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# Economic Theory of the «Second Worst»

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Concepts like rational expectations, workable competition, bounded rationality and the second best are often used informally to suggest that imperfectly competitive market outcomes normally are very good and that it is sometimes appropriate to restrict competition further to achieve even better results. Paul Samuelson's optimal neoclassical analysis adds plausibility to the inference, but the presumption is profoundly misleading because real markets are bounded rational and corrupt. In Herbert Simon's satisficing framework expanded to include vicious behavior, second bests are more plausibly interpreted as «second worsts» and comparative merit must be determined with Abram Bergson's social welfare functions rather than by appeal to the Pareto ideal.

***Key words***: bounded rationality; second best; economic coercion; second worst; inclusive economic theory; social welfare.

**JEL Classification**: D5, D6.

## Introduction

Faith in the cogency of neoclassical economic premises, the theory's logical consistency, comprehensiveness, predictive power and normative merit run very deep among economists. Many find it difficult to believe that individuals, groups, authorities and policymakers significantly and persistently «misbehave»[1]. This faith holds both for idealist neoclassical optimization theory pioneered by Paul Samuelson where individuals are assumed to possess comprehensively well-defined preference functions, perfect information, perfect computation and per-

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[1] There are many exceptions. For example, see: [Marglin, 2008; Sen, 2010; Stiglitz, 2002].

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fect analytics[2] as well as realist «satisficing» variants developed by Herbert Simon that relax these stringent assumptions (realism) [Simon, 1955; 1957; 1990, pp. 1665–1668; 1991, pp. 125–134; Gigerenzer, Selten, 2002; Rubinstein, 1998; Tisdell, 1996; Kahneman, 2003, pp. 1449–1475]. Both approaches in accordance with their Enlightenment origins presume that people are comprehensively rational and virtuous [Rosefielde, Pfouts, 2014]. Businesses may try to augment profits by manipulating supply, but Adam Smith's invisible hand limits their success. Coercion and government collusion likewise are disregarded in both neoclassical models. Individuals, groups, authorities and policymakers know that people aren't comprehensively rational, virtuous, honest and self-restrained, nonetheless the neoclassical vision inclines them to believe that willfulness, power, and unscrupulousness when they occur are secondary; that they take a back seat to competitive individual utility-seeking.

Samuelson's and Simon's disciples often believe that things are as they ought to be [Voltaire, 1759]. Or, if people don't act according to the axioms of competitive rational choice, they should. It is easy to sympathize with this position. Few people admit that they lack complete, well-formed preferences; that they erratically shop and choose impulsively. Few people acknowledge that they are sometimes unscrupulous or power-hungry. Authorities never admit that they subordinate the people's interests to their own private advantage.

It will be shown however that while neoclassical theory is an indispensable analytic tool, the conventional interpretation of outcomes tend to be seriously misleading because it doesn't adequately identify the shortcomings of private sector behavior and public policy actions even when bounded rationality is taken fully into account. Ludwig Wittgenstein would classify Samuelson's idealist optimizing version of neoclassical economic theory as a tautology because its predictions follow from its premises; not from a careful and complete modeling of real behavior[3]. Inclusive economic theory which explicitly incorporates «neorealist» variables

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[2] Samuelson P. *Foundations of Economic Analysis,* Cambridge: Harvard University Press, 1947. Samuelson was one of the first economists to generalize and apply mathematical methods developed for the study of thermodynamics to economics. His Foundations of Economic Analysis is based on the methods of American thermodynamicist Willard Gibbs, specifically Gibbs' 1876 paper «On the Equilibrium of Heterogeneous Substances». See: [Samuelson, 1990, pp. 255–267]. Samuelson also adopted the techniques of Henri Louis Le Chatelier (Le Chatelier principle) in the Foundations to introduce comparative statics into economic microtheory. See: [McCauley, 2003, pp. 199–212].

[3] Idealist neoclassical theory essentially is a beguiling logical tautology in Ludwig Wittgenstein's demanding sense (given its premises, true under all circumstances; it cannot be negated). Pareto optimality assumes that everyone is comprehensively rational and omni-competent, and then gives its claims a scientific patina by analytically deducing from the construct's premises that outcomes are ideal (everyone maximizes his or her utility within the constraints of voluntary exchange. Idealist neoclassical theory is empirically testable, but results are mixed. The disconfirmation is widely disregarded while maintaining the fiction that Pareto analysis is behaviorally true. Idealist neoclassical theory should be more accurately called neoclassical «tauto-nomics». Perhaps Samuelson grasped the nuance in titling his magnum opus *Foundations of Econonmic Analysis*. Ludwig Wittgenstein, «Logisch-philosophiche Abhandlung», Annalen der Naturphilosophie (Leipzig), vol. 14, 1921, pp. 185–262, reprinted in English translation as Tractatus logico-philosophicus, New York and London, 1922. Rhetorical tautologies state the same thing twice, while appearing to state two or more different things; logical tautologies state the same thing twice, and must do so by logical necessity. The inherent meanings and subsequent conclusions in rhetorical and logical tautologies or logical necessities are very different. By axiomatic neces-

(like willfulness, power-seeking, unscrupulousness and corruption) together with idealist and realist axioms redresses the omission, transforming the tautological aspects of neoclassical economics into a behaviorally accurate, testable, scientific theory[4]. Inclusive economic theory doesn't square the circle by creating a unified rationalist construct because neorealist elements aren't rational in the required neoclassical sense[5], but does show that bad behavior often diminishes the public good whether viewed from the perspective of a corrupted competitive process or less vicious «second worst»[6].

