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## Article

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Economics: The Open-Access, Open-Assessment E-Journal

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*Suggested Citation:* Frey, Bruno S.; Gallus, Jana (2014) : Aggregate effects of behavioral anomalies: A new research area, Economics: The Open-Access, Open-Assessment E-Journal, ISSN 1864-6042, Kiel Institute for the World Economy (IfW), Kiel, Vol. 8, Iss. 2014-18, pp. 1-15, <https://doi.org/10.5018/economics-ejournal.ja.2014-18>

This Version is available at:

<https://hdl.handle.net/10419/97028>

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# Aggregate Effects of Behavioral Anomalies: A New Research Area

*Bruno S. Frey and Jana Gallus*

## Abstract

Much recent research in economics focuses on exploring behavioral anomalies, i.e., systematic deviations from the assumptions of the rationally self-interested model of man. Laboratory studies are used to identify seeming inconsistencies with micro-economic theory on the level of individuals. Since economics is a social science, this article proposes that the next crucial step consists in shifting the focus to the macro-level. It examines the process through which behavioral anomalies are aggregated to a societal outcome. Since individuals are reactive when they interact with others and face institutional constraints, the aggregation process may lead to different outcomes than what has been observed in individual-level studies: the respective anomalies may disappear, or they may become stronger on the macro-level. The discussion demonstrates that there are a great number of aspects to be analyzed. The paper presents fragments of what could become a more extensive field of research.

Published in Special Issue [Economics, Psychology and Choice Theory](#)

**JEL** A10 B00 D70

**Keywords** Economics and psychology; behavioral economics; behavioral anomalies; reactivity

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*The authors are grateful for most helpful comments by Reto Cueni.*

**Citation** Bruno S. Frey and Jana Gallus (2014). Aggregate Effects of Behavioral Anomalies: A New Research Area. *Economics: The Open-Access, Open-Assessment E-Journal*, Vol. 8, 2014-18. <http://dx.doi.org/10.5018/economics-ejournal.ja.2014-18>

Received September 3, 2013 Published as Economics Discussion Paper September 25, 2013

Revised January 13, 2014 Accepted April 2, 2014 Published April 5, 2014

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## 1 Great Advances

The field of “Economics and Psychology”, often somewhat misleadingly called “Behavioral Economics”,<sup>1</sup> has made considerable progress over the last decades. It is often understood to be intimately connected with laboratory experiments. The number of studies emanating from the laboratories that were established in many universities is stunning. A specialized journal was founded (called *Experimental Economics*); and, more importantly, lab experiments have entered the general economics journals in great numbers.

A major subject of study in the lab are the systematic (i.e. non-random) deviations from the assumptions of micro-economic theory. These have been called “behavioral anomalies” and are understood to reflect irrationality by individuals. Examples are: anchoring effect (social states are evaluated from a particular starting point, the choice of which influences behavioral outcomes); endowment effect (goods in a person’s possession are valued more highly than those not held in the endowment); opportunity cost effect (an out of pocket monetary cost is given greater weight in the decision calculus than an opportunity cost of the same size); framing effect (the way a decision problem is formulated and the way the information is presented affect individual decisions); overconfidence effect (people are convinced that they know observable facts better than is actually the case).<sup>2</sup>

The results on anomalies are partly due to studying the behavior of subjects under tightly controlled laboratory conditions. The findings have by now been generally accepted in economics though they have not necessarily resulted in a corresponding change in micro-economics. There has also been criticism of the

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<sup>1</sup> Economics has *always* been behavioral. The relative price effect on which economics is based (Becker 1976, Frey 1999, 2001, Kirchgässner 2000) is, of course, a behavioral and not a mechanistic concept.

<sup>2</sup> For further examples, see Frey and Eichenberger (1994).

laboratory approach as normally undertaken, especially concerning the subject pool.<sup>3</sup>

This paper focuses on the process through which behavioral anomalies<sup>4</sup> are aggregated to a societal outcome. The basic idea is that individuals are *reactive* when they are subject to an anomaly. As a result, what is observed in the lab does not necessarily become apparent on the societal level. Behavioral anomalies may remain unchanged when aggregated on the macro-level, but they may also disappear, or they may translate into even stronger anomalies than what is observed on the individual level.

