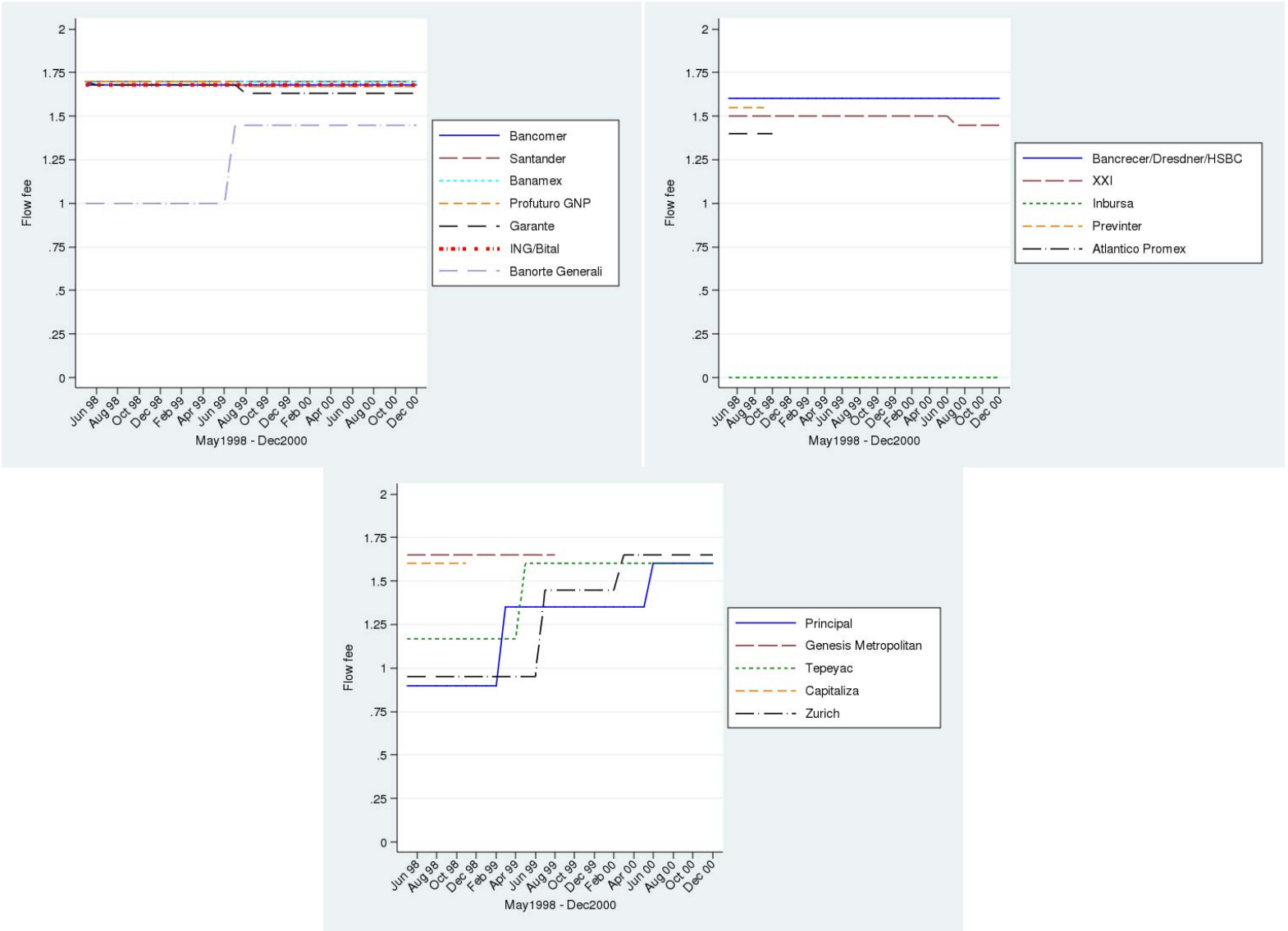
FIGURE I: NUMBER OF AGENTE PROMOTORES ACTIVE IN THE MARKET