## Second Best

Economists have always known that willful, power-seeking, unscrupulous and corrupt people can act economically on their own behalf[7], and that their misconduct often damages the public good [Hayek, 1949]. Nonetheless, concepts like the «second best»[8] and «satisficing» [Simon, 1955, 1957] have tended to lull economists and the public into believing that rationality minimizes misbehavior[9], and that competitiveness assures that private and public policies are mostly virtuous [Smith, 1776]. Therefore, it is important to appreciate that much of what passes for neoclassical bounded rational behavior isn't authentically second best in any coherent sense. It is vicious or perhaps «second worst» because willfulness, power-seeking, unscrupulousness and corruption enable influential market participants and governments to better

sity, logical tautologies are neither refutable nor verifiable under any condition. Herbert Simon's realist (behavior) neoclassical theory often is constructed from controlled behavioral experiments and therefore constitutes theory rather than tautology.

4 [Rosefielde, Pfouts, 2014]. The term inclusive economics is used by other authors to mean different things. The OECD uses it as concept supporting the claim that NGOs and other local organizations enhance market performance. See: *The Social Economy: Building Inclusive Economies*, http://www.oecd.org/regional/leed/thesocialeconomybuildinginclusiveeconomies.htm The nascent inclusive economics literature is very soft, consisting mostly of admonitions to integrate ethics into neoclassical theory, and embrace the concept of wellbeing in lieu of utility, without adding anything substantial to the established body of normative theory. There have been no attempts to construct a fully integrated body of neo-realist economic theory of the sort developed in this treatise. See: http://www.stwr.org/economic-sharing-alternatives/when-growth-is-empty-towards-an-inclusive-economics.html [Rauniyar, Kanbur, 2010, pp. 437–469].

5 People frequently bargain and cut costs even when they are buying dis-preferred goods and producing the wrong products; that is, behaving Pareto inefficiently. A unified field theory in physics refers to the possibility of incorporating all fundamental forces and elementary particles in a single field. The term was coined by Albert Einstein who sought to unify the general theory of relativity with electromagnetism. He failed, and no one else has succeeded.

6 Gongloff M. Janet Yellen: Rising Income Inequality Could Seriously Harm The U.S. Economy. *Huffington Post*, November 5, 2014. http://www.huffingtonpost.com/2014/10/17/janet-yellen-inequality_n_6002774.html

7 The Philosophes were wrong.

8 [Lipsey, Lancaster, 1956, pp. 11–32]; Making the Second Best of it, *Economist*, August 21, 2007. http://www.economist.com/blogs/freeexchange/2007/08/making_the_second_best_of_it

9 See: Kant I. *Groundwork of the Metaphysic of Morals* (1785); *Critique of Practical Reason* (1788); and *Metaphysics of Morals* (1797); Sandel M. *Justice: What is the Right Thing to Do?* New York: Macmillan, 2010.

themselves at the expense of others. The true merits of alleged «second bests» should not be presumed. They must be assessed with normative methods [Bergson, 1938, pp. 310–334; 1966; Arrow, 1963; Suzumura, Arrow, Sen 2002].

## Bounded Rational «Second Best» and «Second Worst»

The distinction between Herbert Simon-type bounded rational «second bests»[10], and «second worst» private and public policy can be clarified by investigating the difference between good and bad behavior in bounded rational enterprise «satisficing» spaces, or attractors. Virtuous neoclassical managers will move toward a satisficing space and once they operate in the attractor they will continue to do so efficiently until conditions change, whereas managers miss motivated by willfulness, power-seeking, unscrupulousness and corruption are free to operate outside the attractor or at inferior points within it. Unscrupulous and corrupt managers 1) coercively distort the attractor and acquire unearned profits, revenues, incomes rents and transfers. Willful and power-seeking agents 2) operate sub-optimally within the attractor, or outside of it. When the axioms that support «second best» claims are violated, results may be «second worst». The virtuous bounded rational outcome is corrupted by coercion and rendered vicious (a satisficing worst). The introduction of another distortion could be Pareto improving, resulting in a «second worst»[11].

Bounded rational outcomes can be construed as Simon «second best» or «second worst», but never Samuelson ideal. This means that no equilibrium, unique or otherwise, can be deduced from first principles for any competitive groups or for their members. The same conceptual framework applies to consumption under conditions of local non-satiation [Rosefielde, Pfouts, 2014].

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[10] Richard Lipsey and Kelvin Lancaster defined the second best with respect to an optimal solution marred by a single distortion. They argued that the introduction of a second distortion could be Pareto improving. Hence the term «second best». The analysis developed in this paper focuses on the Simon-type bounded rational second best rather than Lipsey's and Lancaster's special case because the Simon approach is more general. A Simon-type second best has the same logical structure as Lipsey's second best. If there is a market distortion that prevents managers from achieving a first best bounded rational satisficing solution, the introduction of a second distortion could be Pareto improving [Selten, 2002]. Selten has pointed out, «A comprehensive, coherent theory of bounded rationality is not available. This is a task for the future». We do not have a theory whose axiomatic basis enables us to deduce implications of the theory in mathematical form. Simon described human reasoning as follows: We know today that human reasoning, the product of bound rationality, can be characterized as selective search through large spaces of possibilities. The selectivity of the search, hence its feasibility, is obtained by applying rules of thumb, or heuristics, to determine what paths should be traced and what ones can be ignored. The search halts when a satisfactory solution has been found, almost always long before all alternatives have been examined [Simon, 1992].