Due to a strong focus on laboratory experiments, the distinction between Behavioral Economics and psychology tends to vanish. But economics is a *social science* (Frey 1999). Rather than only concentrating on individual behavior, it should go further to advance our understanding of societal outcomes. This means that the interaction of persons in the aggregation process must be part of “Economics and Psychology”, and that institutions shaping this process must explicitly be taken into account. The future progress of “Economics and Psychology” is likely to be based on field (DellaVigna 2009), and possibly even more on natural experiments (Levitt and List 2009). These experiments should analyze the specific features of different aggregation processes. This has been undertaken to a limited extent and for special conditions, e.g. by Camerer (1987) for the case of biases in probability judgment in experimental markets; by Fehr and Tyran (2005) for the role of “strategic complementarity” and “strategic substitutability” for aggregate outcomes; by Ganguly et al. (2000) for the relation

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<sup>3</sup> A group of prominent psychologists (Henrich et al. 2010: 61, 82) recently stated in Behavioral and Brain Science: “Behavioral scientists routinely publish broad claims about human psychology and behavior in the world’s top journals based on samples drawn from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies... The sample of contemporary Western undergraduates that so overwhelms our database is not just an extraordinarily restricted sample of humanity; it is frequently a distinct outlier vis-à-vis other global samples. It may represent the worst population on which to base our understanding of Homo sapiens.” See the extensive debate in *Behavioral and Brain Sciences* (2010, 33: 83–122). For the more general discussion about the external validity of laboratory experiments, see e.g. Levitt and List (2007).

<sup>4</sup> Similarly, it would be possible to analyze the effect of individuals mispredicting their own evaluation of goods and how these mispredictions in their aggregate have an impact on the societal level (Frey and Stutzer 2004, Gilbert 2006).

between traders' judgment biases and asset market prices; by Genesove and Mayer (2001) for the effect of loss aversion on seller behavior in the housing market; by List (2003, 2004) for the possible elimination of market anomalies by market experience; by List (2006) for the effects of reputational concerns on market performance; and by Vissing-Jorgensen (2004) for the potential elimination of what is considered irrational behavior by wealth increases.

Section 2 discusses how the aggregation process in general may affect the behavioral anomalies as they become visible on the macro-level of society. The following section lists various ways in which the aggregation process can be captured. Section 4 outlines how competitive forces, and the effort to protect against them, affect aggregate anomalies, suggesting a new and possibly fruitful field of research. Section 5 concludes.

## **2 Aggregating individual behavioral anomalies**

Behavioral anomalies have been studied and identified in the laboratory.<sup>5</sup> Certainly, many anomalies have also been found in real life (see DellaVigna 2009, Russo and Schoemaker 1989, Samuelson and Zeckhauser 1988). However, the major emphasis has been to analyze in more and more detail the exact nature of behavioral anomalies under closely controlled conditions, i.e., in the lab. In this effort, the social science nature of economics has been partly pushed into the background and is at times even disregarded. While the behavior of individuals and the different psychological channels are important for understanding what happens on the macro-economic level,<sup>6</sup> they should not be considered the unique goal of economic inquiry. This is different in psychology (perhaps except social psychology). The adoption of a technique typical for psychology, namely experiments with individuals in the laboratory, tends to seduce psychological economists to also remain on the individual level. However, since individual anomalies may not translate one-to-one on the macro-level, it is reasonable to

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<sup>5</sup> Most attention was received by Kahneman and Tversky's (1979) *Econometrica* paper.

<sup>6</sup> Many Keynesian economists would dispute this statement. They believe that it is perfectly possible to understand the macro-economy with quite simple assumptions about individual behavior (e.g., harmlessly assuming decreasing marginal utility in the consumption function).

assume that much can be gained by shifting the focus to the aggregation process. This will allow drawing policy conclusions on the institutional level.

