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Abstract

This paper succinctly overviews three primary branches of the industrial organization literature with behavioral consumers. The literature is organized according to whether consumers: (1) have non-standard preferences, (2) are overconfident or otherwise biased such that they systematically misweight different dimensions of price and other product attributes, or (3) fail to choose the best price due to suboptimal search, confusion comparing prices, or excessive inertia. The importance of consumer heterogeneity and equilibrium effects are also highlighted along with recent empirical work.

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1 Introduction

A fast growing literature on behavioral industrial organization (IO) revisits classic IO questions while relaxing assumptions of the standard model. The majority of the work maintains the assumption that firms maximize profits but enriches the model of consumer behavior to be more realistic by allowing for self-control problems, loss aversion, inattention, overconfidence, confusion, and other deviations from homoeconomicus. A smaller fraction of the work considers firms run by managers who, like their customers, are also human and sometimes make mistakes. The fascinating branch of work on behavioral managers and firms is largely beyond the scope of this special issue, apart from Bailey's (this issue) discussion in "Behavioral Economics and U.S. Antitrust Policy", but readers may refer to other surveys (Ellison, 2006; Ho, Lim and Camerer, 2006; Armstrong and Huck, 2010; Goldfarb, Ho, Amaldoss, Brown, Chen, Cui, Galasso, Hossain, Hsu and Lim, 2012). Thus far, explicitly behavioral consumers appear most often in theoretical IO models, but they are appearing more often in empirical IO models as well.[1]

The IO literature with behavioral consumers is diverse, but a large fraction of it may be grouped into three primary branches. First, firms will cater to consumers' non-standard preferences, such as loss aversion or a preference for commitment. Second, overconfidence and other biases lead consumers to systematically misforecast future choices. As a result, they systematically misweight different dimensions of product price or other product attributes and firms offer complicated contracts to exploit the mistake. Third, artificial product differentiation and market power often arise because consumers fail to choose the best price due to suboptimal search, confusion when comparing prices, and excessive inertia. Beyond these three main branches, research examines a variety of other issues such as inattention and strategic naivety, and researchers continue to expand the field in new directions.[2] Below I give a brief overview of the three primary branches of the literature with references to more comprehensive surveys. Next, I draw attention to two recurring themes: (1) that consumer heterogeneity, such as the presence of both savvy and non-savvy consumers, has important consequences for market outcomes and policy, and (2) that equilibrium effects often offset consumer benefits of policies aimed at improving individual decision making. I finish by highlighting some recent empirical work.

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[1] As Ellison (2006) points out, much empirical work that estimates consumer demand might be deemed agnostic as to whether consumers are rational or not.

[2] For instance, see Matějka and McKay (2012, 2015); Persson (2013); Bordalo, Gennaioli and Shleifer (2014); Grubb (2015a); Grubb and Osborne (2015); Matějka (Forthcoming); de Clippel, Eliaz and Rozen (Forthcoming) on inattention, Eyster and Rabin (2005); Esponda (2008); Esponda and Pouzo (2014) on strategic naivety, and (in this issue) Eliaz and Spiegler (this issue) on new directions in the field.

2 Catering to, or exploiting, non-standard preferences

A wealth of evidence shows that individuals are both loss averse (Camerer, 2004) and present biased (Frederick, Loewenstein and O'Donoghue, 2002; DellaVigna, 2009; Bryan, Karlan and Nelson, 2010) and these are the most studied non-standard preferences in IO. Loss aversion implies that, relative to a reference point, individuals feel a loss more acutely than an equal sized gain. Present bias implies greater impatience when patience requires a sacrifice now (such as giving up \$10 today to get \$11 next week) than when it requires a sacrifice in the future (such as giving up \$10 in 52 weeks to get \$11 in 53 weeks).