[11] There are no unique bests and worsts in a bounded rational universe. Best and worst must be construed both with respect to participant's choice and the assessment of an external judge [Bergson, 1938, pp. 310–334]. Paradoxically, a partial improvement in competitiveness under administrative command planning instead of making the vicious (satisficing worst) case Pareto superior, could make it Pareto inferior. See: [Gang, Tower, 1988, pp. 189–191].

## Attractors and Bounded Rationality

To better appreciate why Simon type bounded rational outcomes can be either «second best» or «second worst», let us consider the choice problem between maximizing sales and profits posed by William Baumol in a comparative static[12], bounded rational universe that precludes ideal optimization of both the perfectly and transitorily imperfectly competitive types [Baumol, 1959]. Baumol, on the basis of his consultant experience concluded that «optimizing» businessmen (firm managers) in monopolistic enterprises were more interested in maximizing sales than profits once an acceptable level of profit had been attained, prompting him to infer that they wanted to maximize revenue subject to a profit constraint. Since this also requires knowledge of product and factor demand equations it cannot be done ideally, but it is possible for a firm by lowering price to increase revenue and thus perhaps increase market share[13].

Consider a limited plane space denoted by $\Gamma$ and a subspace within $\Gamma$ denoted by $\Omega$. We also consider a type of motion that takes place within $\Gamma$. If motion of this type starts within $\Gamma$ but not within $\Omega$ and always ends within $\Omega$, then $\Omega$ is an attractor. We will return to this definition after developing an example devised by Edward Beltrami [Beltrami, 1987, p. 208].

Figure 1 depicts the non-ideal (and imperfectly competitive) consumer product demand and producer factor cost curves of a monopolistic firm. It can be estimated, but for practical and econometric reasons, the monopolistic firm knows that it is unreliable. Ideal Samuelson type demand curves don't exist.

$p_1$ and $p_2$ are the implied (but non-determinable) ideal (or short run imperfectly competitive ideal) profit maximizing and revenue maximizing prices respectively. Suppose the firm, unable to locate $p_1$ and $p_2$ set the price $p^*$ above the profit maximizing price. The management may find that this price is too high evaluated from the standpoint of bounded rational

[12] For a semi dynamic extension see [Rosefielde, Pfouts, 2014, appendix 4]. Dynamic analysis adds valuable insights, but doesn't alter the conclusion that when the axioms of virtuous rationality underlying Simon's neoclassical «satisficing» construct are violated, outcomes cannot be «second best» in a narrow technical sense, and in the real world are likely to be very bad.

[13] There are at least three definitions of market share-profit share, output share, and revenue share. Maximizing profits is consistent with maximizing profit share, so no conflict between firm behavior and the assumption of profit – maximization arises. Output share is subject to an «apples and oranges» problem because the products of different firms may be heterogeneous with regards to design and, as perceived by buyers, quality. Therefore, in the formal model, it is assumed that market share is measured as the share of industry revenues. First, it sometimes happens that the volume of future sales depends on prior achieved levels. For example, the sale of razor blades often depends on the number of razors and therefore razor blades in use. Similarly adopting Word instead of WordPerfect should be preferable because Word's large market share allows users' greater scope for document sharing. Second, increasing market share may discourage would be competitors. If it appears that entrants might face stiff competition from dominant firms, prospective new entrants may decide that discretion is the better part of valor. Third managers may succumb to moral hazard placing their private interest above firm owners'. Managers are not «residual claimants» and therefore may be more interested in market share than profits because this usually increases their compensation [Berle, Means, 1932]. Fourth, large market share sometimes makes it easier to raise capital on private equity markets because investors equate size with success, or anticipate that lending to this type of firm will make it an attractive takeover candidate.

product demand and factor supply curves because the quantity sold is small and profits are not as large as expected. They may decide to lower the price a small amount. This will set a price nearer the bounded rational profit maximizing and the revenue maximizing price. Clearly this is a desirable result since both profit and revenue are larger.

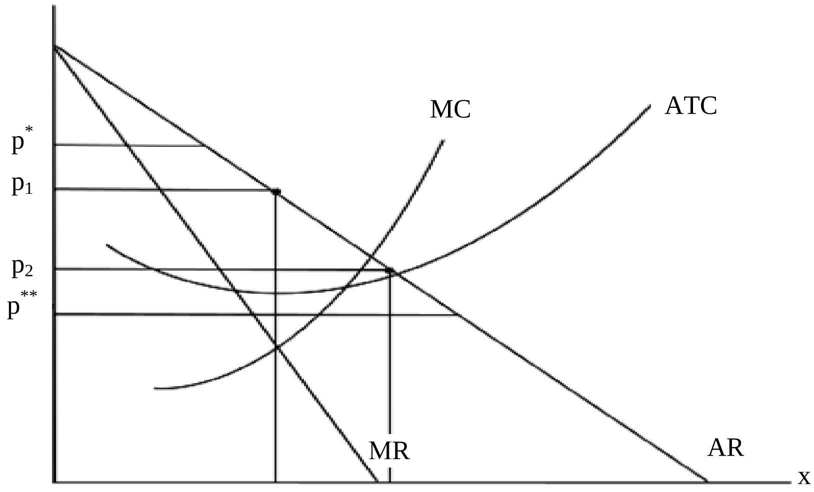


***Fig. 1***. Feasible Monopolistic Production

The success invites repetition that will continue until a price lower than $p_1$ but larger then $p_2$ is fixed. A further reduction will reduce profit and increase revenue. A price decrease no longer increases both. The firm is in its attractor.

