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Akratic Homo Economicus: Does the Neoclassical Economic Theory "Rational Agent" Assumption Accurately Depict Human Nature?

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Abstract

Neoclassical economic theory has long been scrutinized for its failure to be congruent with reality, often lacking generality and tractability due to, what many critics argue to be, unrealistic assumptions. One of the theory's core suppositions is a representative "rational agent" or *homo economicus*, whose self-interest and optimal choices, which are in state of equilibrium and efficiency are rooted in utility maximization of his well-being. Even though neoclassical economics claims to accurately depict human nature, from its very inception it has failed to incorporate human psychology and sociology into its foundations. As the behavioral and biological research became more robust in the 20th and 21st centuries, it began to provide evidence against some of theory's core questionable and often unsubstantiated claims. The paper intends to demonstrate a flaw in the "human rationality" assumption of the standard economic theory by exploring the phenomenon of addiction as one of the akratic behaviors that is often exhibited by human beings in the real world. This paper will focus on providing a brief overview and juxtaposition the Rational Choice and Rational Addiction models against assumptions and conclusions of the "picoeconomic" approach to explore the concepts of rational versus akratic behaviors in an attempt to evaluate whether these theories are capable of systematically explaining addictive tendencies of an "economic man."

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Chapter One: Introduction

The definition and the scope of *economics* as a social science discipline have been evolving since the time of what is, stereotypically, considered to be its official inception, i.e. in the works of Adam Smith. In its initial iterations, economic behavior was frequently viewed within a social context with a particular emphasis on production, distribution and consumption of wealth; however, the economic inquiry experienced a shift to a microeconomic level with the rise of neoclassical economic theory, with a particular accent on the study of "man" and his role in economic activity. Lionel Robbins developed a definition that is commonly accepted stating that "economics is a science which studies human behavior as a relationship between ends and scarce means which have alternative uses." This definition allowed economists to expand their grasp beyond discipline's standard scope and promote interest in analysis of any type of behavior influenced by scarcity.[1] Its proponents argue that the economic method is capable of being utilized in studying what we would not typically perceive as economic aspects of life, such as politics, sociology, religion, law and general human behavior. Through "economic imperialism," all areas of life can be analyzed within the context of primary standard economic theory axioms, including stable preferences, utility maximizing

[1] Backhouse, R., and Medema, S. (2009). "Retrospectives: On the Definition of Economics", *Journal of Economic Perspectives*, 23(1), p. 225.

behavior and market equilibrium.[2] However, neoclassical economic theory and its core assumptions have long been scrutinized for their failure to acknowledge and incorporate approaches and discoveries from other disciplines such as psychology, sociology, philosophy as well as natural sciences.[3] One of such core assumptions is the ubiquitous yet contentious concept of rationality, which permeates interests, discussions and theories of social scientists and philosophers alike. This paper will specifically address and critique this important assumption of the standard microeconomic theory of consumer choice and decision-making.[4] Particular focus will be given to rational choice theory and its ability to explain the phenomenon of akrasia. Akratic behavior can be observed in individuals with self-harming habitual behaviors, including, but not limited to, behavioral and substance addictions. The development and perpetuation of addictive or compulsive behavioral and consumption patterns that can affect both short-term and long-term well-being, problems of self-control and relapse, are considered some of the most relevant and complex issues sought to be addressed by social and biological sciences. From mere observation of such issues, which most people (without the necessity for complex analytical inquiry) would consider the opposite of "rational," should induce us to question the standard theory's core assumptions about the "man" whose behavior it seeks to predict. The paper questions the idea of a utility maximizing rational agent embodied within the conception of *homo economicus*. The paper attempts to do this by considering

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[2] Cowen, T. (2001). "How Do Economists Think About Rationality?" https://www.gmu.edu/centers/publicchoice/faculty%20pages/Tyler/rationality.pdf (accessed February 10, 2016).

[3] Not counting the inclination of early neoclassical economists, such as Alfred Marshal, Léon Walras and Francis Edgeworth, to construct theories based on mid-19th century physics and mathematics.