We argue that it is important to carefully analyze how the anomalies found on the individual level are manifested on the level of society as a whole (Frey and Eichenberger 1994). Three different outcomes may result from this process. A particular individual anomaly may be (1) strengthened; i.e., it appears in even greater force on the macro-level; or (2) reduced, becoming less visible on the macro-level; in principle, the aggregation may even (3) lead to the opposite phenomenon of what has been observed on the individual level—though it is difficult to find a case where this has been shown to occur.

An example where anomalies are reinforced on the aggregate level is the treatment of the endowment effect by democratic governments seeking reelection. When standing for reelection in 1983 as Prime Minister, Margaret Thatcher exploited the fact that the Falkland Islands were under British administration. Had the British been asked whether they wanted to acquire a quite resource-poor piece of land located in the South Atlantic Ocean in the first place, they would have almost surely refused. Moreover, individuals would have hardly agreed to incur such a high cost to defend this endowment against the attack by the Argentinian military forces. By sending the Royal Navy, Thatcher stirred up national feelings, thereby accentuating the endowment effect. Another example of a reinforcement effect occurs when institutions (such as rankings, see Pope 2009) further fuel social comparisons, a self-reinforcing rat race may be propelled. Individuals shift their attention to the single dimension that is so prominently being compared (e.g., income) and thereby fall prey to the reference point effect.

Most of the studies that do take into account the aggregation process<sup>7</sup> focus on the second case where anomalies are reduced. In particular, it is analyzed how market forces reduce individual behavioral anomalies (Levitt and List 2008, List 2003). The existing literature thus covers an important aspect, but disregards the possibility that the anomalies may be strengthened. Moreover, in addition to the market, there are other important aggregation processes in society, such as democracy or bargaining, possibly leading to different outcomes.

The view advanced here stresses that deviations from rationality as defined by neoclassical micro-economics are not purely exogenous, i.e., due to cognitive and

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<sup>7</sup> See, e.g., Elster (1979), Schelling (1984), and Weber (1990).

other limitations imposed on individuals by their genetic outfit. Rather, behavioral anomalies are *endogenous*. People do not simply take these limitations as given but *react* to them in many different ways. Individuals are active and (to some extent) seek to overcome the problems resulting from anomalies. The specific type of *reactivity* depends to a large extent on the aggregation process, as well as on the institutions in place.

Our approach does not suggest that there are no behavioral anomalies, or that they are not worth studying in the laboratory. Rather, it stresses that many anomalies may be transformed or may even cease to exist on the societal level. If no anomaly is observed in real life this may be due to two entirely different reasons: (1) There are no limitations on the individual level leading to deviations from rationality, or (2) behavioral anomalies exist but they are meted out in the aggregation process. It is important to be able to distinguish these two reasons in order to better understand society, and to suggest policy interventions to deal with relevant anomalies.

### **3 Types of aggregation processes**

Two different aggregation processes influencing behavioral anomalies can be usefully distinguished. They are not mutually exclusive but rather constitute complementary ways of conceptualizing the aggregation. The first considers various classifications of social decision-making systems, the second takes into account the forces acting on individuals when they interact with each other.

#### ***Social decision-making systems***

A suitable classification is based on the different systems of social decision-making that can be distinguished (Frey 1983). The rather old-fashioned differentiation between market and state is well-known. Alternatively, Hirschman's (1970) distinction between exit and voice has proved to be most fruitful. Though the concepts of exit and voice are widely used all over the social sciences (Adelman 2013), Hirschman added a third mechanism, namely loyalty.<sup>8</sup> A third

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<sup>8</sup> Characteristically, the German translation of his book dropped loyalty in the title and just called it “Abwanderung und Widerspruch” (Hirschman 1974).

and particularly conducive classification is advanced in Dahl and Lindblom (1953), who analyze the specific workings of the price system, democracy, hierarchy (or bureaucracy) and bargaining. To this could be added decisions based on traditions, and random decisions. Depending on which of these aggregation mechanisms is considered, individual anomalies are aggregated and reveal themselves in different ways.

