Failing to Choose the Best Price: Theory, Evidence, and Policy

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Abstract

Both the "law of one price" and Bertrand's (1883) prediction of marginal cost pricing for homogeneous goods rest on the assumption that consumers will choose the best price. In practice, consumers often fail to choose the best price because they search too little, become confused comparing prices, and then show excessive inertia through too little switching away from past choices or default options. This is particularly true when price is a vector rather than a scalar, and consumers have limited experience in the relevant market. All three mistakes may contribute to positive markups that fail to diminish as the number of competing sellers increases. Firms may have an incentive to exacerbate these problems by obfuscating prices, thereby using complexity to make price comparisons difficult and soften competition. Possible regulatory interventions include simplifying the choice environment, for instance by restricting price to be a scalar, advising consumers of their expected costs under each option, or choosing on behalf of consumers.

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1 Introduction

Both the "law of one price" and Bertrand's (1883) prediction of marginal cost pricing for homogeneous goods rest on the assumption that consumers will choose the best price. In practice, consumers often fail to choose the best price. As a result, homogeneous goods sellers charge positive markups and "the 'law of one price' is no law at all" (Varian, 1980, p.651). To choose the best price, a consumer must first search for prices, then select the lowest price among those found, and finally switch when prices change. The traditional explanation for consumers' failure to choose the best price is that searching and switching are costly (Baye, Morgan and Scholten, 2006; Farrell and Klemperer, 2007). Conditional on these costs, it is traditionally assumed that consumers' searching and switching decisions are optimal, and that consumers will initially choose the lowest price discovered. Evidence suggests, however, that all three assumptions are overly optimistic: Consumers sometimes appear to search too little, exhibit confusion in their choices, and then show excessive inertia through too little switching away from past choices or default options. All three mistakes may contribute to positive markups that fail to diminish as the number of competing sellers increases.[1] Firms may have an incentive to exacerbate the problem by obfuscating prices, thereby using complexity to make price comparisons difficult and soften competition.

I discuss each barrier to choosing the best price, limited search, confusion, and inertia, in Sections 2–4. For each, I discuss selected evidence for the problem as well as related theory and evidence on resulting equilibrium outcomes. Together, the work surveyed constitutes an important branch of the behavioral industrial organization (IO) literature. A distinct branch of the behavioral IO literature, which I survey separately in Grubb (2015b), studies equilibrium outcomes when consumers have none of the preceding problems but rather have systematically biased expectations about their own future choices, due to overconfidence or related biases. An important difference between the two branches of work lies in whether or not the modeled consumer mistakes increase firms' market power.

In the work surveyed herein, consumer mistakes lead both to excessive inertia and to noise in active choices that is uncorrelated across consumers. In the work on overconfidence and related biases, consumers systematically misweight different dimensions of price (or other product attributes) in the same way, for instance by overweighting a teaser rate relative to a reset rate on a loan. In the former case, noise in consumer choice artificially differentiates products, creating market power and dispersion in prices but not necessarily any systematic distortion of prices in one particular

[1] Of course, in many cases consumers make good choices and market competition is effective. However, this article focuses on problems rather than successes. For a discussion of settings in which competition can be all the protection consumers need, see for instance Armstrong (2008).

direction. In the latter case, in contrast, systematic consumer mistakes lead firms to distort prices specifically to exploit consumer bias but does not necessarily increase markups or lead to price dispersion (Grubb, 2015b).

Section 5 discusses policies to improve market outcomes when consumers exhibit limited search, confusion, and inertia. Of particular interest, is the policy of providing or facilitating expert advice to consumers to aid them in their choices. Such a policy may be implemented imperfectly, so that the resulting advice is biased, as in the case of Mexico's privatized social security market (Duarte and Hastings, 2012). If consumers follow the advice, then its introduction shifts consumers from making choices with noise, as considered in this survey, to making choices based on a systematically biased weighting of different components of price or other product attributes, as discussed by Grubb (2015b). Thus the policy provides a link between these two important branches of the behavioral IO literature. (A third branch of the literature concerns consumers with non-standard preferences. For a brief overview of all three main branches of the IO literature with behavioral consumers see Grubb (this issue) earlier in this special issue.)

2 Limited Search

Search is the first step for any consumer who hopes to choose a product at a good price, and hence is the first topic I address. Without any behavioral assumptions, models of rational search can explain a commonly observed phenomenon: seemingly homogeneous products sold at highly dispersed prices by many competing firms. For instance, Burdett and Judd (1983) derive equilibrium price dispersion in models with homogeneous search costs and either nonsequential search or noisy sequential search. Alternatively, Stahl (1989) models N competing firms selling a homogeneous good to two types of consumers, *shoppers* that are informed about all prices and *non-shoppers* that search sequentially with search cost c. Stahl (1989) predicts that equilibrium prices are dispersed and converge to the monopoly price (rather than marginal cost) as the number of competing firms increases. Intuitively, equilibrium price dispersion must be a consequence of positive search costs in any market that escapes Diamond's (1971) paradox. If prices were not dispersed, consumers would have no incentive to search, and firms would have no incentive to price below monopoly levels.

Despite the success of unboundedly rational search models, a difficulty is that the search cost required to explain consumer behavior may be implausibly high. A case in point is the US mortgage market. Woodward and Hall (2012) focus on the segment of the market served by mortgage brokers in 2001. Lenders offer mortgages to brokers at competitive wholesale rates. A broker's role is to find borrowers, help them collect documentation, fill out paperwork required to originate loans, and

add on as large a markup as possible. Borrowers should approach brokers in the same manner as car dealers, by contacting multiple brokers and having them compete against each other on price. However, survey evidence shows that many US home buyers undertake surprisingly little search for a mortgage. For instance, Lee and Hogarth (2000) find that 19% of borrowers consult only one lender or broker, and less than half consult more than three. Woodward and Hall (2012) estimate a structural model of rational consumer search among mortgage brokers. Their estimates imply that the financial gains from visiting one additional broker exceed $1,000 for a $100,000 mortgage. Woodward and Hall (2012) argue that this is implausibly high, and conclude that the result rejects their model of rational search.[2]

One reason borrowers may search too little is that they underestimate the returns to search. First, borrowers may believe mortgage brokers will work in their best interests to find them the best available rate, as a financial advisor with a fiduciary duty. In fact, testing of disclosures about mortgage brokers' conflicts of interest shows not only that this belief is common among borrowers, but that they find disclosures to the contrary difficult to believe (Macro International Inc., 2008).[3] Second, borrowers may simply underestimate the dispersion of prices, perhaps because their predictions about the next price quote suffer from overprecision[4] or belief in the law of small numbers (Rabin, 2002).

A second reason borrowers may appear to search too little is that confusion about quality or price may undermine the returns to search. For this reason, there is an important connection between search behavior and the consumer confusion I discuss in the next section. First, if confusion causes consumers to overestimate quality differences between products, they will underweight price relative to brand when making choices. Consumers who anticipate that price will play a small role in choice should rationally exert less effort to find a low price. Second, search is only valuable if one expects to successfully identify the lower price between two quotes, which boundedly rational consumers may fail to do.

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[2]Woodward and Hall (2012) study the market in 2001. Since then, updated good-faith disclosure regulation has restricted *partition pricing* so that brokers may no longer quote multiple fees, such as an "origination fee", a "funding fee", or a "document processing charge", without also reporting the sum. Moreover, since 2011, new regulations restrict commissions that lenders may pay brokers and increase brokers' fiduciary responsibility to borrowers (Federal Reserve Board, 2010). It would be interesting to know how Woodward and Hall's (2012) results would differ under the new regulations.

[3]Lack of search and unawareness of conflicts of interest are widespread in retail finance. Chater, Huck and Inderst (2010) find in a survey of 6,000 Europeans who had recently purchased a retail investment product that (1) 66% consulted only a single investment provider or advisor and (2) that more than half believed their provider or advisor gave completely independent and unbiased advice.

[4]Grubb (2015b) provides a recent overview of the evidence for overprecision, whereby individuals underestimate the uncertainty surrounding their own forecasts.

As discussed in the following section, identifying the lower of two prices is difficult when prices are complex vectors, as is the case with mortgages. Apart from other terms, a mortgage quote includes both an interest rate and closing costs. Borrowers typically face dispersion in both interest rates and origination charges when getting quotes from multiple brokers, and therefore have to understand how to trade-off the two dimensions of price when making comparisons. Consumers who recognise that they do not know how to make these trade-offs may also recognise that their returns to search are small. Consistent with the idea that price complexity limits search, Woodward and Hall (2012) find that borrowers who restrict themselves to consider only no-cost mortgages, which charge no closing fees and only vary by the interest rate, pay substantially lower prices.

Finally, consumers may search little because their search costs actually are very high once the cognitive costs of evaluating offers are taken into account. In particular, price complexity may reduce consumer search because it directly raises the cognitive costs of search. This is reasonable, for example, if increased complexity means consumers need longer to read and understand the "fine print". Ellison and Ellison (2009) document a number of obfuscation practices among small computer parts retailers selling through Pricewatch.com that can be interpreted as raising search costs. For instance, Ellison and Ellison (2009) document that, until Pricewatch.com responded by requiring firms to list total prices, firms practiced *drip pricing* by advertising a base price on Pricewatch.com but only revealing shipping and handling fees (which might amount to 98% of the total price) at check out.[5] Similarly, until Pricewatch.com added a "buy now" button to search results, retailers made it time consuming to find advertised prices on their websites (Ellison and Ellison, 2009).

Importantly, firms choose not only price levels but the complexity of their own prices. Naturally, a firm with a cost advantage over its competitors might both set a low price and try to facilitate price comparison shopping. In other cases, however, firms may find it more profitable to intentionally obfuscate their prices, making them more complex and less transparent simply to make it harder for consumers to comparison shop (Carlin, 2009; Wilson, 2010; Ellison and Wolitzky, 2012). Models of search typically predict that search costs raise equilibrium prices (e.g. Diamond (1971) or Stahl (1989)) and it seems clear that raising consumers' costs of learning a competitor's price could be

[5] As I use the terms, partition pricing and drip pricing both describe price using several distinct fees which must be summed together to compute a total price. Unlike hidden add-on fees, these distinct fees cannot be declined and are all communicated prior to a purchase decision. Partition pricing communicates all the distinct fees at the same time, while drip pricing reveals them sequentially through the shopping process. For instance, if a shipping fee is posted next to a product price, it is an example of partition pricing, whereas if it is not revealed until adding the product to the shopping cart, it is an example of drip pricing. Note that these terms are often used more broadly by other researchers. For instance, Morwitz, Greenleaf, Shalev and Johnson (2013) include drip pricing as a special case of partition pricing and Shelanski, Farrell, Hanner, Metcalf, Sullivan and Wendling (2012) include add-on pricing as a type of drip pricing.

profitable. More surprisingly, Ellison and Wolitzky (2012) explain that an individual firm could want to make its own prices difficult to find by showing that making one's own price hard to find can raise consumers' expected cost of searching elsewhere.[6]

Ellison and Wolitzky (2012) build upon Stahl's (1989) model of sequential search and assume that it takes consumers time $\tau + t_i$ to learn firm i's price, where t_i is a firm-specific component of search time but τ is common to all firms. Then the total shopping time at n firms equals $n\tau + \sum_{i=1}^{n} t_i$. In this context, they show that raising search time only at firm i (by raising t_i) could increase the expected costs of shopping at an additional store for at least two reasons. First, if consumers' cost of total time spent shopping is strictly convex, then using up more of a consumers time at one's own shop increases their marginal cost of time for shopping elsewhere. (In the extreme, using up all of a consumer's time would prevent them shopping elsewhere.) Second, if consumers are learning about the time it takes to find prices, then making one's own prices hard to find may increase expectations about search time elsewhere.[7] In either case, obfuscation is profitable for a firm because raising consumers' expectations about the cost of searching at a competitor means the firm can charge a higher price without inducing consumers to keep searching once they learn its own price. Consistent with this prediction, a lab study conducted by the UK Office of Fair Trade (Office of Fair Trading, 2010) shows that drip pricing is more profitable than transparent pricing because it leads consumers to buy when they would otherwise continue searching.