[4] I also recognize the importance of this assumption as it is applied to the neoclassical macroeconomic modeling and policy conclusions.

the self-defeating akratic behavior such as addiction, which is generally perceived as a negative behavior that is harmful (to self and others) and irrational in nature. The paper consequently questions whether or not neoclassical economic theory has the capacity to explain the "addiction" phenomenon, as it does through a framework of rational addiction theory, which, in itself, is a clear manifestation of "economic imperialism." I will argue that a different approach, hyperbolic discounting, as it is utilized by a subfield of behavioral economics based on experimental discovery known as "picoeconomics," while grounded within an economic theory framework, can provide several important insights into akratic behavioral phenomenon; it offers a more accurate foundation for analysis of addictive behaviors while filling in or replacing some of the gaps of the standard economic model. The paper also identifies some disadvantages of using the picoeconomic approach as the sole method of explanation of addictive behavior. I posit that no singular model has the capacity to fully quantify and predict human behavior due to the sheer complexity of the *Homo sapiens*. The paper does not address the following topics in detail, although I recognize their importance to the specific question as well as the overall argument: in-depth details, discussion and critique of behavioral economic theory origin and methods; emerging field of neuroeconomics and evolutionary biology and psychology; in-depth psychological and physiological foundations of addictive and compulsive behaviors; implications of behavioral and economic research for public health policies; a thorough and comprehensive overview of philosophical theories, specifically concerning the theories of rationality, free will, willpower, identity, self, judgement and morality. The paper intends to 1) explore the flaw in neoclassical theory's assumption of "rational behavior" as a given, with an overly simplistic and incomplete

view of human nature, as demonstrated in its attempt to tackle such a complex psychological and socioeconomic problem as addiction; 2) present an alternative framework of why akratic behavior exists through a model of hyperbolic discounting within picoeconomic literature, which attempts to blend both economic and psychological (and to, some extent, philosophical and metaphysical) considerations.

Since the subsequent discussion intends to look at the interaction of rationality, akrasia and addiction, I first must present a general definition and description of each:

Rationality

Assumptions about *rationality* place a central role in all fields of inquiry that observe and study human behavior. Individuals within the modern western society can generally discern and, in majority, agree what constitutes "rational" or "irrational" behavior; however, in many cases, that which constitutes a rational thought or action should be viewed as subjective. The term "rationality" tends to be used differently across disciplines, including specialized discussions of economics, sociology, psychology, philosophy, evolutionary biology and political science. In economic theorists' views, economic rationality is regarded in an instrumental sense, in which thought or action are means to achieve given ends within the most efficient manner; i.e. reason is a *tool* to reach goals. Philosophers, on the other hand, view rationality through a myriad of lenses and separate it into concepts that include "practical reasoning, procedural rationality and expressive rationality."[5] In certain instances, philosophers explore a dichotomy between rationality and reason, e.g. humans, by nature, are not rational creatures, but are capable of using reason as a psychological faculty to discern between the degree of

[5] Cowen, p. 1.

practicality/rationality of their thoughts and actions. It is agreed that "rationality" does not have one consistent definition.[6] For example, one view of rationality is the notion that if an action, belief, or desire is rational we ought to choose it.[7] This presents rationality as a normative concept, in a philosophical sense, as it refers to the conformity of one's beliefs with one's reasons to believe, or of one's actions with one's reasons for action: a rational decision is one that is not just reasoned, but is also optimal for achieving a goal or solving a problem. It is assumed that each individual is entitled to her own preferences, but that those should adhere to "basic rules of logic and probability theory" and should not change due to subjective factors such as mood or context. [8] In this interpretation, it is fairly simple to transfer the behavior of a *homo economicus* within a market place, bargaining or competing with or for things of tangible value such as money, and include other "goods" that present subjective value in the form of satisfaction or utility, concepts to be elaborated on in subsequent chapter. Despite its general focus on behavioral consistency, the rationality assumption can be perceived as an intuitive concept, i.e. human beings can frequently discern what we, collectively, would perceive as a "rational" versus "irrational" decision.

Social scientists have long held the rationality assumption as a given in modeling and predicting human behavior; there is not an argument amongst them that people have motivations and use reason to pursue their goals, whether these goals are chosen "rationally" or "irrationally." Irrational behavior in itself requires the use of thought and

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[6] Shafir, E., & LeBoeuf, R. A. (2002). Rationality. Annual Review of Psychology, 53(1), 491-517. doi:10.1146/annurev.psych.53.100901.135213

[7] Audi, R. (1999). The Cambridge dictionary of philosophy (2nd;2;ed.). Cambridge; New York: Cambridge University Press.