### ***Forces acting on individuals***

The aggregation process can also be analyzed from the point of view of the forces influencing the decisions of actors. One such force is competition impacting the possibility of individuals to survive in the struggle of life. This view has from the very beginning been dominant in economics. It has influenced Darwin's thinking on the selection process of species, and from there on has been reconsidered in economics (see the account in Alchian 1950 and Friedman 1953). A contrasting view is cooperation, where people seek to reach their goals by supporting each other, especially helping those in need. This approach has become official policy in the social welfare states of some Scandinavian countries.

## **4 A new field of research**

The study of how behavioral anomalies are transformed in the aggregation process has by and large been disregarded. The question to be answered is how the anomalies identified under laboratory conditions appear on the aggregate, societal level. For this purpose cross-section or time series data can be employed. Preferable would be field or natural experiments in which the conditions impacting anomalies are subject to an exogenous change, overcoming possible endogeneity problems.

Such studies open a whole new field of research. In this paper it is only possible to provide some hints of how this could be undertaken. We therefore turn to the forces acting on individuals subject to behavioral anomalies.<sup>9</sup> It is a natural inclination of economists to consider the influence of *competitive processes on*

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<sup>9</sup> For an approach based on social decision-making systems see Frey and Eichenberger (1994).



*economic markets.* A straightforward hypothesis is that deviations from rationality cannot survive in perfect markets, and hence no anomalies will be observed on the market level. Individuals who systematically make mistakes in the sense of not rationally maximizing their utility will lose their job, wealth and income, and will disappear as consumers and investors. Similarly, firms that do not maximize profit lose their market share and eventually go bankrupt. In comparative terms, the hypothesis is that the more perfect economic competition is, the fewer and the less intensive the anomalies visible on markets are.

As competition is taken to be particularly strong in financial markets, one should expect that this sector is characterized by few and weak anomalies, and that potentially arising anomalies disappear quickly. This is borne out to a considerable extent (see Fama 1970, 1991). Individuals seem to be aware of the high costs arising if they behave in an irrational way on financial markets. Many of them learn not to fall prey to anomalies by assigning investment decisions to professionals who are less subject to anomalies (MacCrimmon and Larsson 1979, Machina 1987, Schoemaker 1982, Slovic et al. 1977), though this has been put into question (Haigh and List 2005). However, a considerable number of deviations from rationality on financial markets persist (see, e.g., Daniel et al. 2002, Shiller 1987), the best known being the equity premium puzzle (Haug et al. 2013, Kocherlakota 1996, Mehra and Prescott 1985, 2003). Many investors prefer to invest in bonds rather than shares though, *ceteris paribus*, the return is considerably smaller. This finding suggests that the intensity of market competition cannot fully explain the extent of anomalies in financial market outcomes. Sometimes market efficiency and therewith the possible reduction of individual anomalies are hampered by governmental regulations, for example prohibiting institutional investors to short-sell (Lamont and Thaler 2003).

Most markets are characterized by strong imperfections, such as oligopolies and monopolies, and by a myriad of forms of market manipulations (Ashenfelter and Graddy 2003, 2006). There are also many markets in which it is difficult to compare the goods being traded, such as in art, wine and other collectibles. It can be expected that on such markets, individual behavioral anomalies will subsist to a considerable extent and over a relatively long period of time.

The hypotheses concerning the extent of competition on markets must be viewed with skepticism for yet another reason. The more competitive markets are, the more firms are forced to exploit all possibilities to generate profits, including

profiting from human weaknesses such as behavioral anomalies. This notion of competition corresponds to Schumpeter's (1942) or Hayek's (1945) view of the competitive process. One possibility for firms is to “set traps”, i.e., to set the conditions such that individuals are more likely to fall prey to anomalies. An example is firms offering a product that they do not expect to sell but which increases the attractiveness of an alternative from which they derive even higher profit (Ariely 2009). The stronger the competition among firms, the more innovative they are in setting traps. In contrast to the neoclassical notion of competition, the more anomalies are expected on the aggregate market level, the more intensive will competition be.