Three themes standout within the (largely theoretical) literature on loss averse consumers. First, loss aversion causes first-order risk aversion (Kőszegi and Rabin, 2007), which can lead consumers to demand insurance for small risks and firms to charge flat rates for services (Herweg and Mierendorff, 2013). Second, loss aversion creates kinks in demand curves, either outward, which can lead to price rigidities (Heidhues and Kőszegi, 2008; Spiegler, 2012), or inward, which can lead to stochastic pricing (Zhou, 2011). Third, loss aversion gives firms an incentive to simultaneously influence and exploit consumer reference points via stochastic pricing, (Heidhues and Kőszegi, 2014; Rosato, 2014), which regulators may address via requirements for early disclosure (Karle, 2013; Karle and Peitz, 2014).

The theoretical literature on firms catering to a preference for commitment is also substantial (DellaVigna and Malmendier, 2004; Kőszegi, 2005; Esteban and Miyagawa, 2006; Esteban, Miyagawa and Shum, 2007; Gottlieb, 2008; Jain, 2012; Li, Yan and Xiao, 2014; Nafziger, 2014; Galperti, Forthcoming). However, while the literature shows that firms may offer commitment through contractual terms, on balance the focus has been on consumers who are partially naive and are overconfident about their own self-control. Kőszegi (2005) shows that even slight naivety leads firms to exploit consumers rather than provide commitment. As such, much of the behavioral IO literature on consumers with self-control problems may be usefully grouped with other work on consumer overconfidence below.

Spiegler's (2011a) book and surveys by Huck and Zhou (2011) and Kőszegi (2014) all cover these topics in greater depth.

3 Overconfidence and exploitative contracting

Overconfident consumers may exhibit *overoptimism*, *overprecision*, or both. Overoptimism refers to overestimation of one's own abilities or prospects, either in absolute or relative terms (the *above average effect*). Overoptimistic consumers may misforecast their future average consumption or

overestimate their ability to navigate contract terms. Overprecision refers to drawing overly narrow confidence intervals around forecasts, thereby underestimating uncertainty. Overprecise consumers may underestimate the variance of future consumption. Overconfident consumers, whether overoptimistic or overprecise, misforecast the costs and benefits of offered contracts. Poor choices are the result. For instance, overoptimism about self-control is a leading explanation for why individuals overpay for gym memberships they do not use (DellaVigna and Malmendier, 2006). Similarly, overprecision is a leading explanation for why individuals systematically choose the wrong calling plans, incurring large overage charges for exceeding usage allowances in the process (Grubb, 2009; Grubb and Osborne, 2015).

Three lessons standout within this strand of the literature: First, firms use complicated pricing features to exploit consumer overconfidence even in competitive markets. Second, although overconfidence need not increase equilibrium markups, it is likely to harm consumers when it leads them to overvalue contracts (Grubb, 2015b). Third, although "nudges" that improve individual decision making would benefit overconfident consumers holding firm prices fixed, they will be less beneficial and possibly even harmful when firms' adjust prices in response (e.g. Grubb (2015a); Grubb and Osborne (2015)).[3]

Grubb (2015b) describes a variety of contractual features that may be used to exploit overconfidence, including three-part tariffs, usage thresholds at which quality is reduced, *attention hurdles*, and barriers to follow-through including *memory hurdles* and *self-control traps*. A three-part tariff consists of a fixed fee, an included allowance of units, and a positive marginal price for additional usage beyond the allowance. Related contracts may specify reduced quality, rather than increased marginal price, beyond a usage threshold. Both types of contracts are observed in a variety of settings, such as the pricing of cellular data plans, which often include a monthly allowance of data followed either by overage charges or reduced speed for additional usage. Attention hurdles include terms such as checking-account overdraft fees, which can be avoided if consumers pay close attention to their account balances but otherwise easily prove expensive. Memory hurdles and self-control traps are created when contracts include benefits that are only received with some delay after completing a future costly task. For instance, mail-in rebates constitute both a memory hurdle and a self-control trap, as consumers must both remember to fill in the rebate paper work and exercise self control not to procrastinate the task. Heidhues, Kőszegi and Murooka (Forthcoming) show that firms can have strong incentives to innovate new exploitative contractual features like these even if they are easily copyable by competitors.

[3]This last point is true more generally in the behavioral IO literature (Spiegler, Forthcomingb).

