SGH Warsaw School of Economics

Collegium of Economic Analysis

Choice inertia in Industrial Organization with boundedly rational consumers

Bartłomiej Wiśnicki

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dr. hab. Michał Ramsza, prof. SGH

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1 Motivation and research goals

Consumer inertia is a commonly observed phenomenon among decision-makers. This is averse to classical economic choice models, whereby agents choose products without any biases associated with their experience from past usage; the only inference allowed from the past is the Bayesian updating process resulting from the rationality axioms. However, from a more psychological standpoint, individuals feel exceptionally affiliated with their previous purchases and thus tend to make suboptimal choices compared to rational decision rules, cf. Jeuland (1979), Givon (1984). The empirical literature presents substantial evidence that supports the overall attachment of consumers to their choices. Documented examples that empirically identify consumer inertia can be found in the following markets: employment insurance, cf. Osterman (1987), digital imaging, cf. Tripsas & Gavetti (2000), breakfast cereals, cf. Shum (2004), health insurance cf. Handel (2013), and mortgages, cf. Andersen et al. (2015).

Inertia among decision-makers has been analyzed theoretically through various psychological and economic phenomena. For instance, inertia can be linked to a default effect, cf. DellaVigna (2009), whereby consumers adopt their last purchase as a go-to option for future purchases. Other examples, consistent with the rational agent axiom, are search and switching costs, cf. Farrell & Shapiro (1988). These can either be due to rational optimization or materialize as an agent-embodied fallacy, such as inattention, cf. Ericson (2014); Sitzia et al. (2015) or status quo bias, cf. Samuelson & Zeckhauser (1988). These effects can be associated with other psychological phenomena of the endowment effect, cf. Ericson & Fuster (2011) or choice overload hypothesis, cf. Kamenica et al. (2011).

Inertia has also been axiomatized in decision theory. In Bewley's Knightian decision theory, cf. Bewley (1986); Bewley et al. (1987), inertia appears in decision-making under uncertainty — in the framework of Savage (1954) — when the assumption of completeness of choice is dropped; inertia is embodied in the assumption that consumers revert to their last-chosen option if they cannot decide whether the other alternatives are better for them. This reasoning is similar to the satisficing behavior of Simon

(1955). Masatlioglu & Ok (2005), Sagi (2006), Ortoleva (2010), and Masatlioglu & Ok (2014) also provide a rationalization for status quo bias or endowment effect in decision theory. These contributions share a common principle: consumers possessing a satisfactory product are less likely to switch for an uncertain reward.

The aim of the thesis is to incorporate consumer inertia into oligopoly models of market competition. We are conducting this research for the following reasons. First, we want to investigate the market implications of consumers exhibiting inertia. In other words, we want to analyze the impact of inertia on demand for a product, and specifically how inertia affects demand for products that differ in price and quality. In a rational consumer framework, a better and cheaper product should dominate the inferior one. However, inertia may disturb this scenario to some extent.

More importantly, we want to see how inertia influences market equilibrium. Specifically, we want to gauge how inertia affects firms' pricing decisions. As intuition suggests, a deeper attachment to the currently used brand should increase monopolistic positions. On the other hand, results from search cost models suggest that the cost makes firms decrease their prices, cf. Cabral (2009); Rhodes (2014); Cabral (2016). This unintuitive outcome is explained in the following manner: as consumers exhibit inertia, they are harder to attract; therefore, one needs large discounts to gain or retain market share. It is also important to investigate price strategies dynamically, that is, for firms that seek to gain new consumers and retain the old ones. Based on the search cost literature, we can expect the "bargain-then-ripoff" pricing strategy to take place, whereby firms try to lure consumers with lower prices and then exploit their bounded ability to switch.