In both versions of their model, Ellison and Wolitzky (2012) find that firms obfuscate prices in equilibrium, obfuscation raises prices, and that, while any reductions in exogenous search costs do benefit consumers, they are partially offset by increases in equilibrium obfuscation. Ellison and Wolitzky's (2012) two models are very successful at explaining much of the obfuscation documented by Ellison and Ellison (2009). Together the two papers help explain why the internet has not reduced search costs to zero: any technological reduction in search costs is likely to be at least partially offset by obfuscation efforts. This finding also provides an important warning to market designers and regulators who might hope to craft regulation to promote price transparency: this can be a challenging task.

While Ellison and Ellison (2009) study obfuscation in a single market, Muir, Seim and Vitorino

[6]Wilson (2010) provides an alternative explanation that works when firms' search costs are independent. In contrast to Ellison and Wolitzky (2012), Wilson (2010) assumes that (1) consumers can observe how time consuming it will be to learn a firm's price, (2) consumers can choose to begin their search at a firm with transparent prices (low search costs), and (3) firms choose obfuscation levels before prices. In this setting, Wilson (2010) shows that obfuscation can be more profitable than transparency by providing commitment to softer price competition in the second stage of the game.

[7]Specifically, Ellison and Wolitzky (2012) assume that consumers make inferences about τ, which affect expectations about search costs at other firms, by observing the sum $\tau + t_i$.

(2013) examine how obfuscation, markups, price dispersion, and concentration of Portugese driving schools all covary across geographic markets. Obfuscation is measured by the complexity of price quotes. For instance, obfuscation is low for driving schools that only quote a total price but high for schools that itemize a separate price for each component of a driving course. They find positive correlations between market level obfuscation, price levels, and price dispersion, consistent with the idea that obfuscation raises search costs (Ellison and Wolitzky, 2012) and search costs raise both price levels and price dispersion (Stahl, 1989). Muir et al. (2013) also find negative correlation between market concentration and obfuscation, consistent with the idea that obfuscation is employed to soften competition (Carlin, 2009; Wilson, 2010; Ellison and Wolitzky, 2012). Finally, Muir et al. (2013) find that, within markets, firm prices are positively correlated with obfuscation. This finding is consistent with the informal intuition that high-priced firms benefit most from high search costs, as well as formal predictions by Carlin (2009) and Ellison and Wolitzky (2012).

3 Consumer Confusion

Once consumers have completed price search, and the consideration set is determined, the economics literature typically assumes that consumers will choose the lowest priced seller of a homogeneous good. There are at least two reasons consumers may fail to do so. First, consumers may not realize goods are homogeneous, and attribute imaginary quality differences to products. Second, consumers may be confused by complex prices and not be able to identify the lowest price. As discussed in the previous section, both sources of confusion may rationally reduce consumer search for a low price. This section focuses on the problems that arise even absent limited search: Noisy evaluations of quality and price create artificial product differentiation, and hence market power. Moreover, the theory of differentiated product competition suggests that there is no reason to expect that increasing the number of competitors will lower prices towards costs (Gabaix, Laibson, Li, Li, Resnick and de Vries, 2013). However, we should expect firms to exacerbate consumer confusion about quality through persuasive advertising or other means, and to exacerbate consumer confusion about prices through obfuscation. I discuss consumer confusion about quality first and then turn to confusion about price.

3.1 Imaginary Quality Differences

First, consider the market for headache remedies. Bronnenberg, Dubé, Gentzkow and Shapiro (Forthcoming) report a 100-tablet package of 325mg aspirin selling at CVS for $6.29 under the Bayer brand but for less than a third of that price at $1.99 under the CVS store brand. Bronnenberg

et al. (Forthcoming) point out that these two products are apparently identical, having the same active ingredient, dosage, and directions, and that CVS prompts customers to compare them. Nevertheless, Bayer and other national brands account for 25% of aspirin sales by volume and 60% by expenditure (Bronnenberg et al., Forthcoming). Does the willingness to pay such a high brand premium reflect a subtle but real quality difference or only a perceived quality difference (perhaps due to advertising) where in fact none exists? The former is certainly possible; the FDA found that a generic version of the anti-depressant Wellbutrin XL did not work as well as actual Wellbutrin XL (Thomas, 2012). However, the latter cause of a brand premium has long been suspected by economists (e.g. see Braithwaite (1928)).

To distinguish the two possibilities, Bronnenberg et al. (Forthcoming) compare the headache remedy purchasing behavior of informed consumers, such as physicians and pharmacists, with that of everyone else (while controlling for demographics and income). While typical consumers buy brand name headache remedies 26% of the time, pharmacists do so only 9% of the time. Bronnenberg et al. (Forthcoming) conclude that a substantial portion of the brand premium in headache remedies is due to misinformation about the quality difference. They simulate that if all consumers behaved like pharmacists, brand-name headache remedy prices would fall by 37% and consumer expenditures would fall by 15% ($435 million). Bronnenberg et al. (Forthcoming) document smaller effects in other product categories, but the headache remedy case study nevertheless demonstrates the potential for objectively homogeneous goods to be misperceived as strongly differentiated. This may be one reason why brands sell at a premium compared to objectively identical products in markets for cars (Sullivan, 1998) and index funds (Hortaçsu and Syverson, 2004), and more generally why price competition and the law of one price may fail in markets for objectively homogeneous goods (Hastings, Hortaçsu and Syverson, 2013).

Treating the level of artificial product differentiation due to confusion about quality as exogenous, existing models of product differentiation can be applied to explain equilibrium pricing (e.g. see Anderson, de Palma and Thisse (1992)). In particular, if care is taken to adjust welfare calculations, the noise in random utility models may be interpreted as error in product evaluation rather than as true variation in tastes. Importantly, if consumers misperceive homogeneous goods to be differentiated, there is no reason to expect that increasing the number of competitors will lower prices towards costs (Gabaix et al., 2013).

It is interesting to know how confusion about product quality arises and how firms attempt to influence such confusion. A natural explanation for consumers' misapprehension that Bayer is higher quality than CVS brand aspirin is persuasive advertising, a rich topic I leave beyond the scope of this paper (see Bagwell (2007) for a survey). Alternatively, luck rather than advertising

may differentiate brands for believers in the 'law of small numbers', who exhibit *overinference* by overreacting to small samples of good or bad experiences (Rabin, 2002). For instance, consider an individual who by chance finds headache relief from Motrin branded ibuprofen on Monday but no luck from otherwise identical Advil branded ibuprofen on Tuesday. If he believes in the law of small numbers, he may incorrectly infer a quality difference between the two brand names rather than appropriately attribute the difference in experience to small sample size (Spiegler, 2006b).

There is substantial evidence of such overinference from individual investor behavior. Individual investors' employer stock holdings (Benartzi, 2001), 401(k) savings rates (Choi, Laibson, Madrian and Metrick, 2009), and stock trading patterns (Barber, Odean and Zhu, 2009) all provide evidence of overinference about future returns from past returns. Moreover, in a laboratory setting, Choi, Laibson and Madrian (2010) show that S&P500 index fund investors choose high-fee funds due to a related sample-size mistake. They apparently gauge expected future returns of each S&P500 index fund by annualized returns since inception, failing to realize that differences are due to different inception and prospectus publication dates. Explaining to subjects that S&P500 index funds all try to replicate the returns of the S&P500 index helps, but only modestly (Choi et al., 2010).

The possibility that consumers' brand preferences are driven by misinformation suggests (1) caution when evaluating welfare estimates from standard product differentiation models, (2) recognition that market design creating objectively homogeneous products may fail to foster price competition, and (3) that there may be additional scope for pro-competitive market intervention by providing objective quality information.

3.2 Price Confusion: Which Price is Lower?

A variety of evidence shows that when prices are complex, and in particular are vectors rather than scalars, consumers have trouble choosing the best price. This may arise because people systematically misforecast future choices and hence misweight elements of the price vector due to overconfidence or other biases (Grubb, 2015b). If this were consumers' only difficulty when comparing price vectors, however, then we should not expect to see consumers choosing dominated price vectors, being influenced by partitioned or drip pricing practices, or making other mistakes unrelated to forecasting future choices. In fact, however, we see all of these mistakes, suggesting that it is fundamentally difficult for consumers to properly understand and compare complex price vectors. The problem may be especially common for financial products such as insurance, loans, and retirement savings.

Below I describe empirical evidence of price confusion from consumers choosing dominated options. I try to focus on examples where poor choices cannot be reasonably attributed to unawareness

of better options or subtle quality differences. For additional evidence of price confusion stemming from the effects of partitioned or drip pricing practices, see Morwitz et al. (2013).

Dominated choices: At the moment of this writing, AT&T is currently offering three iPad data plans on its website, as shown in the screen capture in Figure 1 (AT&T, 2014). As is clear from the more transparent presentation of prices I have constructed in Figure 2, the DataConnect 5GB plan is dominated by the DataConnect 3GB plan. Thus AT&T is offering the same product, under the same brand, for a low price and a high price, and advertising both prices on the same menu so that all consumers who observe the higher price also observe the lower price. It is possible that the DataConnect 5GB plan is not intended to be purchased, but rather appears on the menu to attract attention to the menu (Eliaz and Spiegler, 2011b) or to influence consumers choice among the other two options on the menu (Ok, Ortoleva and Riella, 2011). However, it is suggestive that some consumers may not realize that DataConnect 5GB is dominated by DataConnect 3GB and may choose it as a result. Notably, AT&T's chosen presentation of the data plans makes the dominance of DataConnect 3GB over DataConnect 5GB non-transparent.[8]

It is not unusual for wireless firms to offer dominated options. Miravete (2013) refers to the practice of including dominated options on contract menus as *foggy pricing* and documents widespread foggy pricing by cellular phone companies in the US within his 1984 to 1992 sample period.[9] It is rarer to find examples of foggy pricing where researchers have access to quantity data that can both illuminate whether dominated options are actively chosen and rule out limited search or switching costs as explanations. One such case is documented by Handel (2013).

