JOURNAL OF
INTERDISCIPLINARY
HISTORY OF IDEAS

2022

Volume 11 Issue 22
Item 7

– Section 2: Articles –

Systematic Irrationality and the Emergence of Behavioral Economics

On the Hybridization of Economics and Psychology

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JIHI 2022

Volume 11 Issue 22

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Rational choice theory is one of the theoretical pillars on which the discipline of economics rests. Equipped with this theoretical basis, scholars attempted to explain a wide array of circumstances. However, from the 1960s onwards, different scholars from the field of psychology found evidence that deviations from rationality occur in systematic fashion. This not just created a new field of psychological research but also questioned rational choice theory. Ultimately, the two disciplines merged and formed what is nowadays known as behavioral economics. This article attempts to reconstruct the debates taking place at the economics-psychology nexus but focusing on the axioms of rational behavior as brought forward by von Neumann and Morgenstern (1944). In a second step, these developments will be discussed from a philosophy as well as sociology of science perspectives. Lastly, this article will try to isolate necessary pre-conditions for the hybridization of ideas as the emergence of behavioral economics can be considered the successful hybridization of economics and psychology.

1. Introduction

How do people make decisions? This question occupies the minds of various professions and academic fields. Contrary to other fields, the academic discipline of economics started to formulate rules and axioms regarding the most likely behaviour of people in different—due to their field of study, economic—situations. In order to formulate such axioms, certain presumptions are necessary, such as the theory of expected utility (Bernoulli 1954) which argues that

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Journal of Interdisciplinary History of Ideas 11(2022), 22, p. 7:1–7:35. Peer-reviewed.

utility can be considered the result of a potential pay-offs multiplied by their probability. The theory of expected utility can be considered one of the key pillars of economic thought as it enables agents to compare and choose from different possibilities. Based on the theory of expected utility, traditional economic theory also assumes that agents try to optimize (read as: enhance their utility) and that—due to multiple actors negotiating their utilities—markets eventually reach an equilibrium (Thaler 2015, 44). After the Second World War, economics as a field of study gradually become mathematically more sophisticated as scholars such as Kenneth Arrow, John Hicks, and Paul Samuelson (among others) assumed that the powerful tools of mathematics may illustrate utility functions in different fields of application more accurately (Thaler 2015, 44). The initial impulse of these developments has been to understand how people make decisions but also—based on the presumptions outlined above—to predict people's decisions. The tradition of predicting people's behaviour based on pay-offs and utilities lives on, among others, the field of game theory (Binmore 2007). The mathematically-driven argumentations outlined above are known as 'rational choice theory' which has—for the longest time—been a central reference in economics and has been consulted by countless actors and institutions.

Generally speaking, a theory can be considered a low-resolution model of reality (Hepfer 2021, 29-30) which helps people to navigate in an otherwise messy world. Based on a constructivist's point of view (Piaget 1954; Berger and Luckmann 1980-1969), this low-resolution model—some also refer to it as a map (Birnbaum and Mellers 1978; Pihl, Peterson, and Finn 1990)—is constantly updated. However, not every unexpected feedback results in an immediate change of these mental structures but only when the cognitive conflict (Piaget 1954; Scharlau 2007)—the difference between the projected outcome anticipated based on the map and the actual outcome—is too huge to be brought in accordance with the map/theory, the structure is re-designed. However, in

order to decide whether a cognitive conflict is meaningful enough to re-design one's mental map, one's feedback structure (read as: what counts as evidence?) must be defined. This paper tries to reconstruct these conflicts in—and with it, the developments and changes of—the field of economics as major changes happened from the mid-1940s to the present day. The intellectual negotiations primarily circled around the question of how people make decisions and which theory can predict decisions more accurately. Along these questions, there is also an on-going debate which kind of evidence counts as legitimate in the field of economics.

One of the first instances of academic debate on the questions and issues outlined above took place in 1946 and focused on the theory of the firm. Following the theory of the firm, companies "keep hiring workers until the cost of the last worker equals the increase in revenue that the worker produces" (Thaler 2015, 44)—a rational and utility-oriented theory of hiring. Yet, in 1946 Richard Lester—at the time economics professor at Princeton University—published an article in which he used survey data he generated by addressing owners of manufacturing companies asking about their hiring rationale. Contrary to rational choice axioms, the company owners neither considered wages nor the price of their products—both key factors of the utility function approach—as relevant factors regarding their hiring practices (Lester 1946, 81-82). "Instead, they reported trying to sell as much of their product as they could, and increasing or decreasing the workforce to meet that level of demand" (Thaler 2015, 45). The generated data led Lester—methodological considerations aside—to the conclusion that "grave doubts as to the validity of conventional marginal theory and the assumptions on which it rests" (Lester 1946, 81) need to be raised as actual people make decisions differently than standard economic theory suggests. In the same year, Fritz Machlup replied to Lester's findings. Even though Machlup regards the theory of the firm as imperfect—he admits that costs and revenue are evaluated on a subjective basis rather than an objective one (Machlup 1946,

521) and that a plethora of business decisions is driven rather by routine than rationale (524) –, he still argues that the rational choice-based approach holds true as the following quote illustrates:

Yet, one must not assume that all producers 'really' know their cost in the sense in which an efficiency expert would determine it; several of them may lack the interest or experience; they may not find it worth their while to dig too deeply into the mysteries of their business. (After all, we know that there are good business men and bad, and that the majority is somewhere between good and bad.) But this does not invalidate the proposition that the producer is guided by marginal cost. (Machlup 1946, 522)

Machlup's main argument is that even though real people do not conduct all of these mathematically sophisticated operations, their action resemble as if they had conducted these calculations. In his attempt to make his point, Machlup compares economic theory to driving a vehicle and then attacks Lester based on methodological grounds by imaging a survey study on overtaking another vehicle:

Would he not obtain the most hopeless assortment of answers? Would not these answers support the conclusion that the assumptions of the theorists had been wrong and that one must look for other explanations? Yet I can hardly believe that any sensible person would deny the relevance of the enumerated variables and would contend, for example, that speed and distance of the approaching automobile could not have been taken into account by the *driver* passing the truck, because he was not good in mathematics. (Machlup 1946, 535)

Ultimately, Milton Friedman (1953) also contributed to the on-going debate on the differences of theoretically rational and actual behavior of actors and agents. In his essay *The Methodology of Positive*[1] *Economics* (1953), he traded in Machlup's driver for an expert billiard player, yet arguing for the validity of rational-choice theories:

Consider the problem of predicting the shots made by an expert billiard player. It seems not at all unreasonable that excellent predictions would be yielded by the hypothesis that

[1] Note that 'positive theory' is supposed to mean descriptive. Later, when Prospect Theory came up (see section 2), it understood itself as a descriptive theory of decision-making demarcating itself from the normative approach perpetuated by standard economic theory.