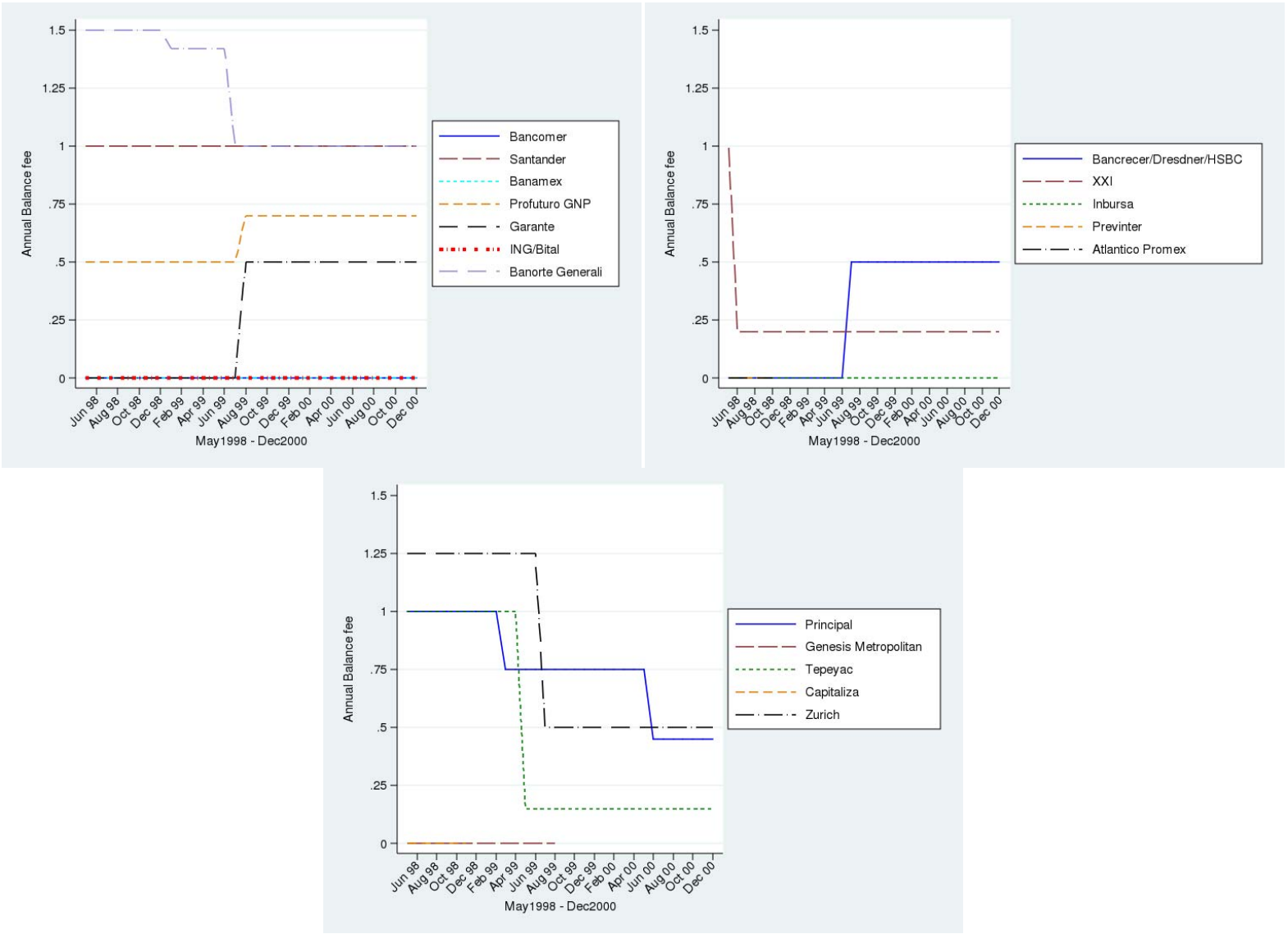
Note: Data from official Agente Registration panel from CONSAR. Data record each Agente Promotor, their current status and the Afore for whom they are working.