If the firm had started with a price of $p^{**}$, price increases would raise both profit and revenue until the price had been raised above $p_2$. If the price is greater than or equal to $p_2$ and less than or equal to $p_1$ the firm is in the attractor.

It will set a price at or below the profit maximizing price and at or above the revenue maximizing price. In other words it will operate at one of the maximizing prices or at a price between them. If it sets prices outside this price interval it can increase both profit and revenue by moving toward the interval. This closed interval from $p_1$ to $p_2$ inclusive is the firm's attractor. The firm will always seek to operative within its attractor.

This example meets the definition of an attractor given above. The space Γ is the demand curve between intersections with the axis or other extreme points. The type of motion is changing the production level and the attractor, corresponding to Ω is the demand curve from and including $p_1$ to $p_2$.

Why should a monopoly care about revenue and satisfying? Shouldn't it care only about profit? Not necessarily because satisficing discourages potential completion.

Although the firm does not know the precise location of either the ideal or the bounded rational demand curve, it can find out when it is in the attractor by varying its price. If profit and revenue change in the same direction it is not in the attractor. If they change in opposite directions or if one objective does not change they are in the attractor. These points may easily be verified by reference to Fig. 1.

If the firm is in its attractor and lowers its price, with the lower price also within the attractor, it will increase revenue and lose profit. Revenue will increase because bounded rational demand is elastic (marginal revenue is positive) in the attractors. Profit will decline to the right of the profit maximizing price marginal cost because margin cost in this region is greater than marginal revenue.

On the other hand if the firm when it is in the attractor raises its price, the new price also being in the attractor, revenue will decline and profit will increase. Revenue will decline with the higher price because demand is elastic. Profit will increase because selling fewer units lowers cost, and since marginal cost is greater than marginal revenue, profit will increase. These points may be verified by reference to Fig. 1.

The behavioral rules of thumb here are straightforward. If a price change causes both profit and revenue to increase, firms should change price again in the same direction. If a price change causes both profit and revenue to decrease, firms should change price in the opposite direction. If a price change results in either profit or revenue increasing while the other decreases, the firm in the attractor must decide which goal is best. If either profit or revenue remains the same and the other one increases, the firm is at or near the maximum point for the unchanged objective. Again a decision is required.

Suppose that the monopolist's worst fear is realized and a competing firm enters the market. This alters the original firm's estimated demand equation and the estimated demand curve will shift each time that the competitor changes its price. Thus the attractor changes with the competitors' price changes. But the attractor still remains attractive. Following its self-interest will still lead the firm toward and into the new attractor. In short, satisficing supply side theory shows that monopolistic firms (and competitive ones too) can behave diversely in what seems to be ideally rational ways without nudging the state of the system toward ideal competitive or imperfectly competitive equilibrium. It could be true that each firm may believe that it is optimizing, but Baumol fails to adequately appreciate that this cannot be so for the ideal system in its entirety. Suppliers under this sort of regime are responsive to bounded rational consumer demand, and don't have any ideally reliable way of choosing between profit and market share maximizing[14].

## Firm Revenue and Profit in a Competing Group

Let us now consider the general case of rival, not necessarily identical firms. Assume that the number of firms is small enough so that each firm can affect the market by changing its price, but there is more than one firm. A bounded rational product demand equation exists for each firm but no firm knows it with precision. The same principle holds for primary and intermediate factor supply curves behind the scenes.

A product demand equation for each of the n firms in the competing group can be formulated as:

$$x_i = f(p_1, \ldots, p_n, m), \quad \forall_{i=1}^{n}.$$

[14] The same problem held in a more extreme form in Soviet enterprises, see [Rosefielde, 2007].

Where $x_i$ is the quantity sold by the ith firm, the $p$'s indicate the prices charged by the firms and m indicates the income of the buyers. We also specify that $\frac{\partial x_i}{\partial p_i} < 0,\ \frac{\partial x_i}{\partial p_i} > 0,\ j \neq i,$ and $\frac{\partial x_i}{\partial m} > 0.$ Because buyer's income is exogenous to the market and we are interested in interactions within the market we will ignore income terms.

Each firm is interested in revenue because it contributes to profits and market share. Revenue for firm is

$$R_i = p_i x_i.$$

Firms that are interested in gaining market share will try to increase revenue by lowering their prices. The change can be shown as[15]:

$$dR_i = x_i dp_i + p_i \frac{\partial x_i}{\partial p_i} dp_i + \sum_{k \neq i} \frac{\partial x_i}{\partial p_k} dp_k. \qquad (1)$$

Income terms are ignored because we assume that demand is elastic for small competitive firms. Note that if price is reduced by firm *i*, the first term on the right will be negative but the second term will be positive. The second will be larger in absolute amount if and only if the firm is operating at a point at which its demand is elastic in its attractor.

The summation in (1), the third term on the right, shows the effect on firm *i*'s revenue of price changes by competing firms. Clearly this summation must be considered when the firm is trying to anticipate the effects of its own price change. If the firm lowers its price to increase revenue or increases its price to increase profit, the summation of the effects of other firms' price changes may offset its effort in whole or in part. Of course, since the firm does not know its demand equation it does not know the mathematical statement of the summation but it will know that the forces represented by the summation are operating even though it cannot measure their effects.