Handel (2013) studies employee health insurance choices at a large employer from 2004 to 2009. During the later part of this period, two health plans were offered that were identical in non-financial attributes, and for about half of new employees (including those with families and lower incomes) the cost of one plan strictly dominated the other by more than $1,000 (Handel, 2013). In unreported analysis, Handel finds that within this group, 7% (or roughly 40 out of a total of 600) chose the dominated option (Handel, 2014). The only plausible explanation is that these new employees did not realize the plan was dominated. This is not hard to believe because comparing the two plans required comparing a vector of four pricing parameters, including the (1) premium, (2) deductible, (3) co-insurance rate, and (4) out-of-pocket maximum. In fact, the simplest way to

[8]Consumers are typically uncertain about future data usage and hence the final cost of a data plan. As one might expect, experimental evidence shows that individuals are more likely to choose a dominated lottery when the description of available alternatives makes dominance non-transparent (Tversky and Kahneman, 1986).

[9]Miravete (2013) finds mixed results about whether foggy pricing increases or decreases with additional competition due to entry.

DataConnect Plans for:

iPad, Tablets, Camera and Gaming Devices

Data	Plan Charges	AT&T Wi-Fi Access	Domestic Overage Fees	Canadian Data	International Data	
DataConnect 250MB	$14.99	✔	$14.99 per 250 MB	$0.015/KB	$0.0195/KB	Add View details
DataConnect 3GB	$30.00	✔	$10.00 per 1 GB	$0.015/KB	$0.0195/KB	Add View details
DataConnect 5GB	$50.00	✔	$10.00 per 1 GB	$0.015/KB	$0.0195/KB	Add View details

Figure 1: A screen capture from AT&T's website showing iPad data plans on November 25th, 2014 (AT&T, 2014).

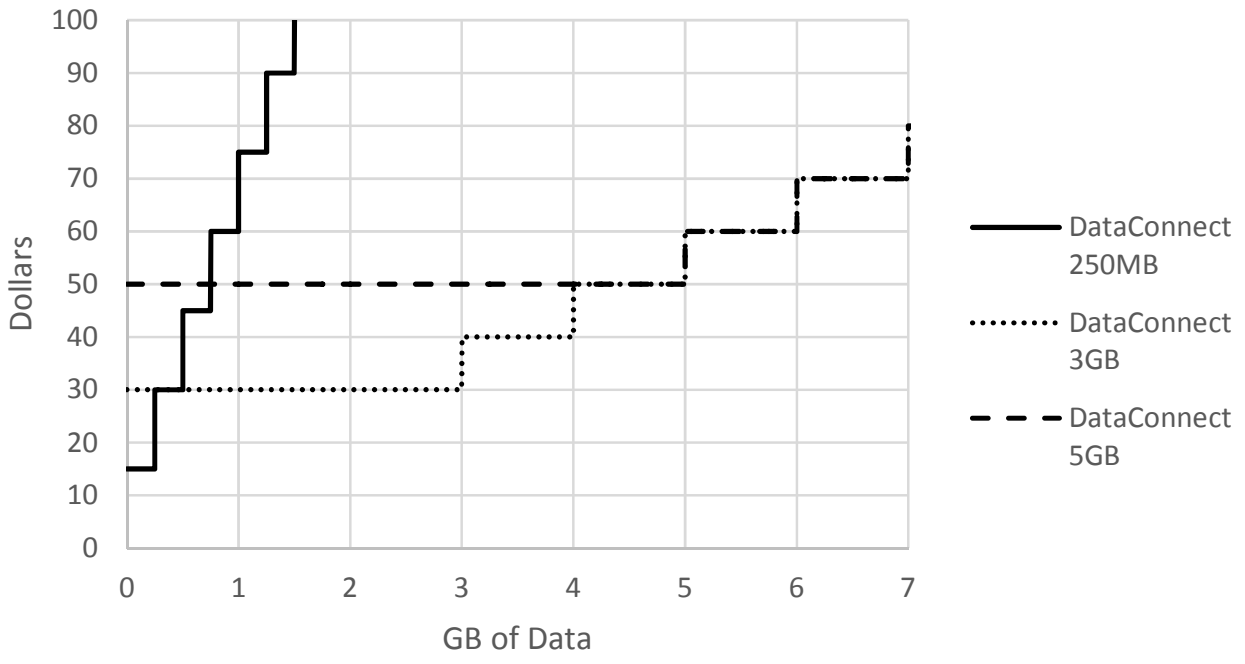

Figure 2: A more transparent presentation of AT&T's iPad data plans from November 25th, 2014 than that which was available on AT&T's website (AT&T, 2014).

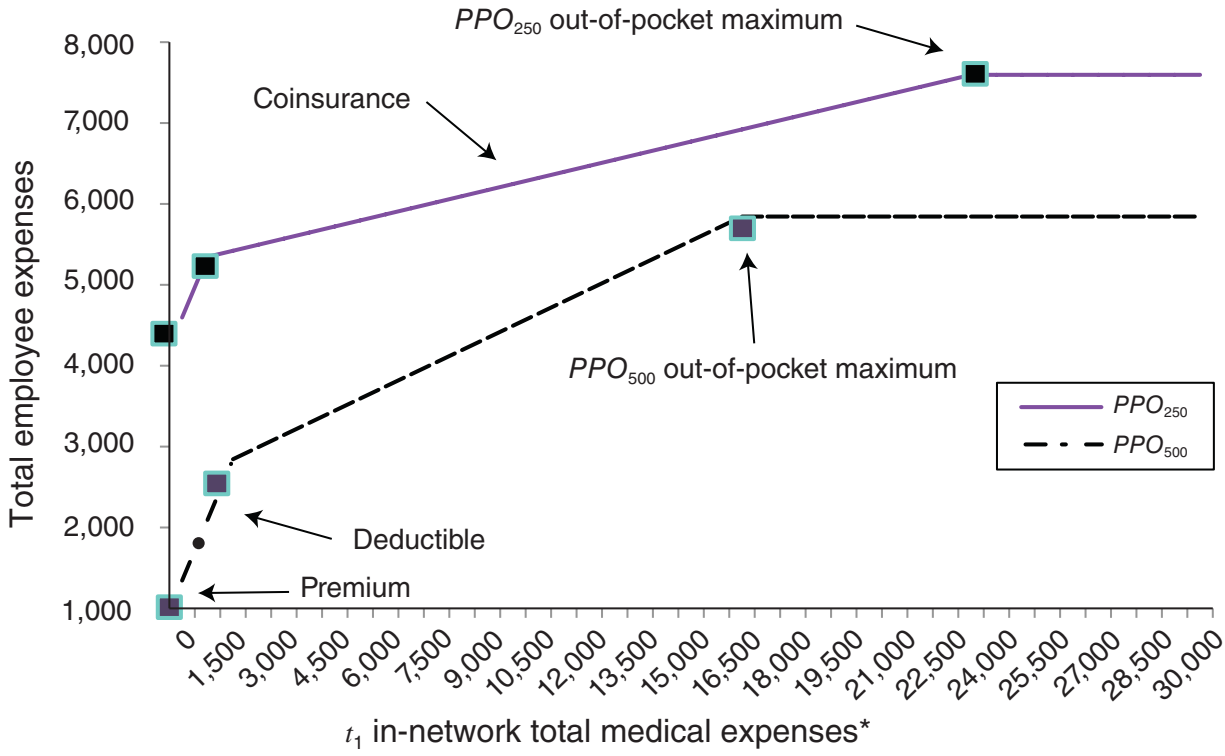

Figure 3: Reproduced from Handel's (2013) Figure 1 Panel B. Employee out-of-pocket costs for a low-income family as a function of total medical expenses for the PPO_{250} and PPO_{500} health plans in the year Handel (2013) labels "t_1".

find out that one plan dominated another would have been to plot each plan's cost as a function of medical expenditure using a spreadsheet, as in Figure 3 reproduced from Handel (2013, Figure 1 panel B). It is unlikely that many employees thought of doing this, as even the human resources department in charge of health insurance benefits had not done so and was unaware that they were offering employees a dominated option (Handel, 2013).

Other evidence of consumers making dominated choices comes from survey evidence. Wilson and Waddams Price (2010) analyze two surveys of UK households about electricity tariff choice. Electricity is the same no matter the retail provider. Consistent with this fact, among those who report switching power companies, 77 to 86 percent report switching for a "cheaper" rate or for "better prices/rates". However, prices are complex, including a fixed fee, initial marginal rate, and sometimes a threshold and subsequent marginal rate. Perhaps as a result, within the group of consumers switching to lower their rates, Wilson and Waddams Price (2010) find that 6–12% switch to a tariff that is dominated by their original choice.[10]

[10]Figures are computed by multiplying Table 3 row 11 by Table A7 row 5. Naturally, a larger fraction (19–31%)

3.3 Models of Price Confusion and Price Obfuscation

Above I have argued that complex price vectors can be difficult for consumers to compare. A natural way to model choice when consumers find price comparison difficult is to assume that consumers observe prices with noise. Importantly, firms choose not only price levels but the complexity of their own prices. Thus firms may intentionally obfuscate their prices, making them more complex and less transparent simply to make it harder for consumers to comparison shop. It is therefore interesting to ask what obfuscation firms will undertake in equilibrium and how this will affect market outcomes. Below I first discuss models of equilibrium pricing when firms choose only prices and consumers observe them with noise. Then I turn to models in which firms choose both prices and price frames in order to influence the comparability of prices.

Noisy price evaluation: A natural explanation for why consumers might choose the higher of two considered prices for the same good is that they observe prices with noise, leading to confusion about their ranking. If the noise in evaluating price is exogenous to firm or consumer choices, a natural starting point to modeling demand is with a stochastic choice interpretation of a random utility model, such as Luce's (1959) interpretation of the multinomial logit model. Similarly, a spatial model could be reinterpreted with transportation costs to firms capturing (relative) overestimation in prices.[11] In this case random "utility" shocks capture noise in price evaluations but do not enter welfare calculations. The resulting consumer confusion artificially differentiates identical products and supports positive markups.

Standard random utility models, such as the multinomial logit, assume distributions that imply consumers are more likely to misrank two prices if they are close together, and that the likelihood of a mistake will decline continuously as two prices diverge. Some researchers have proposed a sharper distinction, that consumers can perfectly distinguish prices that are *significantly* different but choose randomly between *similar* prices. Shilony (1977) characterizes equilibrium in such a model where prices are deemed similar if they differ by less than a constant d.[12] This formulation leads to a mixed strategy equilibrium, but otherwise the same conclusion that consumer confusion about price rankings supports positive markups. Others take the same approach at the individual level but assume that the threshold for two prices to be similar varies continuously across consumers,

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switch to tariffs that raise their bills without necessarily being dominated.