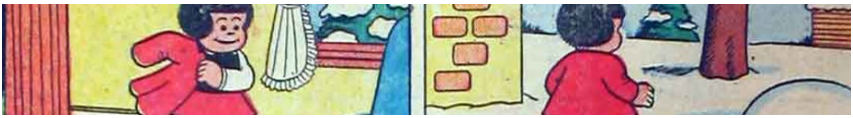
the billiard player made his shots as if he knew the complicated mathematical formulas that would give the optimum directions of travel, could estimate accurately by eye the angles, etc., describing the location of the balls, could make lightning calculations from the formulas, and could then make the balls travel in the direction indicated by the formulas. Our confidence in this hypothesis is not based on the belief that billiard players, even expert ones, can or do go through the process described; it derives rather from the belief that, unless in some way or other they were capable of reaching essentially the same result, they would not in fact be expert billiard players. (Friedman 1953, 157-158)

For most economists at the time the arguments from the rational choice camp seemed to be convincing, the debate was put to rest, and "economists returned to their models free from worry whether their assumptions were 'realistic'. A good theory, it seemed, could not be defeated using survey data, even if the defenders of the theory presented no data of their own" (Thaler 2015, 46). In the following, standard economic theory was governed by rational choice approaches which were based on the assumptions stated at the beginning of the introduction. New and upcoming economic theories were tested by comparing them to six axioms formulated by von Neumann and Morgenstern (1944) in their *Theory of Games and Economic Behavior*. These axioms—each will be outlined and discussed in section 2—were based on rational logic, stemmed also from the field of mathematically-minded economists, and can be considered cornerstones of standard economic theory. A theory which violates one of these can no longer be in accordance with what used to be standard economic theory.

These intermediate results on the debate of behavior, economic theory, and evidence are the starting point of this paper. In the following, this paper will attempt to reconstruct the changes which took place after rational choice theory—and with it its, underlying understandings of evidence—became economics textbook theory. In the late 1950s and early 1960s, two young Israeli psychologists—Amos Tversky and Daniel Kahneman—discovered that in certain settings and scenarios actual people act irrational, at least according to logics of rational choice theory. Not just do they argue that the rational choice approach "is grossly inadequate as a descriptive model of individual choice behavior" (Tversky 1975, 163) but also that "deviations of actual behaviour from normative models [rational choice models] are too widespread to be ignored, too systematic to be dismissed as random error, and too fundamental to be accommodated by relaxing

the normative system" (Tversky and Kahneman 1986, 3). The Lester-Machlup debate outlined above regained popularity, yet this time powered by insights, observations, and conclusions drawn from psychology. However, change in theories—and with it, mental maps—did not occur upon the first cognitive conflicts but took a tremendous amount of time; in fact, what actually happened was not an abandonment of rational choice theories but a merger, one could also say the hybridization, of theories, perspectives, and understandings from the fields of psychology and economics, which resulted in the creation of a new (sub-)field: behavioural economics.

Taking all these aspects into account, this paper will attempt to reconstruct the developments which led to the hybridization of these two fields (economics and psychology) by doing the following three things: firstly, the paper will present the six axioms as put forward by von Neumann and Morgenstern (1944) and reconstruct how psychological research has gradually refuted each of these—and with it, the notion that rationality alone should be consulted to describe and predict behaviour (section 2). Secondly, these developments will be discussed from a sociology and philosophy of science perspective (section 3) before trying to isolate the pre-conditions for the hybridization of ideas (section 4). The paper will end with a review of central results (section 5).



2. The Six Axioms of Rational Behavior

In the following five subsections, each of the axioms outlined by von Neumann and Morgenstern (1944)—Cancellation, Transitivity, Invariance, Dominance, Comparability, and Continuity—will be illustrated regarding its importance for standard economic theory. Also, the ways, experiments, and argumentations which led to its refutation will be presented. As argued, these six

axioms were considered—the following comment refers to the dominance principle alone—"the cornerstone of the normative theory of choice" (Tversky and Kahneman 1986, 6). As such, gradual refutation of these axioms can be viewed as a necessary pre-condition for the hybridization of disciplines and ideas.

2.1. Cancellation

The weakest axiom—it has already been refuted prior to psychological involvement in economic matters—has been the cancellation principle, sometimes also referred to as the 'sure-thing-principle', the 'independence principle' (Savage 1954), or the 'substitution axiom' (von Neumann and Morgenstern 1944). Independent of the chosen name, the cancellation axiom can be described as following: "This axiom asserts that if two alternatives have a common outcome under a particular state of nature, then the ordering of the alternatives should be independent of the value of that common outcome" (Slovic and Tversky 1974, 368). While such a description is rather technical regarding its terminology, the axiom simple says that if two alternatives exist—and these alternatives have some commonality—, the factor which is present in both (the commonality) should not influence the decision. In the same line of thought, it can also be said that if two alternatives (choice A vs. choice B) exist and *both* choices are extended in the same fashion (i.e. combined with another choice C), the original preference should remain intact. Savage provides a rather narrative example of the cancellation axiom:

> A businessman contemplates buying a certain piece of property. He considers the outcome of the next presidential election relevant. So, to clarify the matter to himself, he asks whether he would buy if he knew that the Democratic candidate were going to win, and decides that he would. Similarly, he considers whether he would buy if he knew that the Republican candidate were going to win, and again finds that he would. Seeing that he would buy in either event, he decides that he should buy, even though he does not know which event obtains, or will obtain, as we would ordinarily say. (Savage 1954, 21)

In short: If an agent has preferences (choice A is better than choice B), these preferences cannot be altered, at least not if the same kind of addition is made to both choices. This axiom has been refuted empirically but also philosophically.

On the empirical front, Allais (1953) and Ellsberg (1961) constructed multi-layered decision scenario which involved ambiguity to show that the addition of the same factor (to both choices) resulted in a change of preferences—a clear violation of the cancellation principle and logic itself. The experiment, sometimes referred to as the Ellsberg-paradox, exists in multiple set-ups, still the results are similar. The experiment starts with an urn holding 30 red balls and another 60 balls which are—the ratio is unknown—either yellow or black. In the first stage of the bet, the agent can choose between choice A (betting on a red ball being drawn) or choice B (black ball). The majority of participants selects choice A. In the second stage of this multi-layered betting scenario, the agent is now confronted with choice C (betting on a red or yellow ball being drawn) or choice D (black and yellow). Basically, this is the same bet as in stage one, with the only difference that both possibilities now also feature the yellow ball. However, majority's preference shift from A over B (round 1) to D over C (round 2). While a plethora of competing hypotheses explaining this deviation from rationality exist, it is also noteworthy that even mathematically-minded people, i.e. Jimmy Savage—the politically interested real-estate buyer and defender of the cancellation principle –, initially fall for the Ellsberg paradox. Only after the math behind the decision scenario is presented, most people act rationally (Slovic and Tversky 1974). Apart from its empirical refutation, the cancellation principle has also been deconstructed from a philosophical point of view. Colin Blyth (1972) constructed the "Simpson's paradox" in which a violation of the cancellation principle results in a higher overall pay-off. Ross (2004, 12-13) illustrates such a paradox by comparing baseball player's batting percentages: even though player A hits more balls than player B in season one and two respectively, the sum of both seasons show that player B has a higher batting percentage[1] (ergo: hit more balls). If, in such a scenario, the agent picks based on the

