Behavioural economics and the future of regulation: nudge not prescription?
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Overview

- Considerable scepticism about behavioural economics *within* economics e.g. the Forum on behavioural economics, *Journal of Economic Literature, Summer 2013*
- Especially with respect to firms
- Two examples
Ofer Azar 2006

- ‘Behavioral industrial organization, firm strategy and consumer economics’, 2006, [http://mpra.ub.uni-muenchen.de/4484/](http://mpra.ub.uni-muenchen.de/4484/)
- “Industrial organization encompasses topics such as market structure, price dispersion, and how firms compete by choosing prices, quantities, R&D levels, product quality and other product characteristics. Often also topics such as the internal organization of firms, incentives, and contracts are attributed to industrial organization”
- “Behavioral industrial organization is then the application of insights from psychology and of deviations from the behavior of “Homo Economicus” (a selfish and utility-maximizing, unboundedly-rational agent) to topics that belong to industrial organization”
Azar: where I disagree

- “The deviations from fully-rational decision making that result in this research being classified as "behavioral" can come in principle from any of the economic agents involved in the market. Recent research, however, usually attributes the irrational behavior to consumers and not to firms.”

- “Irrationality on the side of the firm should reduce its profits, hurt the firm's position both in its product markets and in the capital markets in which it obtains its financing, and eventually is likely to lead to the firm's bankruptcy due to more rational firms driving it out of business. Therefore it is hard to believe that firms can behave significantly in an irrational fashion and still survive the competition for a long time.”

- “It is much more plausible that consumers behave irrationally, since the above considerations do not apply to them. Consumers do not disappear if they make biased decisions; they just do not obtain a utility level as high as they could get with optimal decision making”
Glenn Ellison, 2006


- What happens when consumers are subject to the behavioural biases identified in the psychology and economics literature, and how do profit-maximising firms take advantage of these biases – *this is the biggest of the three in the literature, and motivates a lot of regulatory policy*

- the “explicit bounded rationality” approach. In this literature, cognition is costly, and agents adopt second-best behaviours taking these costs into account

- “the rule-of-thumb approach”. These papers typically assume directly that consumers or firms behave in some simple way, rather than deriving behaviour as the solution to a maximization problem

- I am talking mainly about the third, to some extent the second. A lot of regulation is about the first, which may be misplaced if some or all firms do not behave in this way
The background

- A literature over a long period of time suggesting systematic deviations from rationality by firms e.g.
  
- “[Interviews of 38 business organisations] casts doubt on the general analysis of price and output policy in terms of marginal cost and marginal revenue ... they are thinking in altogether different terms; that in pricing they try to apply a rule of thumb we call ‘full cost’.”
Herbert Simon (1)

- By far the single most important paper in behavioural economics is that by Herbert Simon ‘A Behavioural Model of Rational Choice’, Quarterly Journal of Economics, 69, 1955
- Simon’s chair at Carnegie Mellon was not in economics, but in industrial management
- “Recent developments in economics, and in particular the theory of the business firm, have raised great doubts as to whether the schematized model of Economic Man provides a suitable foundation on which to erect a theory – whether it be a theory of how firms do behave, or how they ‘should’ rationally behave”
- Of course, a great deal of regulatory policy is concerned with the latter point – how they ‘should’ rationally behave
Herbert Simon (2)

- “the task is to replace the global rationality of economic man with a kind of rational behaviour which is compatible with the access to information and computational capacities that are actually possessed by organisms, including man, in the kinds of environments in which such organisms exist”
- He coined the phrase ‘satisficing’, which economists have corrupted and essentially neutralised. It has come to mean within economics situations in which cognition is costly, and agents adopt second-best behaviours taking these costs into account.
Keynes and Hayek

- Keynes held a similar view about the existence of ‘radical uncertainty’: *Quarterly Journal of Economics*, 1937 “We have, as a rule, only the vaguest idea of any but the most direct consequences of our acts”
- Hayek in particular emphasised the inherent limits to knowledge – his Nobel lecture is entitled ‘The Pretence of Knowledge’
- So the views of three truly major thinkers in economics support the idea of behavioural economics applied to firms, the idea that firms may deviate systematically from the standard, rational profit-maximising model, and not simply because of information costs.
Challenges

“Simon and his followers produced many interesting results. But what is still lacking is a body of systematic theory that is as orderly and teachable as the neoclassical theory of the firm.” Harsted and Selten, ‘Bounded rationality models: task to become intellectually competitive’, *Journal of Economic Literature*, 51(2), 2013

- An argument is of course – we saw it above in the Azar article – that firms that fail to profit maximise have an increased probability of bankruptcy. So, in some evolutionary way, profit maximisation will become the predominant behavioural rule.