Aside from pricing, another important aspect of firms' strategies that we want to analyze is how consumer inertia impacts decision-making about the product's quality. This analysis is not present in the switching cost models as quality and price are identified in the same dimension: quality is the linear function of price. By assuming that consumers are boundedly rational, we can separate the impact of quality and price change. This separation enables us to specifically investigate how the fact that consumers exhibit inertia influences firms' quality decisions. Product quality — as suggested by the

empirical literature on inertia (Goettler & Clay 2011; Kiss 2015), as well as in some theoretical works (Holman & Zaidi 2010; Matějka & McKay 2012) —plays an important role in generating inertia: consumers overestimate the owned product's quality and are therefore less likely to switch. Hence, quality may seem an indirect tool that enables firms to affect inertia. By exhibiting inertia, consumers may provide an incentive for firms to increase the product's quality—a premise that, to our knowledge, has not been investigated in the IO framework.

One of the key aspects of the analysis is to examine the market welfare implications of consumer inertia. Intuitively, inertia — since it lowers switching frequency — should make consumers worse-off and increase firms' profits. On the other hand, as we imply above, inertia may nudge firms to increase the product's quality; in this sense, it may prove beneficial to consumers. Hence, it is intriguing to see how these effects develop in an oligopolistic framework and their final impact. We want to analyze this from both the company and the consumer sides of the market. Nonetheless, the latter is of greater importance, as it provides an answer to the question of how inertia affects consumers in a market. This question is important not only research-wise but also because the model's results have public policy implications. With modern technological ease of access to information and discoveries from behavioral economics, governments are trying to nudge consumers into a more active role in the market; Grubb & Osborne (2015), Guthrie et al. (2015), Sunstein (2014), and Spiegler (2015) are some prominent examples of IO analysis in favor or against such practices. This study introduces further insights into the discussion of eliminating the behavioral biases of consumers.

2 Thesis outline

The thesis consists of four main chapters, apart from the introduction, presentation of research goals and methods, and conclusions.

In Chapter 2, we review the existing research concerning boundedly rational consumers in the field of Industrial Organization. Along with Grubb (2015), we distinguish three main branches of this literature strand: boundedly rational search procedures, inability

to compare products, and choice inertia.

Chapter 4 provides the formulation of the consumers' decision-making rules. We combine the anecdotal reasoning framework of Spiegler (2006) with consumer inertia founded in Bewley (1986) to make a tractable presentation of consumer inertia in the market setting.

We apply the formulated consumer decision rule to models of market competition. Chapter 5 analyzes a static, long-run competition model in which firms compete over steady-state market shares. In Chapter 6, we investigate a two-period market competition. We find Nash equilibria of price and quality levels and analyze, through comparative statics, the welfare implications of choice inertia among consumers.

3 Decision rule

Based on the literature review, to examine the market implications of consumer inertia, we need to include some form of consumer uncertainty about product characteristics or quality in the model. The uncertainty is modeled based on the incapability of consumers to compare products fully, thereby inclining them to rely on anecdotal reasoning. The modeling method is based on the $S(1)$ procedure of Osborne & Rubinstein (1998), which has been used (without inertia) to examine oligopoly markets in Spiegler (2006) and Szech (2011). Every option is endowed with a probability of satisfying the consumer that comes from the binary distribution; that is, with probability $\alpha_i \in [0,1]$, a product sold by firm i provides a consumer with positive utility. However, instead of knowing the probability distribution, consumers obtain only a piece of information about product quality upon which they base their decisions. This information is modeled by a binary signal which tells the consumers whether the product is "good" or otherwise.

The presented decision rule combines the aforementioned framework of limited product comparability with consumer inertia. In the decision-making process, the consumer first evaluates the recently-purchased product of the brand. Then, if the owned brand is satisfactory to the consumer, she, with probability $\rho \in (0,1]$, continues market research

and with probability $1-\rho$ refrains from the market search for a better alternative. The decision tree of the procedure for a two-firm market is presented in Figure 1.