[1] Ross (2004) looked at Derek Jeter and David Justice in the seasons 1995 and 1996. In each season, Justice had a higher percentage (1995: $104/411 = 0.253$ and 1996: $45/140 = 0.321$) than Jeter (1995: $12/48 = 0.25$ and 1996: $183/583 = 0.314$). Yet, taken together, Jeter ($195 - 630 = 0.31$) seems to be the better hitter than Justice ($149/551 = 0.27$). The same effect is exploited in the Will-Rogers effect (Dobelli 2012) in which stock portfolios are improved by re-organizing two already existing portfolios. The trick: In the superior portfolio every stock has a better performance than any stock in the weaker portfolio. By shifting the weakest stocks of the superior portfolio to the weaker one, both portfolios gain regarding their average performance.

initial preference (who has hit more balls?), the weaker player gets selected and a real pay-off is lost. Apart from the empirical (Allais 1953; Ellsberg 1961) and mathematical (Blyth 1972), the cancellation principle has also been questioned philosophically. Richard Jeffrey extends Savage's real-estate example—in which he assumes that the businessman would prefer Republican leadership—by the factor of causality:

> Change Savage's example to make the election be merely for the office of mayor, and suppose that the businessman thinks—perhaps correctly, and perhaps with excellent reason—that his buying the property would improve the Democratic contender's chances of winning. (Jeffrey 1983)

In such a scenario, the purchase of the real-estate would not be in accordance with the stated preferences and a distinctively different action, compared to Savage's story, would emerge from that.

These three lines of counter-argumentation and evidence convinced the academic public that the cancellation axiom can no longer be uphold. As said, cancellation has been the weakest of the six axioms and has already been retired prior to the involvement of (cognitive) psychology into the matter.

2.2. Transitivity

Transitivity describes the simple fact that people when being confronted with a decision scenario should act according to their subjective calculations. Expressed more formally, the axiom of transitivity is bided by if agents attach 'certainty-equivalents' (that is subjectively calculated/assumed percentages) to specific choices and then go for the choice which appears to be superior (Loomes, Starner, and Sudgen 1991, 425). Classic rational choice theory assumes that people maximize their utility, ergo it should not occur that people rationally explain that a certain choice is superior to another but then act differently (Tversky and Kahneman 1986, 7). Heukelom (2007, 7) breaks it down as following: "This assumption [transitivity] holds that the preference ordering of the individual is consistent. That is, that the preferences do not contradict one another". It appears relatively straightforward that for a theory which puts rationality at its center, transitivity is a key axiom.

Slovic and Lichtenstein (1983) tested this axiom by confronting people with two bets from which the participants were supposed to choose one. Either the participants could enter a small probability bet with a huge potential win (option A) or could go for a high probability but low pay-off bet (option B). Taking the expected utility function (Bernoulli 1954) as a basis, the participant should select option A as it promises the higher expected utility. However, Slovic and Lichtenstein observed that a relatively huge proportion went for the high probability, low pay-off bet—a behavior they decided to call "preference reversal phenomenon" as they assumed that utility consists of more than just one factor and that these factors need to be negotiated but also that these different factors govern different parts of mental processes (i.e. attaching certainty-equivalents and the actual decision). A different kind of explanation has been provided by Loomes and Sudgen (1983) who argued that regret aversion is responsible for the violation of the transitivity principle. Regret aversion describes the phenomenon that decision-makers not just consider numerical probabilities and expected pay-offs but also imagine themselves in these different decision outcomes. A central role, according to regret aversion, play the anticipated/imagined emotional states (Neuhaus 2021a). Following this reasoning, it feels a lot better to secure a relatively safe win than being disappointed by losing on an unlikely bet. Daniel Kahneman (2011) also cites regret aversion as a key reason for overpaying low-probability insurances as the imagined emotional state of being hit by a low-probability disaster and not having bought insurance appears to influence most people's decisions in tremendous ways.

Independent of one's preferred reasoning, the axiom of transitivity has empirically been refuted and caused tremendous doubt regarding the validity of the rational choice approach: "Preferences that are inconsistent in this manner challenge the notion of human rationality and suggest the need for theories based more on psychologically descriptive assumptions to replace rational-choice models" (Regenwetter, Dana, and Davis-Stober 2011, 43). At the begin-

ning of the 1980s, transitivity may have found consideration from some scholars; however, the majority of researchers only employed the axioms of invariance and dominance for predictive assumptions (Bell 1982; Fishburn 1982; Loomes and Sudgen 1982). Therefore, it can be argued that von Neumann and Morgenstern axioms—as symbols for the rational choice approach—have still been used by that time; however, in part these principles (namely transitivity and cancellation) have already been out of the equation for the majority of researchers.

2.3. Invariance

After transitivity and cancellation have been refuted, cognitive psychology has been primarily occupied with empirical tests regarding the validity of invariance and dominance as these two have—at the time—still been considered cornerstone of rational choice theory. The axiom of invariance is of special importance as it is tightly connected to the theory of expected utility as such. The theory of expected utility says that probabilities are supposed to be multiplied with potential outcomes and the result can be considered the expected utility. When being confronted with different decisions, agents should—according to the axiom of invariance—select the option/decision which has the highest expected utility. Further, invariance suggests that the form in which these probabilities and expected utilities are expressed do not alter the behavior/decision as such (Tversky and Kahneman 1986, 6)—*de facto*, in their original formulation of the axioms, this factor has not even been discussed but has been presupposed.

Invariance has been tackled by cognitive psychology through two-stage decision games (Tversky and Kahneman 1981, 453): In the fictional scenario of an unknown, newly emerging, and potential lethal epidemic, 600 people have been infected and subjects have to choose between two scenarios. In scenario A 200 people survive the epidemic and 400 die. In contrast to that, option B says that there is a 33% chance that everybody survives but at 66% likelihood that 600 decease—the overwhelming majority of participants (72%) selected option A over option B (which has just been taken by 28%). In a reformulated version of the scenario, participants now had the chance to choose between option C—400 people—and option D, a 33% chance that nobody dies and a 66% probability that all infected find their end. Taking expected utility theory and the axiom

of invariance seriously, there should not be a significant difference how people act in the different decision scenarios. Yet, option C has been picked by only 22% of all participants while 78% chose option D—an almost complete reversal of the choice made in the first round of the experiment and a clear violation of expected utility theory and the axiom of invariance.

This effect—which should find its way into the literature as the 'framing effect'—could also be observed in real-life settings, such as medical decision making or sports (Lewis 2017). McNeil et al. (1982) found that experts as well as lay people choose different treatment option depending on whether the expected outcome is formulated as a probability to survive or the likelihood of death; even if the numerical probabilities are exactly the same. One of the more elaborate explanations for this irrational inconsistency is that the nature of the decision has been altered by the selected presentation of the numerical probabilities. Depending on which factor of the decision is emphasized by the presentation of probabilities—200 people being safe versus the sure loss of 400 lives—, the decision is either framed as a risky maneuver threatening another 400 lives or as a mission to secure the otherwise 400 lost souls. In either case, the empirical observations are diametrically opposing the axiom of invariance and expected utility theory (Tversky and Kahneman 1979), yet considering these irrational aspects led to superior predictions on people's behavior. Further, the psychologically-minded perspective suggests a model of mental book keeping (Cialdini 1999) which—neither exact nor statistically accurate—keeps track whether a person is rather in the domain of gains or losses. This model of mental book keeping, at least according to Kahneman's and Tversky's Prospect Theory,[1] is tilted in systematic ways which—that is at least the suspicion—has evolutionary causes (Neuhaus and Großjohann 2022; Neuhaus 2020). One of these systematic biases, which can in part explain the violation of invariance, is called loss aversion and argues that—in the mental book keeping—losses are accounted for twice as much as gains (Tversky and Kahneman 1991). Depending on the specific framing (see above), the participants are either located in the field of gains or losses and with it, their evaluation of the outcomes and

[1] 'Prospect Theory' is a concept/word coined by Tversky and Kahneman and subsumes the irrational, yet predictable, deviations from rational choice theory caused (mostly) by cognitive factors, such as the presentation of data (Neuhaus 2020).

utilities thereof change. Taking these kinds of observation seriously, probabilities, outcomes, and expected utilities are not evaluated invariantly of external circumstances but the assumed current standing and associated territory (are we rather in a field of gains or losses?) influences the way real people evaluate probabilities and outcomes. If confronted with a scenario of certain losses (i.e. 400 people die for sure), risk aversion is on average more pronounced in people than in an alternative framing (Tversky and Kahneman 1992).