The preceding contract features are profitable because overconfident consumers typically misweight some elements of price. For instance, potential credit card holders who are overoptimistic about paying attention to their balances and avoiding over-limit fees will underweight the importance of over-limit fees when choosing a card. By charging high over-limit fees, banks ensure that such consumers underestimate the cost of credit cards. As discussed in Grubb (2015b), equilibrium consequences depend on the market pass-through rate.[4] On the one hand, if the pass-through rate in the credit-card market is less than one, as Agarwal, Chomsisengphet, Mahoney and Stroebel (2014) argue, then over-limit fee revenues will not be fully competed away through cash-back rewards or other terms. As a result, overconfidence harms infra-marginal card holders by raising the equilibrium cost of credit cards. On the other hand, if the market pass-through rate is equal to one, over-limit fee revenues are competed away through cash-back rewards or lower interest rates and overconfidence does not raise the total cost of a credit card. Nevertheless, overconfidence still harms consumers because it causes them to underestimate the cost of credit cards and hence hold too many. In this issue, Heidhues and Kőszegi (this issue) argue that this *participation distortion* can cause substantial consumer and social welfare losses.

Grubb (2015b), from which this section is adapted, is a useful reference for the literature on overconfident consumers. Additional biases, such as inattention to add-on fees (Gabaix and Laibson, 2006; Heidhues et al., Forthcoming) may or may not be interpretable as overconfidence. For instance, Bubb and Kaufman (2013) interpret consumers who ignore add-on fees when choosing a bank as overoptimistic about their ability to avoid the fees. However, its hard to interpret inattention to shipping fees (DellaVigna, 2009) as overconfidence. In either case, the themes described above for overconfident consumers hold true whenever consumers systematically misweight different dimensions of price or other product attributes and firms write exploitative contracts. For further reading, see Spiegler (2011a, Forthcominga), Huck and Zhou (2011), Kőszegi (2014), and Armstrong (this issue).

4 Failing to choose the best price

Consumers often fail to choose the best price. This is particularly true in markets with which consumers have little experience, and firm prices are complex price vectors rather than easily comparable scalars.

To choose the best price in a homogeneous product market, a consumer must (1) search for

[4]The market pass-through rate measures the fraction of an infinitesimal increase in marginal cost that is passed on to consumers in higher prices. It is equal to 1 in a perfectly competitive market with perfectly elastic supply.

prices, (2) identify the lowest price among those discovered, and (3) switch if prices change. Search and switching costs are the standard explanations for why consumers may pay more than the lowest offered price (Baye, Morgan and Scholten, 2006; Farrell and Klemperer, 2007). Conditional on these costs, the standard assumptions are that consumers search optimally, select the lowest price found, and switch optimally. Unfortunately, even putting overconfidence and other related biases aside, these standard assumptions appear to be overly optimistic. Consumers sometimes appear to search too little, exhibit confusion when comparing prices, and stick with initial choices or default options with excessive inertia. Importantly, consumers' difficulty comparing prices cannot be captured by overconfidence or other biases that cause systematic misweighting of price vector elements because misweighting cannot explain dominated choices, such as those documented in health plan choice by Handel (2013, 2014) and in electricity supplier choice by Wilson and Waddams Price (2010).

All three problems, insufficient search, confusion comparing prices, and excessive inertia, can contribute to price dispersion and positive markups for homogeneous goods that are robust to increasing the number of sellers. In particular, limited search and confused choice lead to noise in active decision making that is uncorrelated across consumers. This is like an artificial form of product differentiation that gives firms market power and the ability to raise markups. In contrast, overconfidence and other biases cause consumers to systematically misweight dimensions of product price and quality in the same way. This leads firms to distort prices specifically to exploit consumer bias but does not necessarily increase markups or lead to price dispersion (Grubb, 2015b).

Policies to improve market outcomes when consumers search and switch too little and become confused by price comparisons include simplifying choice environments, such as limiting prices to be scalars, providing or facilitating expert guidance, or choosing on behalf of consumers. Notably, providing or facilitating expert advice to consumers to aid them in their choices, but doing so imperfectly, may transform a market best captured by a model of noisy choice as surveyed in Grubb (this issue), to one best captured by a model of biased choice as surveyed in Grubb (2015b). (Mexico's privatized social security market provides a potential case study. The market regulator, CONSAR, introduced a fee index that overweighted flow fees relative to balance fees, much as a biased investor might (Duarte and Hastings, 2012).) Thus the policy provides a link between these two important branches of the behavioral IO literature.