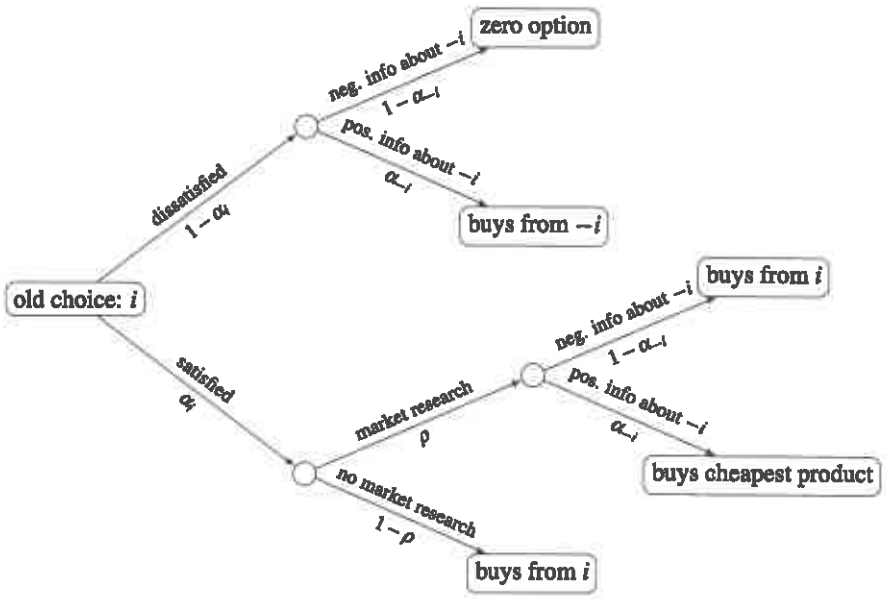

Figure 1: Decision procedure for a consumer that owns product i in the duopoly market. $-i$ represents the competitor of i.

The decision rule in this study only depends on the last choice and not the entire purchasing history. Thus, it can be modeled as a Markov chain. The steady-state of this Markov process forms the demand for the static model and the simple transition matrix for the two-period one.

4 Models of market competition

In Chapters 5 and 6, we incorporate the above-described decision rule into a market competition. In both cases, we analyze a duopoly, in which firms compete in prices and product qualities. Hence, we find the price and quality equilibria as functions of consumer inertia.

The dynamics of both the long-run and short-run competition models share some sim-

ilarities. Both models start with firms deciding on quality levels. Then, they decide on price strategies. While the quality strategies can only be pure, we allow mixed strategies in price. In the static model, the consumers then perform the described choice procedure and form a steady state of market shares. In the dynamic one, consumers form demand through one iteration of the Markov process, and firms can change prices after each period. The market shares induce profits for firms. We assume constant marginal production cost normalized to zero and (apart from one extension in the static model) no quality setting costs.

In both models, a general feature of equilibrium strategies is that firms decide to play mixed strategies in the price competition. The price strategy takes the form of a continuous probability distribution with identical support for both firms and possible atoms at the border prices equal to 0 or 1. An example of the cumulative distribution function of such strategy (for exogenous qualities) in the static model is presented in Figure 2.

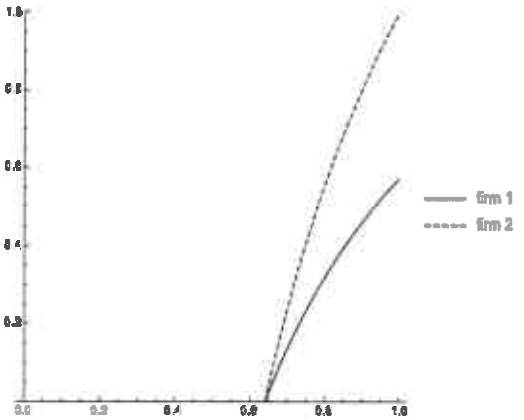

Figure 2: Nash equilibrium price distribution in the static model. $\alpha_1 = 3/4$, $\alpha_2 = 1/2$, $\rho = 1/2$.

Generally, we observe that, for fixed levels of product quality, firms increase prices as a response to an increase in inertia. Inertia provides firms with monopoly power over consumers attached to a particular firm. This is especially indicated in the two-period competition in which firms employ a "bargain-then-ripoff" strategy: they play very low prices (even equal to zero) in the first period, whereas they increase them substantially

in the following one.