[11] For a reference on stochastic choice, random utility, and spatial models see Anderson et al. (1992).

[12] Given two firms, the model is equivalent to a Hotelling line duopoly in which 1/2 of customers are jointly located with each firm at either end of the line. Bachi (2014) extends the analysis to more general definitions of similarity, including ratio similarity, which says two prices are similar if neither is more than d% larger than the other.

yielding pure strategy equilibria (Allen and Thisse, 1992).

Consumer confusion about price rankings is likely endogenous to both consumers' investigation of prices and firms' countervailing efforts at obfuscation. In this respect, adapting product differentiation models to capture confusion omits two important issues. Matějka and McKay (2015) address the first endogeneity issue. They model consumer demand in a discrete choice model when consumers optimally choose how much information to gather about options, using the rational inattention framework due to Sims (2003). In particular, Matějka and McKay (2015) assume that the cost of information is proportional to the expected decrease in entropy between prior and posterior beliefs. They show that the resulting choice probabilties are described by a generalized logit model, where the probability of choosing good i from $\{1, ..., N\}$ is:

$$\frac{e^{(\alpha_i + v_i - p_i)/\lambda}}{\sum_{j=1}^{N} e^{(\alpha_j + v_j - p_j)/\lambda}}.$$

This reflects the standard logit formula, where the average utility of purchasing good i, its value v_i less its price p_i, is adjusted by the term α_i to account for prior optimism about good i, and λ is the marginal cost of attention. When all goods are indistinguishable ex ante, the α_i terms drop out and the standard logit choice probabilities apply. When consumers are a priori more optimistic about low prices at some firms than others, however, the α_i terms matter and the model predictions cannot be matched by any random utility model. For instance, Matějka and McKay (2015) show that adding an option can increase the likelihood that an existing option is selected because the additional option increases the returns to evaluating existing options in comparison.

Matějka and McKay (2012) characterize oligopoly pricing using Matějka and McKay's (2015) framework. One might anticipate a result similar to Diamond's (1971), in which firms all charge the monopoly price and consumers do not invest attention in learning prices because they are all the same. Matějka and McKay (2012) avoid this, however, by assuming that firm costs are stochastic, resulting in noisy prices in equilibrium, and hence positive returns to attention. Rather than monopoly pricing, they predict positive markups that decline smoothly to zero as the cost of attention declines to zero. Their most interesting results are those in which goods may be of low or high quality, consumers have heterogeneous costs of attention, and firms are indistinguishable ex ante.[13] In that case, low quality may be associated with high prices because those who overlook low quality due to high costs of attention are likely to overlook high pricing as well.

A possible future course for this research would be to consider firms investing in obfuscation

[13]In that case, choice probabilities correspond to those of "a random utility model with tastes distributed according to a mixture of different extreme value distributions" (Matějka and McKay, 2012).

that raises the cost of attention and hence increases the noise with which prices are evaluated. This would be in the same spirit as Ellison and Wolitzky's (2012) work. Recent work that addresses the second endogeneity issue, firms' efforts to confuse consumer price comparisons, has taken a more structural approach, which I discuss in the next section.[14]

Obfuscation: The first step in modeling firms' incentives to obfuscate is to model how consumers make choices from a set of complex options. Unboundedly rational consumers can take any quoted contractual terms, calculate their expected costs, and easily choose the lowest cost option among homogeneous products. Real consumers, however, often cannot compute expected costs from quoted price vectors. For instance, the typical social security investor in Mexico appears to lack the required financial literacy to compute annual expected costs from quoted balance and flow fees (Hastings and Tejeda-Ashton, 2008).[15] Among two options, when one fund has a low balance fee but the other has a low flow fee, being unable to compute expected annual costs is a substantial barrier to choosing the cheaper option.

Spiegler (2006a) suggests that consumers may cope with the complexity of multi-dimensional price vectors by randomly selecting one dimension of price to compare and choosing the option with the lowest price on that dimension. In this case, firms have an incentive to price low on some dimensions to attract customers but to price high on other dimensions to profit from them. Spiegler (2006a) interprets such variance in pricing across dimensions as a form of obfuscation. He shows that increasing the number of competitors does not reduce equilibrium prices, but rather causes firms to obfuscate more by increasing the variance of prices across dimensions.

Returning to Mexican social security, suppose that two investment funds differ on only a single dimension, the flow fee, and charge the same price on the other dimension, the balance fee. In this case, Spiegler's (2006a) consumers will still make the wrong choice 25% of the time, as they ignore the flow fee half the time and end up choosing randomly. However, it seems reasonable to expect consumers to be more sophisticated, and recognise that if balance fees are identical then funds should be compared on flow fees. This allows consumers to identify the cheaper option without

[14] A reduced form exception is Carlin (2009), which like Varian (1980), assumes that consumers are either informed and choose the lowest price or are uninformed and choose randomly. Unlike Varian (1980), Carlin (2009) assumes that the fraction of uninformed consumers is increasing in each firm i's prior choice of a scalar k_i, interpreted as complexity. By increasing the number of consumers who choose randomly, complexity in Carlin's (2009) model can be interpreted as increasing either search costs or price confusion. In contrast to the model I suggest, in which complexity of firm i's price increases the noise with which it is evaluated, Carlin's (2009) model assumes that if firm 1 makes its price more complex, it directly reduces the number of consumers who can compare prices between firms 2 and 3. Gu and Wenzel (2014) analyze a duopoly version of Carlin's (2009) model with asymmetric firms.

[15] Flow fees are charged as a percent of income rather than contributions. As contributions are 6.5% of income, the equivalent load fee is $1/0.065 \approx 15$ times the flow fee.

any calculation. The idea that consumers should make better choices when prices are more easily comparable forms the basis for three recent papers about obfuscation (Piccione and Spiegler, 2012; Chioveanu and Zhou, 2013; Bachi and Spiegler, 2014).

Bachi and Spiegler (2014) model duopolists that each choose two attributes of their respective products when competing. Of particular interest is the special case of partitioned pricing competition, in which each firm chooses two dimensions of price, p_1 and p_2, that sum to the total price of its product, $p_{total} = p_1 + p_2$. When neither firm's price is lowest on both dimensions, Bachi and Spiegler (2014) say that the consumer faces a *difficult choice*, one that requires making a tradeoff between the two dimensions of price. The consumer either avoids a difficult choice by selecting a default option, or as in Spiegler (2006a), chooses by comparing prices only on one randomly selected dimension. However, unlike in Spiegler (2006a), when one firm's price is lowest on both dimensions, the consumer faces an *easy choice* and successfully selects the lower price. In equilibrium, firms randomize over prices and make positive profits. Moreover, when the default option is not buying, consumers sometimes do not buy even though it is the worst option, simply to avoid a difficult decision.

Piccione and Spiegler (2012) take a different approach by assuming that each of two firms simultaneously chooses both a scalar price and a price format or frame. A consumer who can compare the two firms' offers chooses the lowest price. A consumer who is confused and cannot compare the two firms' offers chooses randomly. A primitive of the model is the *comparability structure*, which specifies the fraction of consumers $\pi(x, y)$ who find any two frames x and y comparable. If firms choose the same frame, then most or all consumers can compare prices and choose the lowest price. When firms choose different frames however, more consumers will be confused and choose randomly.[16] Chioveanu and Zhou (2013) adopts a similar but more restricted model of frames and extends the analysis to more than two firms.

The price frames modeled by Piccione and Spiegler (2012) and Chioveanu and Zhou (2013) are abstract, so can be applied flexibly in a variety of contexts. For instance, "\$5 per 8 oz" is the same price as "\$10 per pound", but the two different units of measurement could correspond to different frames. Similarly, "\$9.99 free shipping" and "\$1.99 plus \$7 shipping & handling" reflect the same total price of \$9.99, but the different shipping charges could correspond to different frames. An

[16]Piccione and Spiegler's (2012) model can be reinterpreted as a spatial competition model where (1) frames correspond to locations, (2) each consumer i can costlessly travel a maximum distance d_i but no further, (3) consumers' maximum travel distances, d_i, are uniformly distributed on $[0, 1]$, and (4) travel distance between locations are given by the comparability structure. The key difference from a standard spatial competition model is that consumer locations are not exogenous to firm location choices. Rather 1/2 of consumers co-locate with each firm, wherever firms choose to locate. Piccione and Spiegler's (2012) model is generalized by Spiegler (2014).

important limitation on what can be interpreted as a frame, however, is that frames are independent of prices. (This is true in the second example because total price is independent of the shipping charge.)

Piccione and Spiegler (2012) and Chioveanu and Zhou (2013) both show that in equilibrium firms mix over both prices and price frames, and the resulting consumer confusion sustains positive profits.[17] The authors investigate whether interventions to increase transparency (Piccione and Spiegler, 2012; Chioveanu and Zhou, 2013) or increase the number of competitors (Chioveanu and Zhou, 2013) will reduce firm profits to consumers' benefit. When all price frames are equally comparable (meaning that the fraction of consumers confused by cross-frame price comparisons is the same for any two distinct frames)[18] the answer is yes. Price competition is softest when firms can all find their own price frames and the fraction of consumers who become confused comparing different price frames is large. Reducing the number of frames per firm, either by increasing the number of firms or reducing the number of available frames, crowds firms into the same frames making direct price comparisons easier and stiffening competition (Chioveanu and Zhou, 2013). Moreover, making frames more comparable and reducing the number of consumers who become confused by cross-frame comparisons also stiffens competition directly (Piccione and Spiegler, 2012; Chioveanu and Zhou, 2013).

Piccione and Spiegler's (2012) model allows some frames to be inherently more complex than others. If more consumers can compare prices across frames x and z than can compare prices across frames y and z ($\pi(x,z) > \pi(y,z)$), then we may interpret x and z as more similar frames than y and z. Moreover, if x is more similar to z than y is to z for any z ($\pi(x,z) > \pi(y,z)$ for all z), we may interpret y as inherently more complex than x. When some frames are more complex than others, increased numbers of competitors or increased transparency may raise firm profits. For instance, while additional entry may crowd firms together in the same frames more often, firms may shift towards more complex frames to compensate, and soften competition as a result (Chioveanu and Zhou, 2013). Similarly, reducing the number of simple frames (Chioveanu and Zhou, 2013)

[17]These results are not surprising in light of the literature on spatial competition. It is well known in models of spatial competition that firms will differentiate to soften price competition and raise profits, and that when locations and prices are chosen simultaneously equilibrium must be in mixed strategies (Anderson et al., 1992). Moreover, we may re-interpret spatial competition models as models of competition with framing effects by reinterpreting random utility shocks or travel costs as utility irrelevant decision errors. Much of this literature, however, focuses on the case in which prices are chosen after frames (Anderson et al., 1992; Eiselt, Laporte and Thisse, 1993). While appropriate for the original applications of these models, this assumption seems less realistic when a location is reinterpreted as a price frame.