Competition is not only a force impacting markets, but competition also plays a major role in *political processes*. Democracy has been defined as the competition between parties for the citizens' votes with the intent of forming the government (Downs 1957, following Schumpeter 1942). Two cases may be distinguished:

1. The voters are able to avoid falling prey to anomalies if the politicians and the public officials serving them draw their attention to these anomalies. The fierce competition between parties indeed forces the politicians to help the voters avoid anomalies.
2. The voters do not, or at least not fully, avoid anomalies. The most obvious case is the paradox of voting. Voters in general only have a minute impact on the voting outcomes. The benefit is vastly outweighed by the costs of voting, and yet a large share of citizens participate in elections and referenda (Downs 1957, Feddersen 2004). Party competition then does not annihilate the behavioral anomalies, and they will be observable on the aggregate level. An intensive struggle between parties may even intensify anomalies.

The forces acting on the aggregation process via party competition depend on the democratic political system. A two party system, where the outcome of the political competition will be in the median of the vote distribution, differs from a system with three or more parties. In the latter case, additional conditions, such as the possibility of forming party coalitions (see Selten 1979), have to be accounted for. In many cases no stable equilibrium can be predicted. The discussion shows that, in democratic political systems, it is difficult to make a prediction about how individual behavioral anomalies are manifested on the aggregate level. In a large number of political systems, however, party competition is curtailed or totally

suppressed, resulting in an authoritarian or dictatorial rule. The aggregate outcome is then influenced by the ruler's specific behavioral anomalies.

When *cooperation* shapes the aggregation from individual to macro-level anomalies, the process takes quite different forms than in a competitive environment. In a social welfare system a major task of the government is to protect citizens from falling prey to behavioral inclinations that would be bad for them. This includes anomalies. A great number of different interventions can be observed to be conducive to this goal. For instance, persons who have fallen for the “foot in the door” selling strategy (e.g., Burger 1999) are to some extent protected by laws allowing them to come back on their decision when they are no longer subject to the direct influence of the seller. A more active approach addresses the loss aversion anomaly. When losses loom larger than gains (Kahneman and Tversky 1979), policies that would create net benefits at the aggregate level tend to be rejected by citizens. Milkman et al. (2012) discuss the possibility of policy bundling, whereby bills producing both losses and gains are combined. This tends to offset the costs of separate bills while preserving their net benefits. Unpopular individual policies can thus be transformed into more acceptable pieces of legislation. To the extent that social welfare governments respond to failures in individual rationality, the intensity of anomalies can be reduced on the societal level. This does not mean, however, that the respective anomalies cease to exist on the individual level. By shielding individuals prone to behavioral anomalies from the consequences of their action, governments may help them to “survive”. As a result more anomalies may be present on the individual level.

## 5 Conclusions

This paper argues that the field of “Economics and Psychology” (Behavioral Economics), in particular the study of behavioral anomalies, is too much focused on the individual level as analyzed in laboratory experiments. A new research frontier is suggested whose goal consists in seriously studying the aggregate outcomes resulting from the interaction between individuals. The discussion demonstrates that there are a great number of aspects to be analyzed. The paper only presents fragments of what could become a more extensive field of research.

An important feature of the aggregation process is *reactivity*. People affected by their own lapses from rationality often make an effort to overcome their behavioral anomalies. For that purpose they may seek individual ways, or they may turn to institutions helping them. Governments can and do offer individuals legal possibilities to overcome their weaknesses.

The competitive market process, as viewed in standard economics, is a social decision-making mechanism tending to reduce anomalies on the aggregate level. In contrast, if competition is mainly seen as a process inducing innovations, more behavioral anomalies may be produced.

The authors are well aware that this paper only scratches the surface of a new research area. Its aim is to show that anomalies appearing on the societal level may differ vastly from the individual level studies based on laboratory experiments. Since economics fulfills an important role when informing policy relevant decision-making and the formation of institutions, the aggregation of behavioral anomalies on the macro-level is important to study.

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