During the presentation and discussion of the attractor it was assumed that if the firms are in their attractors and if $dp_i < 0,$ then $dR_i > 0;$ i.e. that other firms' price changes effect the firm's revenue but do not offset completely the effect of the firm's own price change on its own revenue when firm *i* is in its attractor. This permits the firm to set prices with the direc-

[15] Many of the relationships that will be developed could be stated in elasticity terms. E.g. if $dp_i < 0$ and $dR_i > 0$ then using (1) we can easily obtain

$$(1 + \varepsilon_{ii}) \frac{dp_i}{p_i} > \sum_{k \neq 1} \frac{dp_k}{p_k}.$$

Here $\varepsilon_{ii}$ is good *i*'s own price elasticity coefficient and $\varepsilon_{ik}$ is the cross elasticity of *i* with respect to the price of good *k*. It seems more straightforward to use price and quantities rather than elasticity coefficients.

tion of the result being the same in the absence competitors. Of course the magnitude of change will vary with competitors' actions, but the direction will not. The effects of price changes on competitors' revenues are discussed elsewhere [Rosefielde, Pfouts, 2014, appendix 4]. It also can be argued that $dp_j < 0$ implies $dR_i > 0$ will often be empirically accurate.

To deal with profit we introduce cost. The total cost for firm is shown by

$$k_i = k_i\left(x_i, w_1, \ldots, w_q\right),$$

while incremental cost is

$$(2) \qquad dK_i = \frac{\partial K_i}{\partial x_i} \cdot \frac{\partial x_i}{\partial p_i} dp_i + \frac{\partial K_i}{\partial x_i} \sum_{k \neq i} \frac{\partial x_i}{\partial p_k} dp_k.$$

The w's being the prices of factors of production, which we assume to be constant throughout our discussion. Also $\frac{\partial K_i}{\partial x_i} > 0.$

Profit can now be write be written as

$$\pi_i = p_i f_i\left(p_i, \ldots, p_n, m\right) - K_i\left(x_i, w_i, \ldots, w_q\right).$$

Ignoring income effects as before, we write the profit differential as

$$(3) \qquad d\pi_i = x_i dp_i + p_i \frac{\partial x_i}{\partial p_i} + p_i \sum_{k \neq i} \frac{\partial x_i}{\partial p_k} dp_k - \frac{\partial K_i}{\partial x_i} \frac{\partial x_i}{\partial p_i} dp_i - \frac{\partial K_i}{\partial x_i} \sum_{k \neq i} \frac{\partial x_i}{\partial p_k} dp_k$$
$$dK_i - dR_i,$$

or as

$$d\pi_i = x_i dp_i + \left(p_i - \frac{\partial k_i}{\partial x_i}\right) \frac{\partial x_i}{\partial p_i} dp_i + \left(p_i - \frac{\partial k_i}{\partial x_i}\right) \sum_{k \neq i} \frac{\partial x_i}{\partial p_k} dp_k.$$

The effects of competitor's price changes on profits also must be considered. Just as it was assumed in the revenue case that $dp_i < 0$ implies $dR_i > 0$, it can be assumed likewise that $dp_i > 0$ implies $d\pi_i > 0$ [Rosefielde, Pfouts, 2014, appendix 4]. It can be argued that the assumption often will be valid.

## The Attractor[16]

As in the case of a simple monopoly, the attractor is the range of product prices and values bounded by the profit maximizing price and the revenue maximizing price for each firm.

[16] The attractors that we derive are not «strange attractors». The latter require the presence of a fractal and sensitivity to initial conditions. Our attractors do not meet either of these requirements.

Let $\overline{p}_1$ be the profit maximizing price, then according to (3) this is the price at which $dR_i = dK_i$. Since this is the profit maximizing point, at a price higher than $\overline{p}_1$ $dR_i > dK_i$. Thus if the firm lowers its price but still has a price higher than $\overline{p}_1$, it increases revenue and profit. At a price lower than $\overline{p}_1$ but still in the attractor, we have $dR_i > dK_i$. Thus revenue has increased because price is lower but cost has increased even more. Consequently profit is reduced.

As price is lowered from $\overline{p}_1$ revenue will increase by smaller and smaller amounts until $dR_i = 0$, which locates the price, call it $\hat{p}_1$ at which revenue is maximized.

Thus we have $\overline{p}_1$ the highest point of firm *i*'s attractor and $\hat{p}_1$, the lowest. For points outside the attractor, prices higher than $\overline{p}_1$ or lower then $\hat{p}_1$, a price move toward the attractor increases both revenue and profit. Such a move generates $d\pi_i dR_i > 0$. Within the attractor, i.e. at prices between $\overline{p}_1$, and $\hat{p}_1$ inclusive, a price decline increases revenue and increases cost more than revenue, thus lowering profit. For a price increase within the attractor, revenue decreases but cost decreases even more thus increasing profit. Hence for either a price increase or decrease in the attractor, $d\pi_i dR_i \leq 0$.

The heuristics are the same as in a monopoly case. The question of whether all firms can be in their attractors at the same time is critical because satisficing theory depends on all firms seeking their attractors and remaining in them. It is analogous to the general equilibrium question: Can all firms optimize simultaneously? The issue for bounded rationality is whether all firms can reach satisfactory levels simultaneously.