[18]In Piccione and Spiegler's (2012) model this assumption is a sufficient condition for the comparability structure to be *weighted regular*. In Chioveanu and Zhou's (2013) model this assumption corresponds to $\alpha_2 = 0$. See each paper for more general results.

or increasing the comparability of simple frames (Piccione and Spiegler, 2012) may cause firms to shift towards more complex frames, and soften competition as a result.

For additional reading about the obfuscation models discussed above and other related research see Spiegler's (Forthcoming) survey, which is a valuable guide.

3.4 Application: Mexico's Private Social Security Market

I now turn to a case study of Mexico's privatized social security market. The case study serves two purposes: First, it provides more evidence for the importance of price confusion. Second, it is a useful setting for thinking about the implications of the models of price confusion and obfuscation described in the previous section, and comparing them to models of consumer biases, such as overconfidence, that lead to systematic misweighting of different price dimensions.

Mexican social security—evidence of investor confusion: A sequence of three empirical papers about the privatized social security market in Mexico by Justine Hastings and co-authors (Hastings and Tejeda-Ashton, 2008; Duarte and Hastings, 2012; Hastings et al., 2013) clearly illuminate how consumers fail to choose the best-priced retirement fund. Mexico launched its privatized social security system in 1997. All individuals employed in the formal labor market are required to contribute 6.5% of income and must choose a regulator-approved firm, called an Afore, to manage their accounts. Since 1997, there have always been at least 17 Afores, all of which are well-known and reputable consumer finance brands in Mexico. Regulation dictates asset allocations according to age so that, objectively, all account-management firms offer the same homogeneous product.[19] Prices differ across firms, but each firm must charge the same price to all its own investors. Prices have two components, a load fee on contributions (expressed as a flow fee on income) and an annual fee on balances (Hastings et al., 2013).

Regulators clearly hoped that Mexico's social security market design would lead to fierce price competition and low management fees near cost. Unfortunately for Mexican investors, this hope was not fulfilled. A year after launch, the average (asset-weighted) load on contributions was 23% and the average asset-weighted annual balance fee was 0.63% (Hastings et al., 2013). Hastings et al. (2013) report that "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%."

[19] In 1997 assets were primarily Mexican government bonds (Hastings et al., 2013).

Why did the market for an objectively homogeneous product with 17 competing firms produce high margins, profits, and prices? The short answer is that it is because demand was not price sensitive. However, this only begs the question, why were investors insensitive to prices? Duarte and Hastings (2012) convincingly show that part of the reason is that investors are unable to rank prices from low to high due to their complexity.

Ranking Afore prices is not easy. It requires appropriately weighting the flow fee (a percentage of income) and balance fee. Under the (heroic) assumption that an investor consider switching Afores every year t, an investor i should respond to the current total annual fee of Afore j,

$$P_{ijt}^{total} = Balance_{it} P_{jt}^{balance} + Income_{it} P_{jt}^{flow},$$

which is a function of the investor's account balance and income and the Afore's balance fee ($P_{jt}^{balance}$) and flow fee (P_{jt}^{flow}). Compared to determining which retailer has cheaper gasoline, this is a challenging math problem. Moreover, under the more realistic assumption of no future switching, Duarte and Hastings (2012) suggest the right calculation is much more complex — it is the expected present discounted value of fees, $\sum_t \delta^t E[P_{ijt}^{total}]$, taking expectations over future income and fund returns. Perhaps not surprisingly, Duarte and Hastings (2012) find that investors are insensitive to this cost measure when switching between Afores.

To aid investors, in July 2005, the market regulator CONSAR created a fee index summarizing balance and flow fees in a single number and required a comparative table of the index be displayed on all account statements. Importantly, the index was not customized to each individual's financial situation, and as a result could not appropriately rank Afores for all investors. In fact, it overweighted flow fees relative to balance fees for the typical investor. Despite this limitation, Duarte and Hastings (2012) find that investors responded strongly to the publicized index, even when switching to an Afore with a lower index actually meant paying higher fees. Firms responded by lowering flow fees and increasing balance fees to lower their fee indexes dramatically without reducing total expected fees very much. Ultimately the introduction of the fee index was only marginally successful at lowering fees paid, which fell by 13.5%, and had the unfortunate consequence of raising average fees paid by low-income investors more than 40% (Duarte and Hastings, 2012, Table XII).

The fact that investors switching Afores are insensitive to their true costs could reflect large imagined quality differences between the objectively homogeneous products (as in the case of headache remedies). However, the fact that investors responded strongly to CONSAR's published fee index, even when doing so raised their fees, implies that part of the price insensitivity reflects

a lack of understanding of prices.[20] It implies that if investors could tell which Afore was cheaper, they would often choose it, but complexity of prices is a barrier to doing so. Consistent with this finding, Hastings and Tejeda-Ashton's (2008) survey shows that investors' price sensitivity is strongly correlated with their financial literacy, and that the financially illiterate are much more responsive to fees when expressed in pesos than percentages. Finally, Hastings et al. (2013) find that firms' large advertising and sales expenditures exacerbate the problem by focusing investors on brand, which market design should make irrelevant, rather than prices.

Mexican social security—connecting to the theory: How might models discussed in Section 3.3 apply to pricing choices in Mexico's social security market? None of the models is a perfect fit to the setting because none models N firms that each choose two-dimensional prices (a notable hole in the literature). Nevertheless, the models do provide useful insight into observed outcomes.

Were there only two Afores, Bachi and Spiegler's (2014) model would fit the setting well and would yield sharp testable predictions. In particular, if there is no outside option, Bachi and Spiegler (2014) predict that observed balance fees should be a strictly decreasing function of observed flow fees. In other words there should be no easy choices. Mexican social security investors have no outside option, as they must choose one of the Afores. However, Figure 4 shows that Bachi and Spiegler's (2014) prediction for duopolies clearly fails in the Mexican social security market in June 2005. Rather than all lying on a strictly decreasing curve, some Afore's prices dominate others on both dimensions. For instance, Banorte Generali and several other Afores offer both lower balance fees and lower flow fees than either Santander or Profuturo GNP.

I suspect that the mismatch between model predictions and observed prices is due (at least in part) to the duopoly assumption. Bachi and Spiegler (2014) predict that we will observe dominated prices, like those of Santander, Profuturo GNP, and other Afores, when they include an outside option in the model. Since a third firm could act as an outside option relative to the other two firms, I suspect that dominated prices would also occur in markets with $N \geq 3$ firms but no outside option. (It is not entirely clear how the consumer choice rule should be extended to allow for more firms, but it is an interesting avenue for future work.)

Turning next to Piccione and Spiegler's (2012) or Chioveanu and Zhou's (2013) models, one interpretation to fit the Mexican social security market would be to identify a price frame with the flow fee. Firms that choose the same flow fee thereby chose the same frame, as consumers can rank their offers simply by comparing balance fees. In contrast, firms that choose different flow fees

[20] Possibly also a lack of awareness of prices. Unfortunately, Hastings and Tejeda-Ashton (2008), Duarte and Hastings (2012), and Hastings et al. (2013) do not discuss to what extent results may be due to search costs.

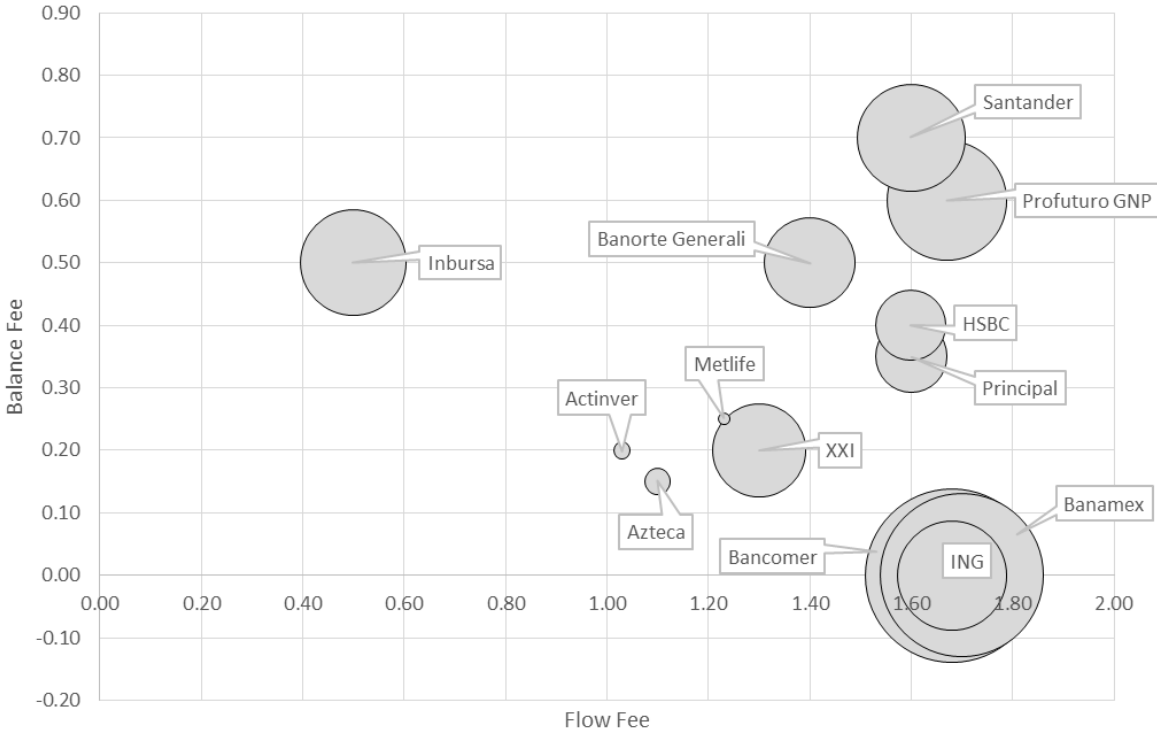

Figure 4: Balance and flow fees of Mexico's Afores in June 2005. Circle sizes are proportional to market share of invested assets. Source: Duarte and Hastings (2012) Table II.

thereby choose different frames and confuse some consumers. Unfortunately, this ignores the fact that offers with equal balance fees should be as easily comparable as offers with equal flow fees. Also, strictly speaking, this is an incorrect application of either model because they assume that prices are scalars and independent of frames.[21]

Ignoring the mismatches between the models and the application, results in Piccione and Spiegler (2012), Chioveanu and Zhou (2013), and Bachi and Spiegler (2014), can all help explain the high fees and high fee dispersion observed in the Mexican social security market. Moreover, they suggest that if the regulator eliminated flow fees (or alternatively balance fees), thereby reducing competition to a single price frame (Piccione and Spiegler, 2012; Chioveanu and Zhou, 2013) or to easy choices (Bachi and Spiegler, 2014), competition would stiffen and investors would benefit.[22]

[21]Both models are compatible with simple partition pricing. Suppose firms choose a product price p_1 and an unavoidable shipping charge p_2 that sum to the total price $p_{total} = p_1 + p_2$. Either model can be applied by equating the frame with the shipping charge, and the model's scalar price with the total price, which is independent of the shipping charge. In the Mexican social security context, however, price cannot be reduced to a scalar "total price" because investors have heterogeneous balances and incomes, and hence should place different weights on balance and flow fees. Thus the price is neither a scalar nor independent of the frame.