In both models, the quality equilibrium is an asymmetric one, in which one of the firms plays a maximal quality, and the other one plays an inferior one. We find that the inferior quality generally increases with higher inertia. This unintuitive result comes from the fact that the quality can be viewed as a method of increasing consumers' attachment: if the product is satisfactory, consumers are not searching the market for a better alternative. Hence, inertia enhances the ability to retain consumers via high quality.

Inertia can also decrease prices indirectly through higher quality. As is the case in the anecdotal reasoning literature, prices decrease with higher qualities as the fraction of consumers who consider both firms satisfactory increases. Hence, inertia may, to some extent, decrease prices in equilibrium.

The impact of inertia on equilibrium variables carries forward to the impact on market welfare. We observe that, for vast values of inertia parameter, high inertia benefits market welfare and, specifically, the consumer surplus. This is both in the case of long-run competition and the two-period model. Therefore, inertia can benefit consumers through an increase in qualities and thorugh price competition.

5 Contributions

The thesis investigates how inertia impacts market competition and thus market welfare. This study can serve as an analytical framework for public authorities to investigate the impact of choice inertia on consumers. Governments can take several courses of action to suppress consumer inertia. One heavily involved in the academic and public debate is the notion of default options in fixed-term contracts, which may exist in many markets (e.g., cellular or Internet service providers). This debate is corroborated by other theoretical models (e.g., Bachi & Spiegler 2018), as well as empirical evidence investigating the harm to which consumers are subjected because of choice inertia, cf. Halpern et al. (2007); Löfgren et al. (2012); Li et al. (2013). This study provides further insights into the discussion of eliminating the behavioral biases of consumers.

Our model's results suggest that reducing consumer inertia without addressing the corresponding limited knowledge and ability to ascertain the product's characteristics may not positively impact consumers' welfare.

References

Andersen, S., Campbell, J. Y., Nielsen, K. M. & Ramadorai, T. (2015), Inattention and inertia in household finance: Evidence from the danish mortgage market, Technical report, National Bureau of Economic Research.

Bachi, B. & Spiegler, R. (2018), 'Buridanic competition', *Games and Economic Behavior* **107**, 298–315.

Bewley, T. F. (1986), Knightian decision theory: Part 1, Technical report, Cowles Foundation for Research in Economics, Yale University.

Bewley, T. F. et al. (1987), 'Knightian decision theory, part ii: Intertemporal problems', *Cowles Foundation* .

Cabral, L. (2009), 'Small switching costs lead to lower prices', *Journal of Marketing Research* **46**(4), 449–451.

Cabral, L. (2016), 'Dynamic pricing in customer markets with switching costs', *Review of Economic Dynamics* **20**, 43–62.

DellaVigna, S. (2009), 'Psychology and economics: Evidence from the field', *Journal of Economic literature* **47**(2), 315–72.

Ericson, K. M. M. (2014), On the interaction of memory and procrastination: Implications for reminders, Technical report, National Bureau of Economic Research.

Ericson, K. M. M. & Fuster, A. (2011), 'Expectations as endowments: Evidence on reference-dependent preferences from exchange and valuation experiments', *The Quarterly Journal of Economics* **126**(4), 1879–1907.

Farrell, J. & Shapiro, C. (1988), 'Dynamic competition with switching costs', *The RAND Journal of Economics* pp. 123–137.

Givon, M. (1984), 'Variety seeking through brand switching', *Marketing Science* **3**(1), 1–22.

Goettler, R. L. & Clay, K. (2011), 'Tariff choice with consumer learning and switching costs', *Journal of Marketing research* **48**(4), 633–652.

Grubb, M. D. (2015), 'Behavioral consumers in industrial organization: An overview', *Review of Industrial Organization* **47**(3), 247–258.

Grubb, M. D. & Osborne, M. (2015), 'Cellular service demand: Biased beliefs, learning, and bill shock', *American Economic Review* **105**(1), 234–71.