To answer the question, recall that in a firm's attractor incremental cost and incremental revenue are equal only at the profit maximizing point, the attractor's highest point. At all other points in the attractor incremental cost is positive and larger than incremental revenue.

In turn incremental revenue is positive at all except the lowest point of the attractor at which it is zero. This last is the revenue maximizing point.

Consequently the attractor can be described by the following statements:

$$\begin{aligned} &dK_i > 0, \\ &dR_i \geq 0, \\ &dk_i - dR_i \geq 0, \quad \forall_{i=1}^{n}. \end{aligned} \tag{5}$$

The first two inequalities assure that the equality in (5) will hold only when, $dK_i = dR_i$, i.e. only at the profit maximizing point the highest point in the attractor. At other points, $dK_i > dR_i$.

The second inequality requires that $dR_i = 0$ only at the revenue maximum. This is the lowest point in the attractor. Beyond this point, at lower prices, $dR_i < 0$. Thus we have a description of the attractor in the inequalities written above. The only remaining question is whether (5) can hold for all firms at the same time. To answer this question we need to examine the inequalities,

$$dK_i - dR_i = \frac{\partial K_i}{\partial x_i}\frac{\partial x_i}{\partial p_i}dp_i - \frac{\partial K_i}{\partial x_i}\sum_{k\neq i}\frac{\partial x_i}{\partial p_k}dp_k - x_i dp_i - p_i\frac{\partial x_i}{\partial p_i}dp_i - p_i\sum_{k\neq i}\frac{\partial x_i}{\partial p_k}dp_k \geq 0,\quad \forall_{i\neq 1}^{n}.$$

We simplify the notation:

$$a_{ii} = \frac{\partial K_i}{\partial x_i}\frac{\partial x_i}{\partial p_i} - x_i - p_i\frac{\partial x_i}{\partial p_i},$$
$$a_{ij} = \frac{\partial K_i}{\partial x_i}\frac{\partial x_i}{\partial p_i} - p_i\frac{\partial x_i}{\partial p_j}$$

and form the matrix

$$A = \begin{vmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{vmatrix}.$$

Which we will argue is non-singular.

Now the inequality in (5) can be shown as

$$\begin{vmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{vmatrix}\begin{vmatrix} dp_1 \\ \vdots \\ dp_n \end{vmatrix} \geq 0$$

or as

(6) $$Adp \geq 0.$$

0 being the zero column vector.

To parse the subject further we rewrite (5) as

(7) $$Adp \geq \alpha.$$

Here $\alpha$ is a vector whose elements are either zeros or positive numbers. This is true because they are the differences between incremental cost and incremental revenue, in other words they satisfy (5) and consequently they cannot be negative. Each row in A represents the $dK_i, dR_i$ for each company; that is, each competitor is represented by a row in A. Since the competitors do not know their demand equations they cannot maximize profit exactly. Therefore, a zero will appear in $\alpha$ only when the firm has stumbled on the precise maximization of profit. Otherwise the elements of $\alpha$ are the positive differences between incremental cost and incremental revenue and (5) shows they will be positive. Even though they may not think of it this way every firm wants to be in its attractor. This is true simply because they can increase both profit and revenue by moving into their attractor. But what do they do, once they are there?

A firm could increase price in an attempt to increase or even maximize profit. If profit is already judged to be satisfactory, this is likely to be unattractive because it involves shooting in the dark. That is the firm does not know its demand equation and it may not know how competitors will respond. Thus it faces two kinds of uncertainty about the outcome which makes price increases unattractive if profit is at an acceptable level.

If profit is judged to be meager, a price increase might be considered especially if the firm's price appears low in comparison to competitors. But this also involves shooting in the dark and carries with it a loss of revenue and perhaps market share. Price increases are likely to be undertaken with caution.

It is not unusual for the senior executives of a company to speak publically about their uncertainty about whether they should raise price and thus increase profit, or lower price to increase market share. In each case they are contemplating the anticipated outcomes is in their attractors.

The firm could consider a price decrease to bolster market share. This however is shooting in the dark and risks a price war. Price competition and price changes generally therefore are likely to be undertaken with caution, except in special types of markets.

Advertising may offer an alternative to price competition. Unfortunately it is often futile because competitors respond in kind, even though firms may feel compelled to advertise for defensive reasons. Curtailing or shunning advertising may appreciably reduce sales.

Price changes and advertising are short-run moves and consequently are limited in their ability to change the attractors of the firms even though each firm may want to change its own and its competitors' attractor to win its rivals' expense. Price changes will not do this and advertising is unlikely to be predictably more effective.

## Unscrupulous Private Agents and Public Policymakers

The attractor illustrated in Fig. 1 is confined to the range of product prices and values bounded by the profit maximizing and revenue maximizing prices because competition limits managers degrees of freedom. Unscrupulous and corrupt managers (like the mafia) by contrast have more choice because they can control prices, marginal revenues and marginal costs with coercive methods, and can expand their options further by colluding with public policymakers (non-competitive state contracts, subsidies, transfers, rents, mandates and executive orders). Power-seeking and willful managers who may neither be profit nor revenue maximizers under bounded rational constraint can operate at suboptimal points inside or outside the attractor on a transitory basis or permanently with government support. Consequently, satisficers in the bounded rational universe don't have to operate as «second best» managers. If they are willful, power-seeking, unscrupulous and corrupt outcomes often will be vicious, Pareto inferior and «second worst». They do not have to operate profitably, or even minimize loses because powerful private actors can enrich themselves at their firm's expense, and public policymakers can subsidize their activities out of general and specific tax revenues, impose mandates, issue executive orders, and government purchase contracts on any terms they desire. Consequently in these cases, neither private enterprise, nor public policies will be «second best» in any meaningful neoclassical sense whenever objective functions and methods lie outside the virtuous axiomatics of Baumol's neoclassical bounded rational framework[17]. Corporate directors and public policymakers of course always claim that their actions are «second best» (they do the best that can be done within the restrictions of bounded rationality, market competition, planning and competent administration), but whenever insiders serve themselves first and the consumers last, outcomes are apt to be «second worst» (Pareto inferior).