The experiments and findings outlined above have shown that the principle of invariance can no longer be uphold and that the approaches suggested by Prospect Theory are superior regarding predictions. As such, the axiom of invariance and with it a share of expected utility theory has lost approval by parts of the scientific community.

2.4. Dominance

After half of the axioms brought forward by von Neumann and Morgenstern has been refuted empirically, the most powerful one (dominance) became psychology's and economics' center of attention in the negotiation of (ir-)rational decision-making processes. Dominance argues that if two choices (A and B) compete and they are exactly the same except for one difference (in which A outperforms B), option A is preferred[1] (Tversky and Kahneman 1986, 5). Dominance epistemological attractiveness is summarized by as following: "Dominance is both simpler and more compelling than cancellation and transitivity, and it serves as the cornerstone of the normative theory [that is rational choice theory] of choice" (Tversky and Kahneman 1986, 6). In a world governed solely by logic and the thrive to maximize utility, dominance would be considered without a doubt a key axiom.

The real-life application of the dominance axiom is known as 'Coase theorem' (Cooter 1989; Kahneman 2011; Thaler 2015) and argues that in a marketplace—as long as transaction costs are low or non-existent—goods will always end up

[1] This definition is, of course, considering transaction costs. Just because an item is 10 cents cheaper in a supermarket 100 miles away, nobody—independent whether the person roots for rational choice or Prospect Theory—would travel there to make the purchase. In its rational choice form, opportunity/transaction costs would be subtracted from the utility gained from the change in options.

at the people who see the highest degree of utility in them and, therefore, are willing to pay the highest amount of money. Coase theorem and with it the axiom of dominance has been tested by Daniel Kahneman, Jack Knetsch, and Richard Thaler (1990 and 1991) by giving students different kinds of university merchandise which does not correspond with their initially stated preferences (also each item had a numerical dollar value attach for matters of comparability). After a week, the students got the chance to trade their merchandise with others and differences in initial value could be compensated with money; according to Coase theorem and the here discussed axiom, the items should move to whomever attaches the highest degree of utility to them. However, this is not what happened as students artificially enhance the value of their items while the items of others were evaluated based on the objective dollar value. It appeared as if the students put an ownership premium on their item which Kahneman, Knetsch, and Thaler later labelled the 'Endowment Effect'. The Endowment Effect, which could also be found in a plethora of other scenarios, violates multiple axioms at once and has put an end to the dominance principle as it has empirically refuted it. The dominance axiom has also been proven wrong when taking loss aversion seriously. As argued earlier, loss aversion describes the fact that losses are perceived as twice as bad as a numerically equal gain. Following this line of thought, a single coin flip in which a person either wins $11 or loses $10—dominance and rational choice theory advocates would take the bet—would, on average rather be rejected, an assumption which has been proven empirically (Kahneman 2011). Additionally to the Endowment Effect and loss aversion, the status quo bias—sometimes referred to as 'default-bias' (Johnson and Goldstein 2003; Dobelli 2012, 129-139)—can also be cited as a scenario in which the axiom of dominance does not seem to play a role. The status quo or default bias can be read as a variation of the endowment effect and manifests itself in the fact that in a plethora of scenarios—mobile phone settings, insurances, memberships etc.—the default is not actively changed. Without a doubt, habit does also play a major role in such scenarios, yet it cannot be habit alone as Johnson and Goldstein argue. In their study, the organ donor models of Austria and Germany are presented and compared regarding their result. Even though the two countries are unique in multiple ways, Austria and Germany also share a significant amount of values, attitudes, culture, and the alike. Regarding organ donorship, Austria has an opt-out model—everybody au-

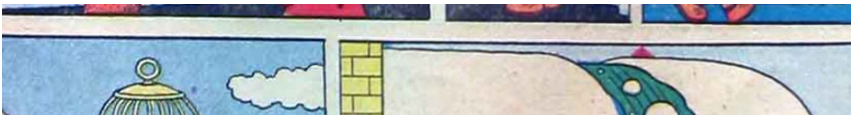
tomatically starts as organ donor but can easily opt-out at any time and without reasons—whereas Germany features an opt-in model. As it seems hard to argue that organ donorship is an action of habit, the change in default settings is arguably the explanation why Austria has significantly more organ donors than Germany. In these rather abstract and normatively driven decisions, it seems to be the case that the status quo's value is artificially increased. Following the line of thought brought forward by the insights from the endowment effect, it can be argued that actual people identify in significant ways with the status quo—constructivists' psychology would argue a feeling of security is a pre-condition for a positively evaluated status quo (Janoff-Bulman 1992)—and thereby appreciate its value compared to alternative (and potentially less secure) scenarios.

May it be loss aversion, the endowment effect, or its more application-based configurations (default/status quo bias), the axiom of dominance has been refuted in multiple ways and evidence of its refutation could be observed in plentiful scenarios. Therefore, four out of six axioms have been proven—at least in some scenarios—to be inaccurate and, as such, lost their claim of universality.

2.5. Comparability and Continuity

The axioms of comparability and continuity are of rather technical nature and have never been a matter of discussion in the vivid exchange of ideas between the disciplines of psychology and economics. Yet, for reasons of completion they should still be briefly discussed. Comparability describes the fact that preferences of different people can still be compared. The problem which is arises is known as the marginal utility theory: The more of a good a person has, the less an additional unit of that good is valued (Layard, Mayraz, and Nickell 2008). Following marginal utility theory, it would be impossible to evaluate and compare the utility different agents attach to a diverging set of choices. However, as Prospect Theory as well as rational choice theory do not aim to assess the numerical difference between different choices but rather want to rank order them—which choice is better for the agent? –, methodologies which are based on large-sample studies in which participants are supposed to choose between options, can still be used. Also, such studies constitute a shared moment between Prospect Theory and rational choice approaches.

Continuity is arguably the most technical axiom brought forward by von Neumann and Morgenstern. It starts with a scenario in which an agent prefers option A to B and option B to C. Continuity now argues that, if option A and C are bundled, i.e., it's either A and (C or B) agents can choose from, a (spectrum of) probability(-ies) exist(s) in which agents prefer option A and C to a safe bet on B. Just as comparability, continuity has never really been at the center of attention and, as such, still remains unchallenged until the very day. However, even while comparability and continuity have been created by rational choice thinkers and advocates, these axioms do not prove the central ideas of rational choice theory. Also, they do not falsify Prospect Theory as such. Therefore, both axioms can be considered rather neutral.