Guthrie, J., Mancino, L. & Lin, C.-T. J. (2015), 'Nudging consumers toward better food choices: Policy approaches to changing food consumption behaviors', *Psychology & Marketing* **32**(5), 501–511.

Halpern, S. D., Ubel, P. A. & Asch, D. A. (2007), 'Harnessing the power of default options to improve health care'.

Handel, B. R. (2013), 'Adverse selection and inertia in health insurance markets: When nudging hurts', *American Economic Review* **103**(7), 2643–82.

Holman, J. & Zaidi, F. (2010), 'The economics of prospective memory', *Available at SSRN 1662183* .

Jeuland, A. P. (1979), 'Brand choice inertia as one aspect of the notion of brand loyalty', *Management Science* **25**(7), 671–682.

Kamenica, E., Mullainathan, S. & Thaler, R. (2011), 'Helping consumers know themselves', *American Economic Review* **101**(3), 417–22.

Kiss, A. (2015), 'Salience and switching'.

Li, D., Hawley, Z. & Schnier, K. (2013), 'Increasing organ donation via changes in the default choice or allocation rule', *Journal of health economics* **32**(6), 1117–1129.

Löfgren, Å., Martinsson, P., Hennlock, M. & Sterner, T. (2012), 'Are experienced people affected by a pre-set default option—results from a field experiment', *Journal of Environmental Economics and management* **63**(1), 66–72.

Masatlioglu, Y. & Ok, E. A. (2005), 'Rational choice with status quo bias', *Journal of economic theory* **121**(1), 1–29.

Masatlioglu, Y. & Ok, E. A. (2014), 'A canonical model of choice with initial endowments', *Review of Economic Studies* **81**(2), 851–883.

Matějka, F. & McKay, A. (2012), 'Simple market equilibria with rationally inattentive consumers', *American Economic Review* **102**(3), 24–29.

Ortoleva, P. (2010), 'Status quo bias, multiple priors and uncertainty aversion', *Games and Economic Behavior* **69**(2), 411–424.

Osborne, M. J. & Rubinstein, A. (1998), 'Games with procedurally rational players', *American Economic Review* pp. 834–847.

Osterman, P. (1987), 'Choice of employment systems in internal labor markets', *Industrial Relations: A Journal of Economy and Society* **26**(1), 46–67.

Rhodes, A. (2014), 'Re-examining the effects of switching costs', *Economic Theory* **57**(1), 161–194.

Sagi, J. S. (2006), 'Anchored preference relations', *Journal of Economic Theory* **130**(1), 283–295.

Samuelson, W. & Zeckhauser, R. (1988), 'Status quo bias in decision making', *Journal of risk and uncertainty* **1**(1), 7–59.

Savage, L. J. (1954), *The foundations of statistics*, Wiley.

Shum, M. (2004), 'Does advertising overcome brand loyalty? evidence from the breakfast-cereals market', *Journal of Economics & Management Strategy* **13**(2), 241–272.

Simon, H. A. (1955), 'A behavioral model of rational choice', *The quarterly journal of economics* **69**(1), 99–118.

Sitzia, S., Zheng, J. & Zizzo, D. J. (2015), 'Inattentive consumers in markets for services', *Theory and Decision* **79**(2), 307–332.

Spiegler, R. (2006), 'The market for quacks', *The Review of Economic Studies* **73**(4), 1113–1131.

Spiegler, R. (2015), 'On the equilibrium effects of nudging', *The Journal of Legal Studies* **44**(2), 389–416.

Sunstein, C. R. (2014), 'Nudging: a very short guide', *Journal of Consumer Policy* **37**(4), 583–588.

Szech, N. (2011), 'Becoming a bad doctor', *Journal of Economic Behavior & Organization* **80**(1), 244–257.

Tripsas, M. & Gavetti, G. (2000), 'Capabilities, cognition, and inertia: Evidence from digital imaging', *Strategic management journal* **21**(10-11), 1147–1161.

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Bartłomiej Ulrich