[22]With a zero balance fee, those who accrue formal sector earnings early in life would cross-subsidize those who

The prediction that reducing price to a scalar by eliminating either flow fees or balance fees would lower markups is consistent with several findings described above. First, the prediction is consistent with Duarte and Hastings' (2012) finding that consumers are highly sensitive to CONSAR's fee index when it is introduced, even when switching to lower the index actually raises an investor's costs. It implies that if investors could tell which Afore was cheaper, they would often choose it, but complexity of prices is a barrier to doing so. Reducing price to a scalar could be the solution. Second, the prediction is consistent with Woodward and Hall's (2012) finding that borrowers who shop for no-cost mortgages pay lower markups than those who consider all options. Third, the prediction is consistent with Duarte and Hastings' (2012) finding that introduction of CONSAR's one-dimensional fee index reduced average total fees by 13.5%.

A caveat to the preceding list of supportive evidence is that the 13.5% fee reduction documented by Duarte and Hastings (2012) can also be viewed as evidence against the models discussed in Section 3.3 because fees remain very high even after the 13.5% reduction. In other words, it remains somewhat puzzling why CONSAR's fee index did not lower markups more dramatically. A simplistic answer is that the fee index did not work better because it didn't accurately rank Afores by cost and could mislead investors to switch to a more expensive Afore. While this may have been part of the problem, we should not jump to the conclusion that CONSAR's index formula was to blame before recognising that a flawed index could in theory be as successful as an unflawed index.

To explain why an inaccurate fee index could in theory successfully spur competition as much as an accurate fee index, it is worth drawing attention to the fundamental difference between models of price confusion in Section 3.3 and models of biases, such as overconfidence, that lead to systematic misweighting of different elements of price. Both types of models assume that consumers misjudge prices and fail to choose the best price. The important difference between the two types of models is that, conditional on overcoming inertia and making an active choice, the mistakes due to confusion modeled in Section 3.3 are noisy and uncorrelated across consumers, while those due to systematic misweighting of price dimensions are the same across consumers. The noise in decisions modeled in Section 3.3 is akin to artificial product differentiation — it creates market power. In contrast, biases such as overconfidence, which cause consumers to systematically misweight dimensions of product price, do not create market power. They give firms incentives to distort price vectors in particular ways, but in a market with a constant pass-through rate of 1, no change in total markups results (Grubb, 2015b).[23] For instance, Grubb (2015a) shows that if inattentive consumers

accrue them late in life. With a zero flow fee the direction of the cross-subsidy would be reversed. Which fee is set to zero could affect the level of competition.

[23]The market pass-through rate measures the fraction of an infinitesimal increase in marginal cost that is passed

are overconfident about their own levels of attention then firms will charge surprise penalty fees. However, in a market with a pass-through rate of 1, firms compete away penalty fee revenues through lower fixed fees and overall markups are not affected by consumer overconfidence.[24]

In theory, CONSAR's fee index could have shifted market demand from fitting a Section 3.3 style model of consumer confusion to fitting a model in which consumer bias causes systematic misweighting of different fees, similar to one surveyed by Grubb (2015b). Prior to introduction of the fee index, the Piccione and Spiegler (2012), Chioveanu and Zhou (2013), and Bachi and Spiegler (2014) models capture many features of the market. If all investors chose an Afore based on CONSAR's fee index, however, a model with misweighting of fees would fit — investors would be all biased to overweight flow fees according to CONSAR's formula. Then firms should respond by inflating balance fees and cutting flow fees, as they in fact did (Duarte and Hastings, 2012). Moreover, without other frictions aside from price complexity, they should compete average total fees down to marginal cost, thereby substantially lowering markups. The fact that this did not occur likely reflects a combination of two factors. First, not everyone responded to the fee index. In fact, among investors switching Afores, the 75^{th} percentile investor switched to an Afore with a higher flow fee, a higher balance fee, and a higher fee index. Second, investor inertia likely reduced the incentives for Afores with large market shares to compete on price: Only 10% of investors switch per year and those no longer making contributions "effectively do not switch" (Duarte and Hastings, 2012). Although CONSAR's formula may have contributed to the limited success of its fee index, the formula alone cannot be solely to blame.

3.5 Differentiated product markets

Evidence described in Sections 3.2 and 3.4 suggests that consumers find price comparisons challenging if prices are vectors rather than scalars. This naturally begs the question of what happens in a market for vertically differentiated products, where unboundedly rational product comparisons are always over vectors that include both quality and price. One possibility is that when faced with comparing products with many price and quality attributes, consumers focus on just a few and ignore the rest. If the attributes consumers choose to focus on are random, this could be

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on to consumers in higher prices. The pass-through rate is equal to 1 in a perfectly competitive market with perfectly elastic supply.

[24]It is possible for overconfidence or other systematic biases to raise equilibrium markups. Overconfidence increases markups, for instance, if the market pass-through rate is less than 1 (Grubb, 2015b). Alternatively, if only some consumers are overconfident, and these are less price sensitive than the unbiased, then an adverse selection problem arises for firms and softens competition (Grubb, 2015a). It is not clear whether either of these two mechanisms might help explain why prices remain high after CONSAR's fee index was introduced.

captured by a variation of Spiegler's (2006a) model. We should expect quality and price dispersion and positive profits. Alternatively, if all consumers focus on the same attributes, then behavior will be the same as if consumers had biased beliefs about which attributes are important.[25] Firms will overinvest on those attributes that capture consumers' attention, but positive profits need not result. For instance, if everyone focuses on price, we should expect minimal quality in equilibrium and low prices. (Noting that having a high add-on price is akin to having a low quality, this is related to the case studied by Gabaix and Laibson (2006) in which some consumers focus on a base price but ignore an add-on price.)

Bordalo, Gennaioli and Shleifer (2014) assume that consumers focus more on some product attributes than others. However, unlike many models (such as Spiegler (2006a) or Gabaix and Laibson (2006)), they do not impose the direction of consumer focus exogenously. Rather, Bordalo et al. (2014) assume that consumers are *salient thinkers* (Bordalo, Gennaioli and Shleifer, 2013), and overweight product attributes that are salient because they vary a lot within the choice set.[26] In particular, suppose that two firms initially offer identical qualities and prices. Then price and quality would be equally salient and correctly weighted. However, Bordalo et al. (2014) assume that if one firm cuts quality by 10% and price by 15%, it would cause price to become salient because the price cut is larger in relative terms. Alternatively, if one firm raised quality by 10% and price by 5%, it would cause quality to become salient because the quality increase is larger in relative terms. Firms have an incentive to choose prices and qualities that make their product's most attractive attribute salient. As a result, Bordalo et al. (2014) show that quality may be over or under provided in equilibrium.

4 Inertia

Consumers demonstrate substantial inertia. This means that they tend to choose the same option they chose previously, even if prices and attributes have changed so that they would no longer make that choice if making it for the first time. (See Farrell and Klemperer (2007) Section 2.2 for a brief survey of evidence.)

For instance, Handel (2013) studies health insurance plan choice at a large employer. Comparing health plan choices between the cohort of workers who join the firm in year t_0 with those of the

[25] In this case outcomes will be similar to those in many other models of biased beliefs, such as those surveyed by Grubb (2015b) that fall under the umbrella of overconfidence.

[26] Kőszegi and Szeidl (2013) develop a related model of endogenous focus but apply it to analyze individual choice behavior rather than equilibrium firm pricing. Spiegler (2014) presents an example that endogenizes salience quite differently. He assumes that firms determine salience of an attribute by the weight it is given in marketing messages.

cohort who join the firm in the following year t_1 shows substantial inertia. Handel (2013) finds that 21% of new employees in year t_0 choose the health plan PPO_{250} when they join the firm, but due to a price increase the following year, only 11% of new employees in year t_1 make the same choice when they join the firm. If there were no inertia, we would expect half of the cohort t_0 employees who chose PPO_{250} in year t_0 to switch away to another plan in year t_1, so that health plan choice shares are the same across cohorts in year t_1. Instead, very few employees switch plans, so that 20% of cohort t_0 workers remain on PPO_{250} in year t_1 despite its price increase. This lack of switching reflects inertia. It may also be viewed as a *default effect*, where last year's choice is the default option for existing employees. DellaVigna (2009, p.322) surveys additional evidence for default effects, arguing that "Overall, the finding of large default effects is one of the most robust results in the applied economics literature of the last ten years."

Much of the empirical literature on inertia focuses on separately identifying inertia from unobserved preference heterogeneity, which is a substantial challenge. Handel (2013) is able to overcome this challenge convincingly because his data combines both a substantial change in consumers' choice set and observation of choices by both new and existing consumers. Shum (2004); Dubé, Hitsch and Rossi (2009, 2010); Osborne (2011); Crawford, Tosini and Waehrer (2011); Goettler and Clay (2011); Sudhir and Yang (2014); Ho, Hogan and Scott Morton (2015); and Grubb and Osborne (2015) are examples of other recent papers that identify inertia in choice of breakfast cereal, orange juice, laundry detergent, land-line telephone plan, grocery delivery plan, rental car, Medicare Part D plan, and cellular-service plan.

The prevailing view is that inertia raises equilibrium prices (Farrell and Klemperer, 2007). Consistent with this view, switching costs have been shown to raise prices for commercial (Viard, 2007) and consumer (Shi, Chiang and Rhee, 2006; Park, 2011) telecommunications services as well as credit cards (Stango, 2002). In some cases, the effects are estimated to be substantial. For instance, Ho et al. (2015, Table 12) predict that inertia was responsible for inflated premiums and, as a result, 14% of Medicare Part D enrollees' out-of-pocket costs between 2007 and 2009. Nevertheless, the view that inertia increases prices is not universally shared (Dubé et al., 2009).

Identifying the source of inertia is important for understanding what policies might reduce it. There are very few papers, however, that empirically distinguish between various sources of inertia, and fewer still that identify behavioral sources of inertia. Search costs and switching costs are the two primary rational explanations of inertia (Farrell and Klemperer, 2007).[27] Typically, empirical models include either a switching cost or a search cost to capture inertia, but not both, leading

[27]Osborne (2011) separately identifies switching costs from learning, which is an additional source of inertia for rational consumers choosing between untested and possibly differentiated experience goods.

to overestimation of the included cost (Wilson, 2012). Exceptions include two recent papers that utilize rich data[28] to separately identify search costs from switching costs, finding that search costs are both larger and more important sources of inertia than switching costs in the US auto-insurance market (Honka, 2014) and the Chilean pension-fund-administrator market (Luco, 2014).

Beyond search costs and switching costs, there are also several potential behavioral sources of inertia. These affect each stage of choice, including product search, price comparison, and switching:

1. **Search:** Consumers' bounded rationality may inflate search costs or lower (perceived) returns to search, as discussed in Section 2.