3. Micro- and Macro Perspectives on the Developments in Economics

The discussion and partial refutation of the six axioms outlined in section 2 should only be understood as an approximation of the actual debate taking place between proponents of rational choice/standard economic theory and the more cognitive psychologically-minded approaches. It is merely impossible to reconstruct all debates which were held on conferences, in (economics) departments all around the world, and in different journals. Compared to the 1940s and 1950s, science experienced a massive expansion in terms of agents, contributors, institutions, communication channels, academic (sub-)fields, and associated media so that discussion—such as the rational choice versus Prospect Theory debate—will never be reconstructed in its entirety. However, in the following years and decades certain trends were observable which will be discussed from a philosophy and sociology of science perspective. This section should be

understood as an interdisciplinary interpretative framework of the actions taking place in the contact zones of economics and psychology. Section 3.1. will provide a framework—a modification of the Popperian scientific theory—why certain subfields of economics were more open to innovation stemming from psychology while section 3.2. will—with a modification of the Kuhnian scientific revolution—take a closer look at the developments of economics as a whole.

3.1. Rationality and Feedback in Different Economic Subdisciplines

Even though it is treated as such, economics is not a homogenous field as a plethora of subdisciplines, such as finance, microeconomics, national/macroeconomics etc., exist. Richard Thaler (2015) notes that certain subfields of economics have been more open to the innovation brought forward by Prospect Theory (i.e. microeconomics) whereas others—most notably the field of finance—holds onto the (slightly modified) notions of mostly rational agents and markets.

In an attempt to frame the developments within the different subfields of economics, Karl Popper's theory of scientific knowledge production (Popper 1969) could be consulted as Popper—just as advocates of standard economic theory—can be considered a logic-driven scholar. Popper's work centers around the idea that scientists put forward theories which, in order to be scientific theories, can be falsified (1969, 41). In case a theory is confronted with unforeseen evidence the following should happen: "[i]f observation shows that the predicted effect is definitely absent, then the theory is simply refuted" (Popper 1969, 36). In case of refutation, Popper provides multiple options how (logical) scientists can react, one being the construction of *ad hoc* modification which should "always be regarded as an attempt to construct a new system" (Popper 2005, 62). In a Popperian world, scientists put forward theories, let them collide with reality/empirical evidence and—due to their logic-driven approach—insufficient (read as: incompatible with reality) theories "[are] to be eliminated if they clash with observation" (Popper 1969, 46). This is not exactly what happened in the field(s) of economics as the negotiation of how people act has taken more than 30 years and, at least in part, is still ongoing today. This article argues that these

incoherencies—at least on the level of economic subfields—relate to the feedback structure of the specific subfield. Based on the cognitive map theory (O'Keefe and Nadel 1978), briefly addressed in the introduction of this paper, each and every person or scientist has a mental map of the world and its entities. Each constituent of the map can be regarded a hypothesis which can be tested and, in case of its refutation, altered and/or substituted. Being in line with Popper, Piaget (1970) also argues that the creation of knowledge (the building of an accurate map) is a process which necessarily requires exchange with the external world and is triggered by responses or feedback. With regard to the question at stake, two remarks regarding the Piagetian and Popperian theories of science and knowledge will be made: one considers the notion of rationality, the other discusses different kinds of (non-)feedback.

From a Popperian perspective, logic is that which follows a set of rules without violating any of them. Following this line of thought, even an infinite amount of proof is not enough to consider a theory to be true, yet a single diverging result can falsify a theory—a single black swan is enough to falsify the theory that all swans are white (Taleb 2007). While this may be a valuable insight for low-probability-high-impact scenarios—Taleb branded such instances Black Swans—human beings adhere to a different kind of rationality which can be explained by expanding Popper's notion with the insights from the mental map model. According to its advocates, positive feedback—a part of the map/theory is confirmed—strengthens a particular aspect whereas negative feedback causes negative emotions (Gray 1982). These negative emotions can be considered bodily responses telling the person that their map/theory is insufficient and requires a modification; these processes are embedded into the hippocampal area which is crucial for the cognitive map theory (O'Keefe/Nadel 1978). Contrary to the Popperian model, such feedback structures do not only operate in a dualistic way (something is either true or false) but also in terms of amplitude. The amplitude is in part determined by the kind of theory[1] being falsified, but also by the degree of its falsification. The insight that not all swans are white may lead to a small ad hoc modification of a not so crucial assumption, whereas the

[1] Janoff-Bulman (1992) argues that there are two assumptions about the world which are particularly painful when being falsified by reality. These are "the world is a safe place" and "I am a valuable part in it".

falsification of the hypothesis that the world is a safe place is rather a "shattered assumption" (Janoff-Bulman 1992) and can reassemble a person's map completely and—in case of inability to reconstruct one's map—result in trauma (Peterson 2009). Generally speaking, Popper and Piaget (as well as their followings) share the idea that human beings confirm or falsify (and then alter) their hypotheses, yet they differ in their notion of rationality. Popper believes in a normative model of rationality whereas the advocates of cognitive mapping theories suggests an evolutionary model of rationality. Evolutionary rationality (Taleb 2018; 2013) can be framed as what has passed the test of time. In terms of survival it may be rational to be hypersensitive to losses (see 2.4 on loss aversion) as losses threaten survival more than gains can guarantee future survival. Yet, from a normative rational viewpoint such behavior appears irrational, as a coinflip with asymmetrical pay-offs (bet $10 to potentially win $11) should always be taken. Considering the idea of evolutionary rationality, it should not come as a surprise that the amplitude of negative/positive feedback matters tremendously. As the original hypotheses (i.e. rational choice is good theory to predict behavior) have gained their place due to repetitive confirmation[1], it would not be evolutionary rational to let a single result change this assumption (unless the single result is of tremendous amplitude). In order to describe the process of change, Piaget has described the processes of assimilation and accommodation (Scharlau 2007). Assimilation describes the re-interpretation of external feedback/data in order to fit one's original hypotheses[2] (Piaget 1954) whereas accommodation occurs when the cognitive conflict (the clash of reality and hypotheses) is too huge—one could say that the original theory/map is no longer useful enough—to be integrated into the existing framework (Piaget 1954; 1970). In such instances, new hypotheses are being formulated which can

[1] Repetitive confirmation can be the result of direct as well as indirect confirmation. Direct confirmation would refer to one's own experiences (i.e. in conducted studies, observations etc.), whereas indirect confirmation can be understood as the promotion of ideas by peers, figures of authority (Cialdini 1987, 176), or the majority (Levitt and Dubner 2014).