FIGURE IIA: AFORE FLOW FEES OVER TIME



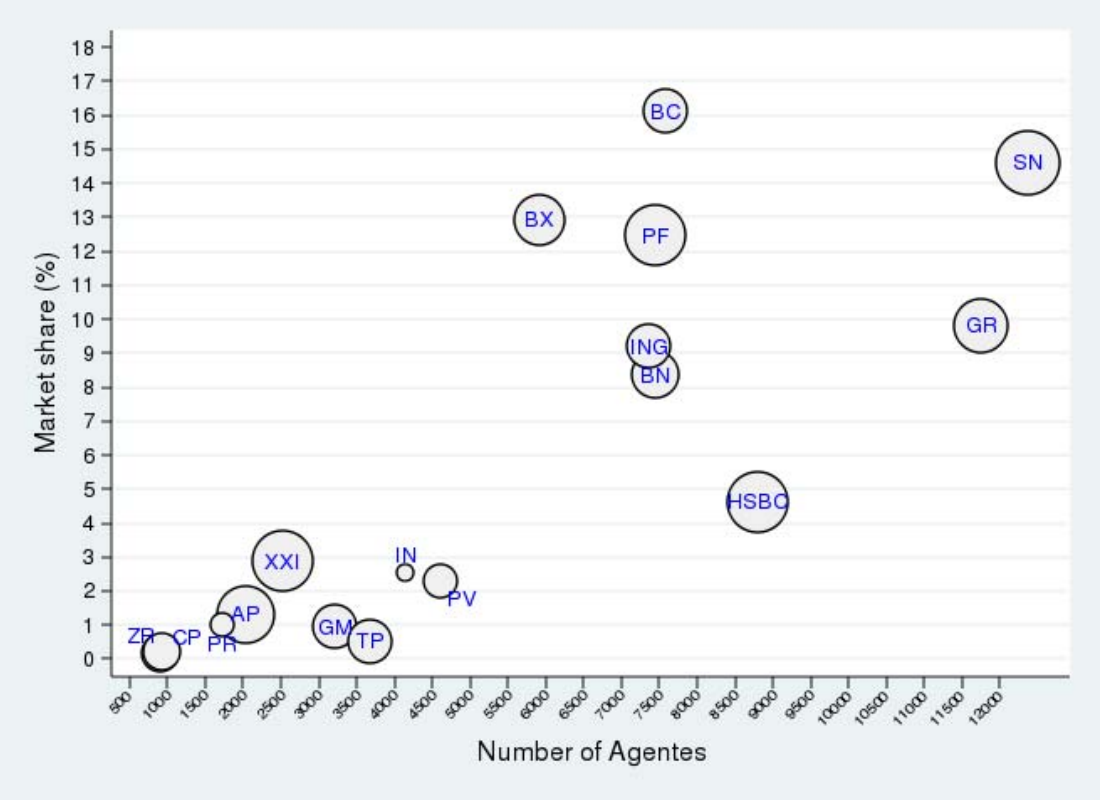
Note: Flow fees for Afores reported as a percentage of salary from May 1998 to December 2000.

FIGURE IIB: AFORE BALANCE FEES OVER TIME



Note: Annual balance fees for Afores shown from May 1998 to December 2000.