2. **Price comparison:** Consumer confusion when comparing complex prices may cause inertia. Several models discussed in Section 3 assume that consumers who cannot compare prices choose randomly between options (Shilony, 1977; Allen and Thisse, 1992; Bachi, 2014; Piccione and Spiegler, 2012; Chioveanu and Zhou, 2013; Bachi and Spiegler, 2014). A natural dynamic interpretation of these static models is that the confused consumers do not choose randomly, but rather avoid making an active choice by keeping the default option and not switching.[29] The dispersed choices of confused consumers then reflect existing firm market shares rather than randomization. This interpretation is consistent with the *choice overload* hypothesis, that complexity of choice (as measured by the number of options) reduces motivation to make any choice (Scheibehenne, Greifeneder and Todd, 2010; Iyengar and Kamenica, 2010).

3. **Switching:** The switching cost literature recognizes that switching costs may be psychological. For instance, loss aversion might create attachment to a previously chosen product similar to an endowment effect (Ericson and Fuster, 2011), and consumers may become psychologically attached to brands (Dubé et al., 2009, 2010).

Finally, each stage of choice, including product search, price comparison, and switching, requires a consumer to take action. This may be impeded by inattention, failures in prospective memory, and procrastination (Sitzia, Zheng and Zizzo, Forthcoming; Holman and Zaidi, 2010; Ericson, 2014b). Procrastination is likely to be a problem for naive present-biased individuals because switching

[28]Honka (2014) observes individual level data about both the firms searched and switching decisions. Luco (2014) observes not only new and current investors, but also lapsed investors. Importantly, whereas current investors avoid both search and switching costs by keeping their current fund administrator, lapsed investors can only avoid search costs because they must fill out paper work even if they do not switch.

[29]This is Piccione and Spiegler's (2012) primary interpretation.

typically involves paying an up-front cost for a future stream of benefits (O'Donoghue and Rabin, 1999; DellaVigna, 2009).

Isolating how important the preceding behavioral factors are in the field remains a largely unaddressed challenge. There are at least two notable exceptions, however. First, Kiss (2014) estimates that inattention to an annual switching opportunity by 70% of policy holders is an important source of inertia in the Hungarian auto-insurance market. Kiss (2014) argues that this is identified by exogenous variation across policy holders in exposure to a non-informative but salience raising advertising campaign. (He estimates that the campaign raises the likelihood exposed consumers consider switching from 30% to 53%.) Importantly, by "inattention" Kiss (2014) does not mean a rational choice to avoid search costs, but rather lack of consideration of the switching opportunity altogether.[30] Second, Madeira (2015) shows that procrastination is a likely source of some inertia in the Medicare Part D market. Madeira (2015) finds that eliminating the open enrollment deadline for high-quality plans leads fewer people to switch to these plans. This is unlikely to be because individuals can wait to switch until they become sick because average costs of those who do enroll in the high-quality plans does not increase. It is consistent, however, with the fact that naive β–δ discounters can procrastinate indefinitely when deadlines are removed (O'Donoghue and Rabin, 1999).

In contrast to the preceding papers, Handel (2013) is unable to separately identify different sources of inertia, and instead captures all inertia with a financial switching cost that he estimates to be about $2,000 for the average family. On the one hand, the estimate must be on this order of magnitude to explain why some employees kept the PPO_{250} health plan after it became strictly dominated by $1,000 or more (Figure 3). On the other hand, $2,000 is implausibly high to be the cost of filling out open enrollment paperwork to switch health plans. The natural inference to make is that sources of inertia other than switching costs were important. Such a conclusion is not uncommon in the literature. In some cases, it is coupled with a strong suspicion that behavioral factors must play a role, such as with inertia in 401(k) savings choices (Madrian and Shea, 2001). In other cases, search costs alone seem to be a reasonable explanation.[31] In Handel's (2013) case, several factors described above could be relevant. For instance, employees in Handel's (2013)

[30]Kiss' (2014) results are consistent with Shum's (2004) finding that advertising reduces inertia. Eliaz and Spiegler (2011a) model competition between firms that can use advertising to influence whether or not consumers consider alternative products.

[31]For instance, Clerides and Courty (2014) document strong inertia in package size choice of laundry detergent and other packaged goods. Many regular consumers of a full-size package fail to switch to purchasing two half-size packages of the same brand on the same shelf when doing so would be cheaper due to price promotions. Clerides and Courty (2014) argue, however, that this can be explained by rational search behavior (or equivalently rational inattention) by considering the cost of the 10 seconds it might take to compare prices.

sample may have failed to switch away from PPO_{250} after the price increases because they were unaware of the price change. If they did not expect a price change, then they would not have had a reason to take the time to look up the new prices. Alternatively, they may have chosen not to switch to avoid making confusing price comparisons between four-dimensional price vectors, which included premium, deductible, co-insurance rate, and out-of-pocket maximum. Finally, employees may simply have procrastinated or forgotten about open enrollment until the deadline passed. Moving beyond such speculation, and disentangling potential sources of inertia is important for evaluating what policies might effectively reduce inertia, and remains an important area for future work in a variety of market settings.

5 Policy Discussion

The fact that consumers often fail to choose the best price has several implications for policy. Overconfidence and related biases cause consumers to misweight various dimensions of price and hence make poor choices. This in turn leads firms to distort prices to exploit the bias, but does not artificially differentiate firms or create market power. For instance, if borrowers ignore loan reset rates, firms will set high reset rates but profits can be competed away through low teaser rates. In contrast, confusion and limited search lead to unsystematic noise in choice, which does artificially differentiate firms and create market power. Policy makers should be aware that a market with a homogeneous good, multiple suppliers, a central website listing all prices, and negligible financial switching costs may yield high markups even in the absence of collusion.[32] Below I discuss three policy options, simplifying the choice environment, providing or facilitating expert advice, and choosing on behalf of consumers.

The hope for all three policies that I discuss is that they could help consumers in two ways, first by helping them make better choices, and second by reducing equilibrium prices.[33] Reducing prices may raise total welfare in addition to helping consumers for two reasons. First, lowering

[32]Such market designs have been implemented in variety of markets, such as privatized social security in Mexico (Duarte and Hastings, 2012) or retail electricity in Texas (Hortaçsu, Madanizadeh and Puller, 2015), and have been approximated in other markets, such as in Affordable Care Act health insurance exchanges (Kaiser Family Foundation, 2013).

[33]Interventions may help some consumers become savvy and make good choices, while others remain non-savvy. The remaining non-savvy may still benefit through equilibrium price reductions in the case of *search externalities* or be harmed through equilibrium price increases in the case of *ripoff externalities* (Armstrong, this issue). The models surveyed in this article typically involve search externalities, so interventions which increase consumer savviness help all consumers. It is worth noting, however, that the same interventions, such as facilitating expert advice, are proposed to aid consumers who misweight elements of price or other product attributes. Biases that lead to misweighting of product attributes can create ripoff externalities between savvy and non-savvy consumers, in which case interventions increasing consumer savviness might harm some consumers (Armstrong, this issue).

price towards costs eliminates dead-weight losses due to underconsumption. Second, in the absence of policy interventions, firms may partially compete away the rents from high prices via costly marketing activities (Haan and Moraga-González, 2011).[34] In this case policy interventions that lower prices should also reduce socially wasteful marketing efforts.

5.1 Simplifying the choice environment

Research on search, obfuscation, and consumer confusion suggests that price complexity is a barrier to good choice. Market designers trying to help consumers, be they regulators or private parties like Pricewatch.com or eBay, should therefore consider policies that make prices simpler to compare. In particular, market designers should consider restricting prices to be scalars if these are sufficient to implement efficient allocations. This could be a good option for CONSAR, Mexico's social security market regulator, as it is not clear what efficiency reasons Afores have for charging both flow fees and balance fees. In other cases it might be impractical, such as for health care, where prices may need to be vectors (including premiums, deductibles, and co-insurance rates) to manage adverse selection and moral hazard.[35]

Both empirical evidence (Ellison and Ellison, 2009) and models with endogenous obfuscation (Ellison and Wolitzky, 2012; Piccione and Spiegler, 2012; Chioveanu and Zhou, 2013) warn that policy makers trying to simplify price comparisons face an uphill battle against firms' obfuscation efforts. Policies which prevent one form of obfuscation may cause firms to shift to other forms of obfuscation, and in some cases weak restrictions may cause price comparability to fall (Piccione and Spiegler, 2012; Chioveanu and Zhou, 2013). However, it can be hoped that regulators that fully control market design can craft strict enough limits on obfuscation to increase price comparability even when firm responses are taken into account.

5.2 Providing or facilitating expert advice

An alternative to simplifying markets is to increase market transparency by providing or facilitating expert guidance. Guidance might come directly from a regulator introducing a fee index, as CONSAR did in Mexico's social security market.[36] Alternatively, guidance might come from third-

[34]The hiring of 100,000 sales agents by Mexican Afores comes to mind as an example (Hastings et al., 2013, Figure 1).

[35]Rather than restricting the use of complex prices, a milder intervention would be to require either firms or a regulator to offer at least one simple option in addition to any complex alternatives. Unfortunately, Spiegler (2011) predicts that such policies will be ineffective.

[36]Bar-Gill's (2012) book contains a complementary discussion of disclosure requirements for such "total-cost-of-ownership" measures.

party price-comparison websites. In the latter case, Thaler and Sunstein (2008) propose *Record, Evaluate, and Compare Alternative Prices* (RECAP) regulation that would require firms to let customers easily share their usage and billing data with third parties who could provide tailored advice about whether to switch to a competing provider.[37] Plans are underway in the UK to do just that. Quick Response (QR) codes will soon be required on retail energy bills in the UK, so that consumers can easily share their billing data with a third-party smart-phone app (Department of Energy & Climate Change and Davey, 2014).

Thaler and Sunstein's (2008) RECAP proposal sounds like a terrific idea and I hope that it will be a success in UK energy markets. There are at least two reasons for caution, however.[38] First, even a benevolent expert is limited by her information and, as documented by Duarte and Hastings (2012), imperfect expert advice may be of limited help to consumers. Second, experts giving the best advice may not be market winners when trying to attract advisees.

(1) Experts with limited information: As discussed earlier, CONSAR's fee index over-weighted flow fees. In fact, without information on each investor's financial position or the ability to tailor the index to each investor based on such information, CONSAR couldn't appropriately weight flow fees for more than a small fraction of investors. Consumers choosing based on a biased fee index act as if they themselves are biased. We should expect firms to distort prices to exploit the bias, as Duarte and Hastings (2012) find Afores do. In the case of privatized Mexican social security, there was limited scope for the change in prices to distort investment decisions as, beyond Afore selection, investors had none to make. In other settings, price distortions implemented to exploit price engine bias could reduce social welfare by distorting consumption decisions. For instance, three-part tariffs designed to exploit overconfidence charge high marginal prices (relative to marginal costs) for high usage, which can inefficiently reduce consumption (Grubb, 2009).[39]

Of course, the fact that lack of consumer-specific information can limit the quality of consumer advice is the very problem RECAP is designed to solve. Unfortunately, even with RECAP data, there are still pitfalls. For instance, suppose that each UK energy bill QR code only includes

[37] In markets with individual specific pricing, such as for mortgages or car insurance, price quotes would also be required to be easily sharable.