[2] If the process of accommodation is not being realized and the newly emerging and (with the original framework) unexplainable data points are continuously re-interpreted or assimilated into one's mental framework, psychologists speak of "cognitive dissonance" (Festinger 1957). This phenomenon can occur if a theory about the world is so deeply rooted in a person that the person is unwilling or unable to change it; even if contradictory evidence is present and well-observable.

explain everything their predecessors were able to explain but who are also able to integrate the newly observed data points. The existence of accommodation and assimilation can be considered mechanisms which allow organisms to negotiate between continuity and adaptation. Both of these are of tremendous importance for survival as continuity keeps that which has worked in the past and adaptation changes that which is no longer valid (i.e., in a new and/or changing environment). As it will be argued in the following sections, the threshold for adaptation alters between organisms and, without surprise, also between academic (sub-)disciplines.

As this section could hopefully show, the specific understanding of rationality plays a tremendous role regarding the change of theories. As argued, Popper's understanding of science is not falsified by the observations made in the field of psychology; it just needs to be modified regarding its understanding of rationality, which should not be understood as a self-sufficient mean in and of itself but rather a mechanism to enable survival (as originally intended, see Popper 1969, 46). Also, this section could hopefully show that the quality of feedback—content as well as amplitude—also plays a significant role regarding the formulation and falsification of scientific theories or, if one wants to employ Piagetian lingua, assimilation and accommodation; an aspect which needs to be discussed in the following section and then tied back to the observations made in the contact zone of economics and psychology.

With regard to feedback, it can be stated that different branches of economics receive feedback in diverging degrees of resolution. As argued earlier, external feedback is crucial regarding the construction, testing, and modification of hypotheses but does not follow a strictly normative rationality. Rather, external feedback is processed in relation to the already existing hypotheses and in its amplitude—strong, direct, and meaningful falsification is considered to a larger degree than incongruent or vague feedback. When transferring these insights to the different field of economics—a falsification of the rational choice approach would affect all subfields of economics –, it can be observed that the feedback structures (one could also say their connectedness to the external world) differ in terms of directness.

As outlined earlier, there is a tendency to not revise hypotheses about the world when being confronted with a single (and arguably not very meaningful) point of counter-evidence. The difference between the economic subdisci-

plines, as described by Thaler (2015), can now be explained by their distance to their study object. While fields like micro-economics—in and of itself relatively close to psychology as both conduct (lab) experiments—has had relatively little distance between itself and the unfolding evidence (single effects could be measured by attempting to reduce the influence of competing factors), more abstract fields like finance only have the one and extremely messy object to analyse, i.e. the stock market (Lynch 2000). Even though historical data can be used to approximate the impact of certain factors, extremely complex systems (Coombs 1968)—such as the stock and/or money markets—do not deliver as clear-cut results as lab studies (Taleb 2018; Taleb 2007; Bernstein 1997).[1] Taking it as a given that the idea of rational actors has, prior to the insights of Prospect Theory, been authoritative textbook knowledge and has strong anchoring in most of the discipline's authorities, it should not be surprising that evidence is pre-selected according to this kind of knowledge, at least in multicausal settings. In fact, the effect which can be observed here has been described by Tversky and Kahneman themselves and adheres to the name of 'availability bias' (Kahneman 2011). According to their findings, quick and intuitive judgements and decisions occur when already known aspects are quick at hand or, as the name suggests, available. While such judgements can be valuable at times, they are also prone to narrative biases[2] (Taleb 2007; Dobelli 2012; Kahneman 2011). Based on these insights, it can be argued that the more abstract and multicausal a subdiscipline is, the more reluctant it is to change its fundamental hypothesis. As stated in the introduction, rational choice theory already came with a set of preformed legitimizations and argumentations—mental overload theory, the 'as-if' rationality (Friedman 1953), different utility definitions (Gunn 2015; Binmore 2007) etc.—for the case that actual behaviour deviates from logic-driven rationality.

[1] Taleb (2005, 215) on the issue: "Causality can be very complex. It is very difficult to isolate a single cause when there are plenty around".

[2] Narrative biases describe the fact that people primarily think in concrete manner and less abstract. Take the Linda problem for example: People are given the description of a person (Linda, 31 years old, outspoken, majored in philosophy, concerned with social justice, etc.) and should then decide whether it is more likely that she is a) a bank teller or b) a bank teller who is active in a feminist movement. Of course, a) is more likely than b) (all Lindas who are feminist bank tellers are also bank tellers); however, due to narrative elements which, in turn, correspond to available images (some would say prejudices), a meaningful proportion of people take option b).

Combined with the problem of multicausality and human's general reluctance to alter hypothesis based on unclear evidence—this is particular true if there is not (yet) an alternative framework with a similar degree of sophistication and epistemological potency available (Lakatos 1976) –, the different developments within economics subdisciplines can be explained.

If one wanted to pathologize the developments of certain (more abstract) branches of economics, the concept of 'cognitive dissonance' (Festinger 1957) could be consulted. According to Festinger, certain ideas are so deeply rooted in people that, instead of altering their hypotheses/ideas about the world, they unconsciously alter their observation of the world—evidence is not seen as the available interpretative structure of reality overshadows the very evidence. An observation which would be in line with Thomas Kuhn's observation that only after a paradigmatic change, scientists see the world with different eyes (1969, 152). However, the author wants to emphasize that the observations made in economics can and should not be considered cognitive dissonances as the role of feedback structures in multicausal settings cannot be overestimated. Nonetheless, the developments described above cannot be explained by a purely Popperian understanding of science as the understanding of rationality as well as the nature of feedback is monolithically defined in Popper's approach and, as a result, does not correspond with and does not predict the observations made in the field. This is of even more importance as the very field of economics assumed clear-cut rationality as human being's mode of operation. As shown, each of these problems can be mitigated by insights from experimental and/or evolutionary psychology as the definitions of rationality needed to be reformulated but also the structure of feedback—or more generally, communication between the individual and the world—required conceptual modifications.

3.2. On Action Potentials of Different Economic Subdisciplines

While section 3.1. primarily focused on the differences between certain subfields of economics in their negotiation of the competing paradigms, this section will take economics as a whole and look at the developments regarding the two competing theories.

Thaler (2015) himself branded the emergence of Prospect Theory and behavioral approaches a "scientific revolution", other commentators described it as a "Thinking Revolution" (Dubner 2017) but—as the terminology has already been introduced—can the emergence of Prospect Theory really be considered a revolution in the Kuhnian sense? Contrary to Popper, Thomas Kuhn proposes a model of science which focuses on the human traits of scientists. Instead of pure logic, Kuhn (1969) sees feelings—i.e. discomfort with existing theories—(128), herd mentality behavior and/or persuasion (130), as well as fortunate coincidences as drivers of mainstream academic trends. Kuhn even goes so far to say that a paradigm change/scientific revolution is never caused by logic and/or experiments—data in the wider sense—alone (131). Following Kuhn's line of reasoning, scientists produce results, yet—depending on the social and temporal circumstances—these scientists do not necessarily accept their findings; this only happens once the favoring circumstances manifest themselves. According to Kuhn (1969, 149), science is only able to produce new paradigms once their time has come[1]. Kuhn derives his model from the observation that scientific progress is not primarily linear but occurs in erratic patterns (Schmidt 1981, 21). These cyclical patterns (Ströker 1974, 29)—regular science producing results until a new paradigm replaces it and, in turn, becomes regular science (Kuhn 1969, 152)—often stem from the fact that scientists look at the world, and with it their prior results, in a certain manner and organize objects in this world accordingly (ibid.). Yet, for an established paradigm to be replaced, it must produce evidence which is incompatible with its axiomatic presumptions; in accu-