I defer further discussion of limited search, confusion comparing prices, and excessive inertia to my article "Failing to Choose the Best Price: Theory, Evidence, and Policy" which appears later within this special issue (Grubb, this issue), and from which this section is adapted. For additional reading see also Spiegler's (2011a) book and surveys by Huck and Zhou (2011), Armstrong (this issue), and Spiegler (Forthcominga).

5 Heterogeneity and equilibrium effects matter

A recurrent theme in behavioral IO is that heterogeneity matters.[5] While there is strong evidence that consumers are often overconfident, search too little, become confused by price comparisons, or exhibit excessive inertia, we do not expect all consumers to have these problems. An important question is whether the presence of more sophisticated, or "savvy" consumers in the market place will protect the non-savvy. In this special issue, Armstrong (this issue) synthesizes results on this question from across the behavioral IO literature. When non-savvy consumers fail to choose the best price due to limited search or price confusion, we should expect savvy consumers to have a positive *search externality* on their non-savvy peers. By being more responsive to prices, the presence of savvy consumers reduces firms' market power, lowers equilibrium prices, and thereby helps everyone. When non-savvy consumers are overconfident or ignore hidden add-on fees, precisely the opposite may be the case (e.g. Gabaix and Laibson (2006); Grubb (2015a)). Savvy consumers may be cross-subsidized by non-savvy consumers, thereby imposing a negative *ripoff externality*. However, Armstrong (this issue) shows that when non-savvy consumers are overconfident, whether search or ripoff externalities arise varies according to fine modeling assumptions.

Heterogeneity can have other important consequences for market outcomes and optimal policy. For instance, Grubb (2015a) finds that bill-shock regulation, requiring firms to alert inattentive consumers when high usage triggers high marginal prices, may be neutral, harmful, or beneficial for welfare depending on whether consumers are homogeneous, heterogeneous in expected demand, or heterogeneous in inattentiveness. A second example, due to Bubb and Kaufman (2013), shows that non-profit credit unions may have a competitive advantage over for-profit banks among consumers who realize they tend to pay hidden fees. Banks attract both the savvy, who avoid hidden fees, and the non-savvy, who expect to avoid hidden fees but end up cross-subsidizing the savvy by paying the fees. Credit unions' non-profit objective is a credible signal of low hidden fees, which allows those who are self-aware that they pay hidden fees to avoid the ripoff externality at banks. Thus Bubb and Kaufman's (2013) work suggests that the success of non-profit firms in a market may depend on heterogeneity in consumer savviness.

A second recurring theme in behavioral IO is that in equilibrium firm actions may offset policies which aim to improve individual decision making. For instance, Ellison and Ellison (2009); Ellison and Wolitzky (2012) find that exogenous reductions in search costs may be partially offset by increased firm obfuscation. For similar reasons, policies which aim to make prices more comparable

[5] In part this is because a subset of the literature studies price discrimination or screening with biased consumers (e.g. Eliaz and Spiegler (2006, 2007, 2008); Sandroni and Squintani (2007, 2013); Grubb (2009, 2015a); Grubb and Osborne (2015)).

may have the opposite effect in equilibrium (Piccione and Spiegler, 2012; Chioveanu and Zhou, 2013). Grubb (2009) finds that de-biasing overconfident consumers could raise the prices a monopolist charges. Grubb (2015a) finds that while bill-shock alerts improve consumers' decisions, they can harm consumers when firm price adjustments are taken into account. Spiegler (Forthcomingb) has a series of additional examples. Typically, such theoretical predictions that policies to improve consumer decision making may actually hurt consumers in equilibrium only apply for a subset of parameter values, and it remains a challenge to see if they are empirically relevant in real markets. In at least two cases, however, negative predictions are based on counterfactual simulations using models of demand estimated from consumer choices. Grubb and Osborne (2015) predict bill-shock regulation would not have helped consumers in their 2002–2004 sample period, and Handel (2013) predicts that eliminating inertia in health plan choice would have worsened underinsurance at the employer in his sample.