## «Second Worst» American Public Policy

There are countless vicious «second worst» cases where private executives and public policymakers serve themselves first and the people last. A single American example suffices. It is widely accepted that the 2008 global financial crisis was triggered by Washington's desire to provide homes to minority owners who could not afford them [Wallison, 2015]. The goal was accomplished by inducing private banks to issue subprime loans without charging adequate risk premiums through mortgage sales to the Federal National Mortgage Association, a government sponsored enterprise[18]. The government in effect altered private bank attractors by subsidizing bad loans. This motive, regardless of its merit, distorted the Baumol attractor. Public policymakers disregarded the requirements of Simon-type neoclassical, bounded rational satisficing, creating a speculative bubble in the process by making it seem that there were no limit to the amount of subprime debt banks originated.

The scheme policymakers devised provided residential real estate developers with disguised federal subsidies for new homes. Real estate agents received subsidized commissions for selling old units. Mortgage lenders offered loans to credit-unworthy borrowers in return for round-about federal compensation, including regulatory authorization to sell subprime mortgages to third party investors. Wall Street made immense underwriting profits from packaging an ever expanding supply of high risk subprime mortgages, sprinkled with a few sound ones, and was glad to have the government stoke a real estate bubble allowing the financially nimble to make windfall gains. Federal housing bureaucrats enjoyed expanding their supervisory, administrative and regulatory empires, and politicians received laundered (corrupt) compensation in multiple forms for providing subsidies, supplemented with the electoral benefits of claiming to have devised cost-free assistance to the disadvantaged.

The scheme was shrewdly designed to conceal the costs by funding them with insurance guarantees and indirect inflation taxes, and by shifting the remaining burden to those ultimately stuck with massive financial losses, including future generations obligated to pay the ever mounting federal debt and forego retirement[19]. It also ignored catastrophic national risk,

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[17] The same principle applies for other Simon-type bounded rational cases.

[18] Subprime refers to mortgages issued to borrowers with poor credit credentials who normally wouldn't qualify for loans at the competitive rate because their income prospects were poor or uncertain, or their credit histories unsatisfactory [Rosefielde, Mills, 2013]. The probability of default is at least six times higher for nonprime loans than prime loans [Chomsisengphet, Pennington-Cross, 2006, pp. 31–56; Pennington-Cross, 2003, pp. 270–301].

[19] Kadet A. Working 9 to 5 – at 75: How the Fastest Growing Group in the American Work force is Changing What it Means to be 'Retired'. Wall Street Journal, March 21, 2012. «The number of working people over

placing insider gain above the people's will and welfare. The results were predictable and were predicted [Shiller, 2000; Barth, Li, Phumiwasana, Yago, 2008; Chomsisengphet, Pennington-Cross, 2006, pp. 31–56], but few participants were chastened because they bet correctly on winning themselves, and leaving the debt baby to others [Shiller, Akerlof, 2009].

The global financial crisis of 2008 struck when it became clear that subprime mortgage-backed securities (MBS) and collateralized debt obligations (CDO) were ripe for default after the housing sector slumped 2006–2007. Major financial institutions went bankrupt or had to be bailed out, and the stock market crashed. Total losses from the subprime prime mortgage fiasco cannot be finely calibrated because they depend on the time frame chosen and cannot be precisely separated from other contributing factors. Nonetheless, the figures in the real estate sector run well into the trillions.

Four million two hundred thousand properties were foreclosed in America 2007–2008, at an average cost of 225,000 dollars (the average home mortgage cost during the real estate boom), summing to nearly 1 trillion dollars, with 10 million more foreclosures forecast through 2012[20]. The disadvantaged minorities that the Federal National Mortgage Association claimed it was serving have been disproportionately harmed because of their large presence in the subprime mortgage market. The subprime mortgage and MBS crises also contributed substantially to collateral damage in the wider national economy. Unemployment ran about 5 million above normal 2008–2012; interest income earned by retirees dwindled to almost nothing, and the national debt more than doubled.

Clearly, the satisficing behavior of America's mortgage lending and mortgage backed securities firms was not Simon efficient. It was warped by the government's high risk indirect subsidization scheme that transformed what should have been a benign «second best» result into a virulent «second worst» outcome. The subprime mortgage debacle was «second worst» because contrary to neoclassical theory, human motivation wasn't always virtuous, competitive and rational. The lesson for analysts at a sophisticated theoretical level is *caveat emptor*. The presumption that markets and governments are bounded rational efficient is behaviorally implausible and scientifically invalid.

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## References

Arrow K. (1963) *Social Choice and Individual Values*, 2nd ed. New York: Wiley.

Barth J., Li T., Phumiwasana T., Yago G. (2008) *A Short History of the Subprime Mortgage Market Meldown*, Milken Institute, 2008.