- This argument was discussed by Alchian in a brilliant article in 1950, one which predates by decades more recent evolutionary thinking. ‘Uncertainty, evolution and economic theory’, *Journal of Political Economy*. 
Alchian and the evolutionary argument

- Alchian puts forward a model – the paper is entirely in English, it is not formalised in maths – in which individuals adapt by imitation and trial and error:

- “In general, uncertainty provides an excellent reason for imitation of observed success. Likewise, it accounts for observed uniformity among the survivors, derived from an evolutionary, adopting, competitive system employing a criterion of survival, which can operate independently of individual motivations. Adapting behavior via imitation and venturesome innovation enlarges the model. Imperfect imitators provide opportunity for innovation, and the survival criterion of the economy determines the successful, possibly because imperfect, imitators.”
The evolutionary argument

- Alchian himself considers what happens when the external environment is subject to permanent, rapid change: “The above convergence conditions do not apply to a changing environment, for there can be no observable comparison of the result of an action with any other. Comparability of resulting situations is destroyed by the changing environment. As a consequence, the measure of goodness of actions in anything except a tolerable-intolerable sense is lost, and the possibility of an individual's converging to the optimum activity via a trial-and-error process disappears. Trial and error becomes survival or death.”

Some more empirical evidence

- Important empirical evidence is provided by, for example, Giovanni Dosi and his colleagues in Pisa. GDosi ‘Statistical regularities in the evolution of industries’, LEM working papers, 2005:
  - “the recurrent evidence at all levels of observation of inter-firm heterogeneity and its persistence over time“
  - “contemporary markets do not appear to be too effective selectors delivering rewards and punishments according to differential efficiencies”
Some implications

- An important implication is that we cannot use a ‘one size fits all’ model.
- Regulation becomes more difficult, in that the regulator has to understand – or at least try to understand - the different motivations and behaviours which operate in the relevant industry.
- There is no guarantee that the regulator will get this right.
- But the application of the standard profit-maximising model may very well not be relevant. The mere fact that the analytical apparatus exists and has been widely applied does not mean it is right to continue to do so.
- There may very well be a variety of possible outcomes, depending for example on who moves first.
- Harsted and Selten ‘The fundamental tool of neoclassical economics is an objective function that maps the space of all relevant decision variables into a real scalar ...... A principal characteristic of nearly all bounded-rationality and a few behavioural economic models is a decision process that does not map all of these variables into a scalar’
Background (1)

- A wide range of industries has experienced deregulation in recent years
  - Legislative e.g. energy supply
  - Technological e.g. Computing
  - Mixture of the two e.g. telecomms
Behavioural rules

- Agent and context heterogeneity means that we abandon claims to a general theory (maximising behaviour)

- Need to be justified with reference to evidence outside the model
Stylised facts

• In the industries mentioned above, we observe falls in the market price (and often an improvement in quality)

• But there seems little connection between the outcome for market price and the number of firms in the market

• There is little connection between the market share of the original incumbent and the outcome for market price

• Most new entrants fail
Overview of model

- A market with a single monopoly supplier
- An entry process for new firms is specified
- The process of gaining/losing market share is specified
- The process of reacting to competition is specified
- The process of how consumers choose suppliers is specified
Overview of model (2)

- The model starts with a monopolist offering a price of 1 and a quality of 1.

- The lowest possible price consistent with available technology and a normal profit is 0. For convenience, a lower value of the quality variable in the model corresponds to *better* actual quality, so the best quality also has value 0.