[1] Malcolm Gladwell (2008) developed a similar thought in his book *Outliers*. He argues that achievements (as well as failures) are seldomly (exclusively) the result of individual merit but should rather be looked at from an "ecology of success" perspective as only the interplay of multiple synergistically organized factors actually causes an outlier. The same point of view is taken by Tetlock and Gardner (2015) who argue that the prediction of—in their case—political turmoil is primarily caused by multiple factors combined. As soon as certain critical indicators are combined, a single action has the potential to cause massive upheaval. Analyzing these events retrospectively, observers could fall victim to the fallacy of reducing the cause to the single triggering act instead of looking at the scenario holistically. Peterson (2018) argues from a personality psychology perspective and says that enough untruths must come together (he chooses the imagery of deadwood) before a single spark can cause a (curative, meaning truth generating) fire. This is in line with the prior positions as the circumstances (individual, institutionally, politically etc.) must be of the right kind to enable individual action to actually cause a major shift.

mulated form, these incompatible evidences are then motivating the search for an alternative paradigm which—following Piagetian thought—accommodates old as well as new evidences.

Kuhn states that dominant paradigms are the once which are respected in science, i.e. through publication in textbooks, and the alike. The problem which arises by looking at Prospect Theory and claiming that it has been a scientific revolution is twofold: Firstly, Prospect Theory *only* modified rational choice approaches, it did not completely replace them. Further, other than described in the Kuhnian scientific revolution/paradigm shift, mainstream economics and what should be later known as behavioral economics had a shared language to communicate in as both disciplines saw similar kinds of evidence, experiments, and procedures as legitimate basis for discussions—the fifth and sixth paradigm (see section 2.5) are proof of that shared language. Also speaking against a truly scientific revolution is the fact that current economics textbooks and introductory lectures teach rational choice theory alongside Prospect Theory. Simultaneously, Daniel Kahneman and Richard Thaler won the Nobel Prize for Economics in 2002 and 2017 respectively. Thereby, it can be argued that their approaches are not just accepted in the community but even consider prize-worthy (for further elaboration on the impact of Prospect Theory, see Lewis 2017). Also, institutions whose expertise is grounded in Prospect Theory and related theories are successful competitors on the consulting market (Straßheim, Jung, and Korinek 2015).

The second problem arising from the framing of a scientific revolution stems from the fact that Kuhn imagines scientific communities to be rather monolithic entities in which a science has a dominant paradigm. Based on that, a scientific revolution is a holistic enterprise in which the entire discipline, step by step, alters, changes, and replaces their dominant paradigms. This may hold true for certain branches of natural sciences; however as shown in section 3.1. economics consists of a plethora of subdisciplines, each having its own inner workings, yet being subsumed under the label of economics. Taking this as a starting point, it can be stated that even if one wants to frame the negotiation of rational choice and Prospect Theory as a scientific revolution, it would be an incomplete revolution.

Alternatively, the developments within economics could be framed by Granovetter's threshold theory (1978). According to his studies, each and every

person has potential for action—the theory has been developed by analyzing riots—which are activated depending on their peers' behavior. It could be said that each action is somewhat of a permission to also perpetuate a similar action (i.e. throwing a stone). Secondly, these potentials are not organized linearly but there is somewhat of a majority. Once there is so much activation potential—though gradual escalation—available that the majority feels empowered enough to join the cause, a tipping point (Gladwell 2000) is reached and a major shift takes place. Threshold theory does not assume that all shifts must result in total compliance as potentials for action are distributed differently along the participating actors: speaking in stereotypical assumptions, the aggressive teenager requires only a little push at a protest while the grandmother will arguable never join any aggressive cause. Transferring the threshold/tipping point model to science would mean that different subdisciplines require diverging amounts of input/activation in order to change their assumptions—a hypothesis supported by the findings from section 3.1. Once a subdiscipline has acknowledged Prospect Theory's validity for their research, it has (implicitly) given it permission to others as well—the theory builds up momentum. Once enough activation potential is available (enough subdisciplines employing parts of Prospect Theory), a momentum shift takes place and Prospect Theory has earned wide-spread legitimacy. Microeconomics required, due to its feedback structures and experimental designs, only little activation (just as the teenager at the protest), the (grandmotherly) field of finance still does not acknowledge Prospect Theory[1]. The necessary modification of threshold theory when being applied to entire (sub-)fields and/or groups is that the meaningful predictor of action potentials needs to be modified. While it may be age at a protest, in this case the quality, quantity, and directness of feedback may be the key variable to rank order the subfields according to their action potentials. Enriching the Kuhnian revolution with the threshold/tipping point model helps to explain partial and/or incomplete revolutions as well as the fact that both paradigms are currently still being taught in higher education.

[1] The (meso-)level of academic subfields can further be broken down to lower levels, such as institutions, labs, or the individual researcher. However, the general mechanism of the threshold approach can still be used to explain the workings within these different settings and—at least in accumulated form—the entire subfield.

Through consideration of the insights generated in section 3.1. und 3.2., it can be argued that the developments surrounding Prospect Theory and rational choice theory can—by looking at the meso- (subdiscipline) and macrolevel (economics as a whole)—neither be framed accurately from a Popperian nor a Kuhnian perspective as different evidences speak against a logic-driven refutation as well as a complete scientific revolution. Yet, both approaches can be mitigated by extending them with insights from sociology and (evolutionary) psychology. However, strictly speaking the developments outlined here (see section 2) are neither a refutation nor a scientific revolution. As the following section will argue, this not being able to be exclusively framed as a refutation or scientific revolution is a necessary precondition for the *hybridization* of ideas. As such, hybridization can be considered a mechanism which should be located between a complete change of (knowledge) systems, which could also be considered a Piagetian accommodation caused by Popperian refutations or a Kuhnian scientific revolution, and conservative assimilation tendencies. In the following, I do not intend to further identify traits of hybridized ideas—as it can be suspected that hybridization is a highly idiosyncratic concept being unique for different disciplines—but rather to derive and identify preconditions for the hybridization of ideas.

4. The Hybridization of Ideas—Preconditions

Generally speaking as well as tremendously abbreviated, economics can be considered the study of markets or, more precisely, the study of how actors act and decide in market settings (Levitt and Dubner 2009). This presumption has key implications as it will be argued that aspects of market principles are central to the concept of hybridization. Markets are structured along the lines of demand and supply and, that is at least the presumption, actors consider

changes in demand and supply—to diverging degrees—in their decisions. Secondly, market settings can also be understood as value hierarchies (Peterson 1999) which provides short-term as well as long-term goals and also presents incentives for each. In successful market settings, these goals are nested inside each other (Berger and Luckmann 1980-1969) as small actions are directed towards higher-level goals (Peterson and Flanders 2002), which also consider the dimension of temporality (Taleb 2018). One of the central goals is an increase in profit which can be reached through different means, i.e., improving efficiency (in transport, overproduction, etc.), find the best (read as: highest grossing) target groups for sales, or lower costs (of production, acquisition, etc.)—each of these goals and the associated strategies can be tied back to the very structure of markets (Deetz 1992). Additionally, different approaches can be rank-ordered by comparing how well they perform in order to reach these goals. Effective approaches implemented by successful actors are adopted by others (Cowen 2021), less effective approaches vanish; sometimes alongside the actors who employed them (Acemoglu and Robinson 2015). In its purest form, a quasi-Darwinian setting which also considers the negotiation of long-term and short-term goals (Taleb 2013) arises. At least in theory and when given sufficient time,[1] markets are relatively harsh feedback mechanisms of what works and what does not. As such, markets can be considered truth-generating tools.