Baumol W. (1959) *Business Behavior, Value and Growth* (rev. ed.), New York: Macmillan.

Beltrami E. (1987) *Mathematics for Dynamic Modeling*, Boston: Academic Press.

Bergson A. (1938) A Reformulation of Certain Aspects of Welfare Economics. *Quarterly Journal of Economics*, 52, 1, pp. 310–334.

Bergson A. (1966) *Essays in Normative Economics*, Cambridge, MA: Harvard University Press.

age 65 reached an all-time low in 2001, when just 13 percent held a job. Now that rate is rebounding, and fast; last summer, it hit 18 percent, a level not seen since Kennedy faced the Cuban Missile Crisis».

[20] Colpitts M. Housing Predictor: 10 Million Foreclosures Through 2012, June 16, 2009, www.realtrac.com The forecast is realistic. There were 2.8 million foreclosures in 2009, and 3.8 million in 2010.

Berle A., Means G. (1932) *The Modern Corporation and Private Property*, New York: Macmillan.

Chomsisengphet S., Pennington-Cross A. (2006) The Evolution of the Subprime Mortgage Market. *Federal Reserve Bank of St.Louis Review*, 88, 1, January/February, pp. 31–56.

Gang I., Tower E. (1998) The Stahl-Alexeev Paradox: A Note. *Journal of Economic Theory*, 44, pp. 189–191.

Gigerenzer G., Selten R. (2002) *Bounded Rationality: The Adaptive Toolbox.* Cambridge: MIT Press.

Hayek F. (1949) *Individualism and Economic Order*, London: Routledge.

Kahneman D. (2003) Maps of Bounded Rationality: Psychology for Behavioral Economics. *The American Economic Review*, 93, 5, pp. 1449–1475.

Kant I. (2005) *Groundwork of the Metaphysic of Morals*, New York: Harper and Row Publishers.

Kant I. (2011) *The Critique of Pure Reason*, New York: Create Space Independent Publishing Platform.

Lipsey R., Lancaster K. (1956) The General Theory of Second Best. *Review of Economic Studies*, 24, 1, pp. 11–32.

Marglin S. (2008) *The Dismal Science: How Thinking Like an Economist Undermines Community*, Cambridge MA: Harvard University Press.

McCauley J. (2003. Thermodynamic Analogies in Economics and Finance: Instability of Markets. *Physica*, 329, pp. 199–212.

Pennington-Cross A. (2003) Credit History and the Performance of Prime and Nonprime Mortgages. *Journal of Real Estate Finance and Economics*, 27, 3, November, pp. 270–301.

Rauniyar G., Kanbur R. (2010) Inclusive Development: Two Papers on Conceptualization, Application and the ADB Perspective. *Journal of the Asia Pacific Economy*, 15, 4, pp. 437–469.

Rosefielde S. (2007) *Russian Economy from Lenin to Putin*, New York: Wiley.

Rosefielde S., Mills D.Q. (2013) *Democracy and its Elected Enemies: American Political Capture and Economic Decline*, Cambridge: Cambridge University Press.

Rosefielde S., Pfouts R.W. (2014) *Inclusive Economic Theory*, Singapore: World Scientific.

Rubinstein A. (1998) *Modeling Bounded Rationality*, Cambridge MA: MIT Press.

Samuelson P. (1990) Gibbs in Economics. *Proceedings of the Gibbs Symposium* (Providence, RI), pp. 255–267.

Sandel M. (2010) *Justice: What is the Right Thing to Do?* New York: Macmillan.

Selten R. (2002) What is Bounded Rationality? *Bounded Rationality: The Adaptive Toolbox* (eds. Gigerenzer G., Selten R.) Cambridge, MA: MIT Press.

Sen A. (2010) *The Idea of Justice*, London: Penguin.

Shiller R. (2000) *Irrational Exuberance*, Princeton NJ: Princeton University Press.

Shiller R., Akerlof G. (2009) *Animal Spirits: How Human Psychology Drives the Economy and Why It Matters for Global Capitalism*, Princeton, NJ: Princeton University Press.

Simon H. (1955) A Behavioral Model of Rational Choice. *Quarterly Journal of Economics*, 59, pp. 99–118.

Simon H. (1957) *Models of Man: Social and Rational-Mathematical Essays on Rational Human Behavior in a Social Setting*, New York: John Wiley.

Simon H. (1990) A Mechanism for Social Selection and Successful Altruism. *Science*, 250, 4988, pp. 1665–1668.

Simon H. (1991) Bounded Rationality and Organizational Learning. *Organization Science*, 2, 1, pp. 125–134.

Smith A. (1776) *Inquiry into the Nature and Causes of the Wealth of Nations*, London: W. Strahan and T. Cadell.

Stiglitz J. (2002) *Globalization and its Discontents*, London: Penguin.

Suzumura K., Arrow K., Sen A. (eds.) (2002) *Handbook of Social Choice and Welfare*, vol. 1, Amsterdam: Elsevier.

Tisdell C. (1996) *Bounded Rationality and Economic Evolution: A Contribution to Decision Making, Economics, and Management*, Cheltenham, UK: Brookfield.

Voltaire C. (1759) *Candide, ou l'Optimisme*.

Wallison P. (2015) *Hidden in Plain Sight: How the U.S. Government's Housing Policies Cause the Financial Crisis and Why it Can Happen Again*, New York: Encounter Books.

Wittgenstein L. (1922) *Tractatus Logico-philosophicus*, New York and London.