- Initially, the market price/quality is (1,1). A new equilibrium is eventually established at (p*, q*)
Overview of model (3)

- The model evolves in a series of steps
- In each step, firms may enter
- In each step, consumers may switch suppliers
- In each step, firms may adjust their \((p,q)\) offer to try to deal with competitors
Overview of model (4)

- Agents – consumers, firms – react to incentives
- Their information set is imperfect
- They are heterogeneous
- Although they intend to take decisions which increase utility, *ex post* this may not be the case
- A key feature of the model is time: we start in one equilibrium and move (eventually) to another. The model describes the steps by which this happens
Model rules (1)

- We specify the maximum number of firms, k-1, which can enter the market

- In step 1, one firm is chosen at random to enter the market

- A new market level of both p and q will be established

- In step 2 and all subsequent steps, each of the remaining firms decides whether to enter with probability equal to the average of the market \((p,q)\)

- So the lower is price and the higher is quality, the less likely it is that a potential entrant will actually enter

- Firms are never certain of the consequences of entering
Model rules (2)

- Each firm on entering gets access to a proportion of the total number of consumers.
- This is drawn at random from a uniform distribution on (0,1).
- In other words, only a proportion of consumers will be aware of the offer of any given firm.
- By definition, all consumers are aware of the monopolist.
- Consumers have imperfect information.
Model rules (3)

- Each consumer is allocated at random a weight, $w_i$, which expresses his/her preference between price and quality.

- In each step of the model, each consumer identifies the firm on his/her network with the best $(p,q)$ offer, given his/her preferences between price and quality.

- i.e. the consumer can only make choices amongst firms of which he/she is aware.

- The consumer switches to the best offer.

- But does so with a fixed probability, $s_i$.

- Consumers perceive different costs in acquiring information.
Model rules (4)

- Firms are aware of the \((p,q)\) offers of all other firms

- Each firm wants to move to the offer of the firm for which \(\omega p_i + (1 - \omega)q_i\) is minimised, where \(\omega\) is the average of the \(w_i\) across all consumers

- But it is only able to do so with fixed probability \(\varphi_k\), where this is drawn at random from a uniform distribution on \([0,1]\)

- Firms differ in their efficiency (G Dosi, ‘Statistical Regularities in the Evolution of Industries, 2005\)
Model rules (5)

- Firms are assumed to have fixed costs such that if a firm gets less than 1 per cent market share, it goes out of business.
- Model properties are invariant to this assumption (within reason).
• The next charts show the outcomes over 1,000 separate solutions of the model
• Illustrated with a maximum of 19 new entrants into the market
• Qualitatively robust with respect to distribution of switching propensity
Fig 2: Histogram of Average Price Outcomes After 40 Periods
Fig 3: Histogram of the Market Share of the Monopoly After 40 Periods
Some further properties

- On average, most new entrants into the market fail. 12.2 have no sales at all after 5 years (20 periods)

- This is compatible with the general evidence on firm entry (Carroll and Hannan *The Demography of Corporations and Industries*, Princeton University Press, 2000)

- A good approximation to the size distribution of the largest 8 firms after 40 periods is provided by a power law ($R^2 0.982$, exponent $-1.67$ s.e. 0.02)

- This is compatible with the empirical evidence (R.L. Axtell (2001), 'Zipf distribution of US firm sizes', *Science*, 293, 1818-1820)
Implications of model

- Competition is a dynamic and not a static process
- Competition essentially goes '1 then N'
Power networks

- Developed last year in conjunction with several of the companies and OFGEM
- Behavioural rules developed and refined through discussion
- Different corporate ‘types’
- The model and the types
- There are two behavioural characteristics:
  - Attitude to risk / penalty
  - Attitude to targets
Energy network model

- **Agents**
  - Networks
  - Regulator

- **Activity**
  - Expenditure
    - Set dependent upon behavioural characteristics
  - Spending impacts upon Outputs
  - Rewards/Penalties
    - Sets incentive structure
    - Sets targets for improvement

- **Outputs**
  - Efficiency
    - Efficiency impacts upon Price
  - Network reliability
  - Efficiency
    - Reputation is a function of outputs
    - Profit is: \((\text{Rewards} - \text{Penalties}) / \text{Spend}\)
  - Customer Service
    - Utility is a function of outputs
  - Environment

- **Outcomes**
  - Profits
  - Regulatory Reputation
  - Customer Utility
Final thoughts

- Firms and consumers do act with purpose and intent
- But in general the model of rational behaviour is not appropriate – a main reason being radical uncertainty
- One size fits all does not work
- Most existing regulatory policy is based on a view of the world which at best sees through a glass darkly