6 Recent empirical work

The recent explosion in behavioral IO has largely been in applied theory but there have been many empirical contributions as well. There is a large body of field evidence documenting behavioral biases of consumers in real markets (DellaVigna, 2009). Moreover, an increasing number of empirical papers document the effect of consumers' behavioral biases on equilibrium prices, rather than simply on consumer behavior. Research documents evidence of present bias in health club pricing (DellaVigna and Malmendier, 2006), magazine pricing (Oster and Scott Morton, 2005), and food pricing (Hastings and Washington, 2010), projection bias in home prices (Busse, Pope, Pope and Silva-Risso, 2012), and inattention in used car pricing (Busse, Lacetera, Pope, Silva-Risso and Sydnor, 2013). In other cases, such as the market for convertible cars on a sunny day, researchers have found that while consumer bias affects purchase decisions it does not affect market prices (Busse, Pope, Pope and Silva-Risso, 2015).

Another development in the empirical IO literature is that behavioral consumers have begun making their way explicitly into structural models of demand. For instance, researchers have estimated structural models of demand that incorporate projection bias (Conlin, O'Donoghue and Vogelsang, 2007), probability weighting (Barseghyan, Molinari, O'Donoghue and Teitelbaum, 2013), overconfidence (Goettler and Clay, 2011; Grubb and Osborne, 2015), inattention (Grubb and Osborne, 2015), naive present bias (Ausubel and Shui, 2005; Hinnosaar, 2014; Fang and Wang, Forthcoming), and MPG illusion (Allcott, 2013). Where standard assumptions are relaxed to allow for behavioral consumers, richer data typically must substitute for the foregone assumptions to main-

tain identification. Most of the preceding papers take advantage of settings with particularly rich choice data conducive to their studies. When this is not available, recent work shows how choice data may be augmented with survey data to incorporate into structural models either biased beliefs (Hoffman and Burks, 2013) or other frictions that deflect consumers from choosing the best price (Handel and Kolstad, Forthcoming).

7 Conclusion

Embedding behavioral consumers in IO models has already had substantial success on at least two important dimensions. First, the approach has successfully generated new explanations for observed outcomes related to pricing patterns and consumer behavior in a broad range of market settings. In some cases these explanations are the first for otherwise puzzling phenomena, and in other cases these are alternatives to existing rational explanations. A common concern among economists is that this may reflect a weakness of the approach rather than a success. Naturally, more can be explained when standard assumptions are relaxed, but without discipline on assumptions, models can be constructed to reach almost any desired conclusion, and they lose their predictive power. Happily, researchers have repeatedly shown that empirical evidence can discipline our assumptions about consumer behavior, and distinguish which assumptions best fit particular settings. For market settings where such empirical work is absent, there remains a challenge for future work.[6]

Second, embedding behavioral consumers in IO models has successfully generated novel and relevant insights for policy makers. This work suggests that policy makers have a difficult job to do. On the one hand, behavioral IO models often identify more market failures or inefficiency, and corresponding need for intervention, than would arise in standard models. Moreover, some behavioral IO models suggest novel policy tools with which to intervene. On the other hand, a recurrent theme is that of unintended consequences: theory and evidence show that seemingly sensible interventions, such as aiding individual decision making, can be ineffective due to firms' equilibrium responses. Importantly, policy makers are becoming increasingly interested in learning from behavioral IO research. (Evidence for this statement includes the strong participation of economists from the UK's Financial Conduct Authority and Competition and Markets Authority at the Behavioural Industrial Organisation and Consumer Protection conference held in October 2014, and the US's Federal Trade Commission's decision to host a panel discussion on behavioral IO and antitrust policy in November 2015.) Clearly, it is an exciting time to be working in behavioral IO, as further illustrated by the interesting work in this special issue.

[6] See Spiegler (2011b) for a discussion of what do to until that challenge is overcome.

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