[38] See Kamenica, Mullainathan and Thaler (2011) for a discussion of other issues relevant to practical RECAP implementation.

[39] The scope for such inefficiency is perhaps larger for differentiated products, as a biased quality index could also distort quality provision. For instance, Dranove, Kessler, McClellan and Satterthwaite (2003) document that introduction of cardiac surgery report cards in New York and Pennsylvania distorted medical care provision and worsened health outcomes. That being said, other quality indexes, such as LA's restaurant hygiene grade cards, have been very successful (Jin and Leslie, 2003).

information for that bill, and not prior bills. A price engine which based its recommendations on a single QR code scan could not take monthly variance in usage into account. Failing to account for variance is a form of overconfidence that firms will exploit via three-part tariffs if they can (Grubb, 2009).[40] Moreover, even if QR codes include a year of information as proposed in RECAP, if price comparison engines recommend the plan that would have been cheapest given last year's usage, firms will have an incentive to charge high fees for billing events that occur once in ten years. This problem might be overcome by basing recommendations for a single individual on RECAP data for many individuals. However, it should be clear that designing a price comparison engine that is not gameable by firms is not trivial even with RECAP data.

Price comparison engines with access to RECAP data may more successfully avoid gaming if firms' prices are restricted by regulators in some way. For instance, the UK's Office of Gas and Electricity Markets (Ofgem), recently restricted utilities to offer only two-part tariffs, with a fixed monthly fee and constant marginal price for usage (Office of Gas and Electricity Markets, 2014). Similarly, Mexican Afores' are limited to charge only balance and flow fees. In both cases, the restriction to constant marginal price contracts rules out the use of three-part tariffs or other complicated pricing structures, thereby reducing firms' ability to game price comparison engines. As a result, the restriction limits the downside to relying on price comparison engine recommendations that use only estimates of the first moment of usage. Thus Ofgem's current restrictions on tariff complexity should be complementary to the QR code initiative and increase its chance of success.

If everyone begins to follow the advice of the same biased price engine, uncorrelated and noisy consumer choice mistakes are replaced with a single consistent misweighting of price dimensions by the price comparison engine. In theory, while prices might be distorted, artificial product differentiation due to consumer confusion should be reduced. Moreover, as a systematic misweighting of product price dimensions need not affect markups (Grubb, 2015b), this would suggest that even a biased price engine could reduce markups. In fact, in Mexico's social security market, CONSAR's biased fee index did reduce average fees paid by 13.5% (Duarte and Hastings, 2012). However, despite this decrease, fees remained very high after the fee index was introduced, and it is somewhat puzzlingly why fees did not fall further. In particular, it is unclear how large a role CONSAR's faulty index formula played in the limited nature of its success. However, two other factors are likely to have been important, including investor inertia and the fact that not all investors responded to

[40]My thanks to Amelia Fletcher for pointing out that price-engine recommendations may be biased in the same manner as overconfident consumers. The conclusion that three-part tariffs could be used to exploit data-limited price engines is related to results in Spiegler (2006a). In particular, Spiegler's (2006a) results may be interpreted as showing that firms should make consumers' bills highly variable from one month to the next when consumers compare options based on a single prior bill from each firm.

the index.

(2) Conflicts of interest: It should not be taken for granted that price comparison engines with access to RECAP data or other experts will benevolently give the best advice that they can. Professional advice already plays a large role in retail finance.[41] Nevertheless, consumers commonly make poor investment decisions (Barberis and Thaler, 2003). Moreover, both theory and evidence suggest that professional advice may exacerbate rather than ameliorate problems (Inderst and Ottaviani, 2012a; Mullainathan, Noeth and Schoar, 2012). If consumers are naive about their advisers' conflicts of interest due to commissions (as evidence referenced in Section 2 suggests) Armstrong and Zhou (2011), Stoughton, Wu and Zechner (2011), and Inderst and Ottaviani (2012a) all predict that advisers will direct consumers towards high priced products with high commissions. Using trained auditors who meet with financial advisers, Mullainathan et al. (2012) document this behavior by financial advisers in the field. Moreover, rival advisory firms that charge a nominal flat fee for unbiased advice will not be able to compete or gain market share (Inderst and Ottaviani, 2012b). This suggests that regulators hoping to rely on price comparison engines to discipline market prices using RECAP data should watch to see whether price comparison engines do in fact try to give good advice.

5.3 Choosing for consumers, defaults and automatic switching

If consumers are unable to consistently choose the lowest price among homogeneous goods, it is natural to consider having a policy maker choose on their behalf. Giving consumers freedom of choice is important when consumers have heterogeneous preferences over options and need to express those preferences to be matched with the efficient option. However, when a choice problem boils down to computing the option with lowest expected cost, it seems a computer is likely to do better than a human.

The Mexican social security system seems to be such a case. In principal, an optimal retirement savings portfolio choice could be highly dependent on individual preferences over risk and other factors. However, the Mexican social security system eliminates all such choice by largely dictating the mix of assets. Investors are left only with a choice of what fees to pay (high fees or even higher fees). It is not clear why CONSAR shouldn't choose a bank (or banks) to manage the money by running a procurement auction, which Duarte and Hastings (2012) point out they already do

[41] Surveys of retail investors show that 73% of Americans consult a financial adviser before buying stock (Hung, Clancy, Dominitz, Talley, Berrebi and Suvankulov, 2008) and 79% of Europeans consult a financial professional before making an investment (Chater et al., 2010).

for back-end account management. This would have three major benefits: (1) improving investor choices holding fees fixed, (2) lowering equilibrium fees, and (3) eliminating a wasteful effort upon banks' part in marketing and upon investors' part in trying to understand the fees and make good choices.

A less restrictive intervention (a nudge) would select a sensible default option for consumers but still allow freedom of choice via opting-out. This could be implemented directly by a regulator. For instance, in the Medicare Part D market, low-income enrollees are defaulted into a low premium plan and then automatically switched to another low premium plan if the insurance provider increases rates in future years. However, enrollees have the option of opting-out of the default and making their own choice (Ericson, 2014a).[42] Alternatively, automatic switching could be implemented by third-party smart-phone apps. Already energy firms in the UK will have to deliver customer data to third-party apps through QR codes (Department of Energy & Climate Change and Davey, 2014; Department of Energy & Climate Change, 2014) and UK banks have agreed to provide a year of current account transactions for download by March 2015 (Competition & Markets Authority, 2014). If this midata program additionally required firms to provide APIs that allow third-party apps to manage switching then individuals could opt-in to automatic switching.[43]

Naturally, the hope is that allowing consumers to opt-in to automatic switching would benefit them privately, by eliminating hassle costs and improving decisions, and also generate a positive externality to other consumers by putting downward pressure on equilibrium prices.[44] As Ericson (2014c) points out, the positive externality suggests there will be too little opt-in to automatic switching from a social stand point if consumers make privately optimal opt-in choices. However, there could be substantial costs to making automatic switching the default. First, the same barriers that prevent people switching when switching is optimal could stop them opting out, and leave them exposed to high switching costs when auto-switched. For instance, low income Medicare Part D enrollees who fail to opt-out of an automatic switch due to inattention may need to get all new

[42]Unfortunately, the program does not select a *sensible* default and hence does not serve low-income enrollees well. First, default enrollment or switching is into a randomly chosen plan among those with premiums below a threshold. Second, the plan premium is not a good measure of expected costs which also depend on deductibles, coinsurance rates or tiered copayment rates, plan formularies, and drug prices (which matter due to deductibles, coinsurance, and the doughnut hole). Moreover, the threshold which determines whether a plan's premium is low enough to be included as a random default for low-income enrollees is manipulable by insurers. Thus, as well as implementing poor default choices for low-income enrollees, the program has driven up prices (Decarolis, 2015).

[43]Evidence from the introduction of smart thermostats shows that consumers can be happy to automate consumption choices and that doing so can substantially affect energy use (Harding and Lamarche, 2015).

[44]From the perspective of firms, it seems that automatic switching should be comparable to eliminating search costs, consumer price confusion, and switching costs all at once. Eliminating search costs and consumer price confusion should lower equilibrium prices, and the prevailing view is that eliminating switching costs will as well.

prescriptions to cope with a formulary change. Moreover, the concerns about expert advice raised in the preceding section all apply with greater force when the experts recommendation is implemented automatically.

5.4 Welfare analysis

To conclude the discussion of policy, note that consumer mistakes have implications for policy analysis as well as policy itself. In particular, consumer mistakes can confound revealed preference arguments that underly standard welfare analysis. In some cases, this is not problematic because we can reasonably make assumptions about true preferences. For instance, it seems reasonable to assume that Mexican retirees would prefer more retirement income to less, holding fixed their contributions. For other cases, a variety of authors suggest that progress can be made by inferring preferences from *trusted* choices that a researcher can identify as being free of mistakes and therefore welfare relevant. For instance, Bronnenberg et al. (Forthcoming) infer the quality difference between branded and generic headache remedies from pharmacists' choices, relying on their expert judgement. In the same spirit, Handel and Kolstad (Forthcoming) infer employee risk preferences from the health plan choices of employees whose survey responses indicate a clear understanding of the choice set. Unfortunately, it is not always possible to identify trusted choices. In such cases, approaches that allow for ambiguity may be best (Bernheim and Rangel, 2009; Bernheim, Fradkin and Popov, Forthcoming). Alternatively, if researchers are willing to make reasonable assumptions about the nature of consumer mistakes, then rich choice data may make it possible to separately infer consumer preferences and biases without relying on trusted choices. For instance, Grubb and Osborne (2015) separately identify cellular calling preferences from overconfidence, and Kiss (2014) separately identifies switching costs from inattention.

6 Conclusion

Consumers often fail to choose the best price because they search too little, become confused comparing prices, and then show excessive inertia through too little switching away from past choices or default options. In particular, consumers are often unable to identify the lowest price among considered alternatives when price is a vector rather than a scalar. All three mistakes may contribute to positive markups that fail to diminish as the number of competing sellers increases. Possible policies to improve market outcomes include regulation to simplify the choice environment, such as restricting prices to be scalars, or enlisting expertise of regulators or third parties to provide advice or even choose on behalf of consumers. In many cases, these policies face an uphill battle

against firms that have an incentive to undo the policies through new obfuscation. Moreover, when implemented imperfectly, as in Mexico's social security market, such policies may change the nature of the problem without solving it. Finally, if poor choices are driven by imaginary quality differences then helping consumers identify the lowest price will not help. Nevertheless, with development of programs such as the UK midata project, and new regulators with a mandate to protect consumers, such as the US Consumer Financial Protection Bureau, it is an exciting time to see whether such pitfalls can be overcome.

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