Transferring these assumptions to the field of hybridization as well as the here discussed case, it can be argued that one key pre-condition for the hybridization of ideas is the free flow as well as the competition of ideas (Vogt and Neuhaus 2021). Competition includes, just as markets do, the ability to rank-order approaches based on a universally agreed upon hierarchy. Further, hybridization requires—equally universally agreed upon and—measurable variables along the lines of which the rank order is established. In the case of Prospect Theory and rational choice economics, (parts of) economics and psychology have already had a shared basis regarding measurable variables—the empirical basis so-to-speak—as well as a common understanding of the rank

[1] Acemoglu and Robinson (2015) discuss cases of functional and dysfunctional economic systems and conclude that—at least when given sufficient time—the functional ones actually prevail. An example of such mechanism may be the USSR which was even in early 1980s estimated to outperform the West, yet—due to their dysfunctional system—ultimately failed. However, this process required roughly 70 years and caused tens of millions of deaths.

orders (e.g. of insights) as certain approaches predicted actor's behavior more accurately than others (see e.g. Tetlock and Gardner 2015). Considering these aspects, the emergence of behavioral economics can also be interpreted as a *re-empirization* of economics; a correction of a discipline which ran the danger of being (too) ignorant of real-life observation as well as empirical research. The necessity of a shared (empirical) basis cannot be understated for the hybridization of ideas as, in case ideas lack this common denominator, each idea remains exclusively in its respective areas or field and communication, exchange, and hybridization become impossible. Ergo, a necessary pre-condition for the hybridization of ideas is the existence of a common (empirical) basis, a partly shared language so-to-speak, as dialogue—and with it, hybridization—would otherwise be impossible.

Conceptualizing markets as value hierarchies with in-build feedback mechanisms can also, at least in part, explain why rational choice approaches have not been obsoleted by Prospect Theory. Value hierarchies suggest how actors should act—see the analogy of normative economic and normative ethical as well as religious theory—, yet real-life behavior sometimes defers from these imperatives. Similar dynamics can be observed in economic theory. Just because reality does not obey these normative standards, the very standards still hold truth and value in them. If conceptualized as—for the market setting—highest-value behavior and actual behavior, a discipline should teach both for reasons of comparison but also for gradual improvement (Neuhaus 2021b). In short: A pre-condition for the hybridization of ideas is the differentiation between diverging resolutions (and functions) regarding values. While normative theory acts like an unattainable, yet valuable goal, descriptive approaches help to predict real-life behavior. An academic discipline benefits if it endures the stress of these competing approaches.

Derived from the value argument in the prior section, the second necessary pre-condition for the hybridization of ideas is the ideas are non-totalitarian. Totalitarian ideas construct a world in which each and everything can be explained by their (often ideological) assumptions (Purvis and Hunt 1993). As such, totalitarian world views leave no room for unexplainable circumstances (Sauer 1967) as their knowledge is total in nature. While the idea of totalitarianism is primarily employed to describe and criticize political actors (i.e. states), the general dynamics can be extended to almost every knowledge generating

system. Economics has often times been compared to and conceptualized as a quasi-religious system (Sedlacek 2012), in this case however an alternative observation can be made. According to Boltanski and Chiapello (2003), economics in the wider sense is one of the few systems which is relatively open to external irritation and is able to integrate aspects which have not been considered prior. This integrative spirit can also be observed in the negotiation of Prospect Theory as it did not obsolete existing economic theory but has been added to the canon of economic teaching. Based on the observed tendencies, it can be argued that economics is less of a totalitarian dogma but more of a hypotheses-driven search for truth, even if the process of generating truth can take some time. Following this line of argumentation, a necessary pre-condition for the hybridization of ideas is the absence of totalitarian thought as all-encompassing (knowledge) systems are unable to change or merge with other schools of thought.

5. Summary and Outlook

This paper has the following goals: first, to discuss the six axiomatic presumptions which have served as a basis for rational choice theory and have been, part by part, refuted by psychological insights. Second, to describe how these insights have been taken up by different subdisciplines of economics. This has been done through consultation of (abbreviations of) Karl Popper's as well as Thomas Kuhn's theory of science; each approach has been modified by theoretical considerations from (evolutionary) psychology and sociology. Lastly, to identify pre-conditions for the hybridization of ideas. In section 4 these have been broken down to the following aspects: a shared empirical basis (as a shared language), the discipline's willingness to endure the existence of different perspectives (as each has value for different purposes), and—derived from the second pre-condition—the given that none of the ideas is part of or constructs a totalitarian knowledge system. Due to economics entanglement with markets and

the wider economy, each of these pre-conditions has been fulfilled. As such, the nexus of cognitive psychology (Prospect Theory) and classical economic theory did not result in the annihilation of either but in a hybridization of thought as Prospect Theory is part of the mainstream economic curriculum, valued by various actors and institutions, and gradually fuses with further subfields of economics, such as marketing, recruiting, human resources, and the alike. As such, the psychology-economics nexus has illustrated that ideas, which have formerly been competing for primacy, can not just co-exist but *de facto* be hybridized.

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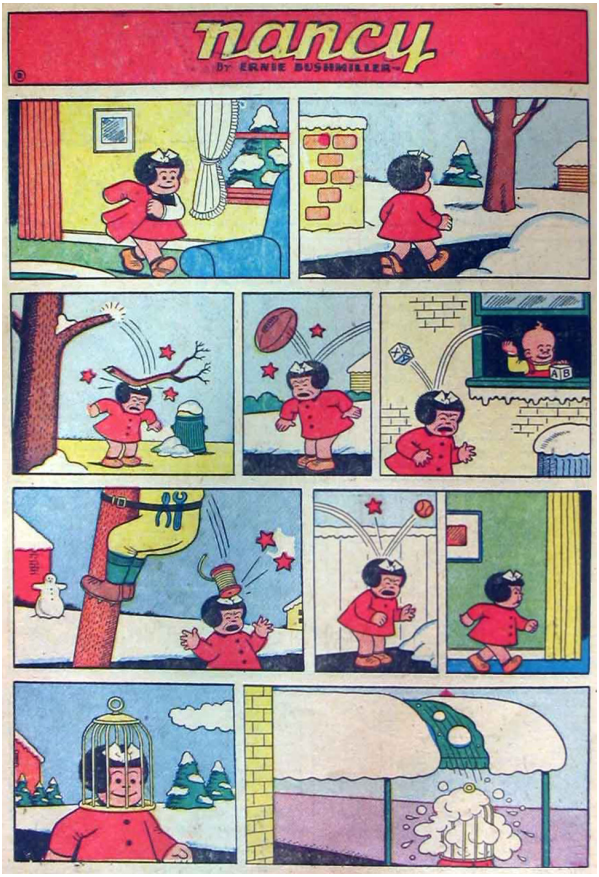

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