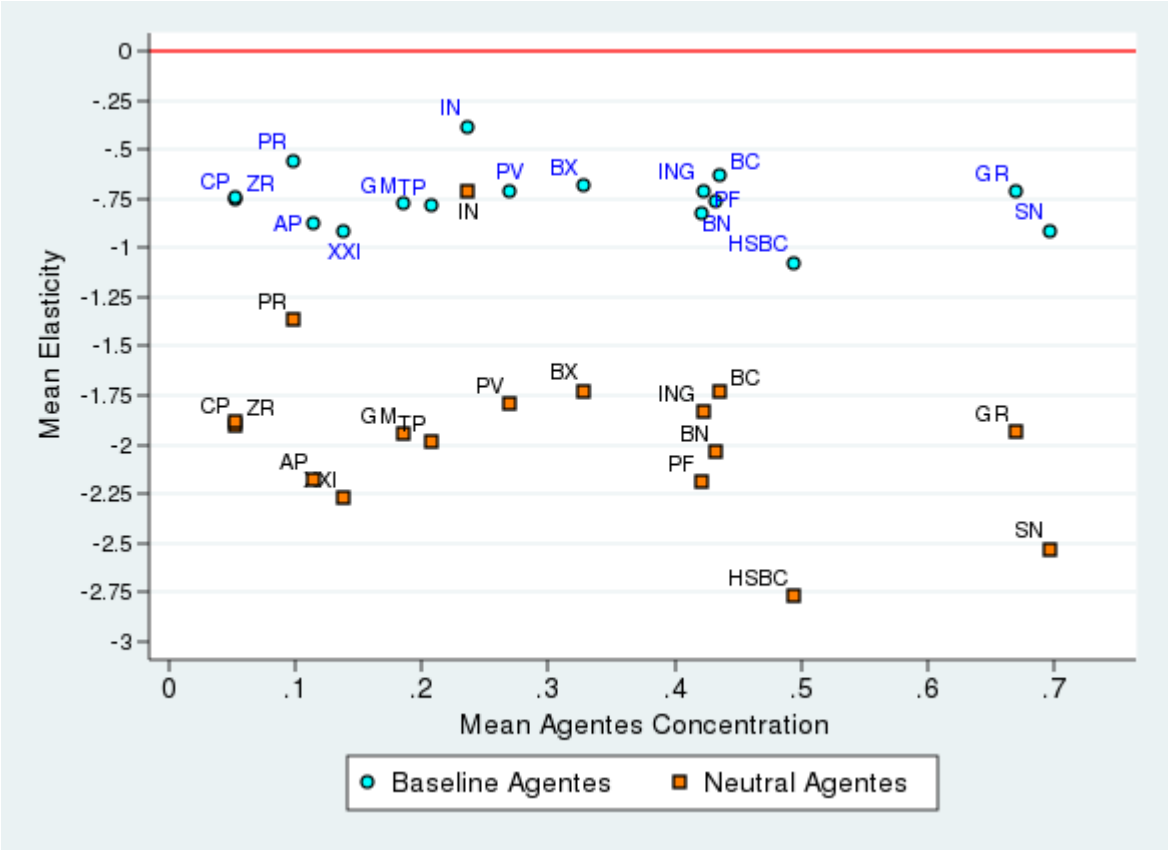
FIGURE III:
MARKET SHARE vs. AGENTES



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 AGENTES



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: Elasticities are calculated at the observed fee levels and individual characteristics. Elasticities in the Baseline Agentes model are calculated using estimates from equation 2 to generate the logit choice probability for each individual for each Afore. Elasticities for the Neutral Agentes model use estimates for demand parameters with Neutral Agentes from equations 2, 3, and 4 using the IV 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 Agentes
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			
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 agentes 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 AGENTES 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 agentes 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 AGENTES 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 Agentes 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 Agentes with Govn't Competitor	
	Base Model	(1) Cap at (3.20,5.00)	(2) Cap at (3.20, 10.00)	(3) Cap at (3.20,5.00)	(4) Cap at (3.20, 10.00)
XXI price	(1.90, 0.00)	(0.00, 0.10)	(0.00, 0.10)	(0.00, 0.10)	(0.00, 0.10)
XXI simulated share	2.7%	6.5%	6.7%	14.2%	14.2%
Market Share of Afores Pricing at Cap	--	20.8%	22.2%	0.0%	0.0%
Percent of Afores Pricing at Cap	--	22.2%	16.7%	0.0%	0.0%
Percentage change in management costs					
All	--	7.6%	12.3%	-64.7%	-64.7%
Low-income	--	20.8%	30.0%	-46.0%	-46.0%
High-income	--	1.8%	5.5%	-71.1%	-71.1%
Male	--	6.9%	11.1%	-65.6%	-65.6%
Female	--	0.5%	6.3%	-69.6%	-69.6%
Young workers	--	16.0%	20.6%	-56.8%	-56.8%
Old workers	--	-2.5%	2.2%	-73.6%	-73.6%

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 Agentes
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%	-39.4%	-74.2%
Low-income	-28.0%	-22.1%	-59.4%
High-income	-38.0%	-45.8%	-79.2%
Young workers	-32.2%	-28.3%	-67.6%
Old workers	-39.0%	-51.0%	-81.5%
Male	-35.7%	-45.7%	-75.0%
Female	-37.5%	-45.7%	-77.7%

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.