[8] Shafir, p. 493.

reasoning. Sigmund Freud insisted that what one might perceive as madness and irrational choice in the long-run, can be interpreted as a patient's solution to a particular problem.[9] The difference in how, for example, the economic and psychological disciplines differ in their approach to the concept of "rationality" lies in viewing behavior in context of "givens" or how the behavior is framed: "in economics, rationality is viewed in terms of the choices it produces; in other social sciences, it is viewed in terms of processes it employs."[10] Economic rationality is depicted as a logical process, not a psychological phenomenon. It does not factor in emotions: emotions and desires are foundations of choice, but they do not explain why a certain choice was made; within the economic context, feelings are givens and are not evaluated based on whether or not they promote the best course of action. The self-interest standard of rationality maintains that rational people consider only costs and benefits that amass directly to themselves. Such a standard stipulates that rational people act efficiently in pursuit of whatever objectives they hold at the moment of choice. Economic rationality, based on the neoclassical model, is, therefore, an agent's consistency within preferences and beliefs while in command of full information and awareness of consequences. It is economically rational to achieve the end-result with given means based on a certain desire; if the goal is achieved, then the process itself is rational; the quality or "rationality" of the result is not judged. However, as will be discussed in later chapters, some of the core foundations of

[9] Simon, H. A. (1986). Rationality in psychology and economics. The Journal of Business, 59(4), p. 209. doi:10.1086/296363

[10] Ibid.

economic rationality are not necessarily supported by qualitative and quantitative evidence.[11]

Akrasia

Akrasia, a term that can be traced back to classical Greek philosophers and is literally translated as "lack of mastery", can be interpreted as "human beings acting against their own better judgement." Akrasia demonstrates a deviation from assumption of prevalent human rationality as an akratic person goes against reason as a result of "pathos" or emotion. Aristotle distinguishes two kinds of akrasia: impetuosity and weakness. An impulsive individual acts first under influence of a strong emotion, only to regret an action later. A weak individual takes time to make a deliberate choice, but rather than go with a reasoned choose to act under the influence of a passion. Aristotle separates causes of akrasia into appetite for pleasure and anger, in part influenced by Plato's tripartite division of the soul in the *Republic.* Plato stipulated that "spirited part" or the "appetitive part" can sway an individual away from a reasoned choice and action. One other interpretation of Aristotle's treatment of akrasia is similar to that put forth by Socrates: akrasia is ignorance. Those who possess "practical wisdom" also possess "ethical virtues" which require complete emotional mastery. "Anger and appetite are fully in harmony with reason, if one is practically wise, and so this intellectual virtue is incompatible with the sort of inner conflict experienced by the akratic person."[12]

[11] Cowen also states that there "no single, monolithic economic method or approach to rationality," meaning that, as different economic perspectives evolved, the concept evolves simultaneously (often allowing for the a particular economic perspective and respective models to be plausible).

[12] Stanford Encyclopedia of Philosophy, http://plato.stanford.edu/ (accessed December 24th, 2015.)

Much of philosophical and psychological literature ties akratic behavior to the weakness of the will. Some modern scholars have elaborated further on ideas put forth by Plato, Socrates and Aristotle to include notions of individuals temporarily changing beliefs and preferences, exhibiting a breakdown of originally preferred action and a conflict of motivational states. Others have taken a more simplistic interpretation that views akratic behavior as a result of people merely seeking pleasure with an intent to delay painful or costly experience. For example, procrastination can be explained as simply a preference for immediate gratification while putting off of an unpleasant task until later. We may be fully aware that the feeling of regret will eventually come and that from, a global perspective, the current choice is not practical, but nonetheless choose the option that, in the moment, is most pleasing.[13] Akratic behavior, in itself, should challenge the economic notion of rationality where a rational human being consistently desires to maximize her short-term and long-term well-being (or minimize harm); how is it, even with full awareness of possible negative consequences, our decisions seem change and induce us to continue making choices that we know are causing self-harm or harm to others?

Addiction

Addiction can certainly be classified as a type of "akratic" behavior. The original definition of addiction as "judicial enslavement," or sentenced to serve another, may be even more helpful in tying it to concepts of akrasia and rationality[14]. An addicted individual voluntarily chooses to be "enslaved" by her addiction. The idea of "addiction"

[13] This challenges the economic concept of "maximization."

[14] Simpson, J. A., Weiner, E. S. C., & Oxford University Press. (1989). The Oxford English Dictionary (2nd ed.). Oxford; Oxford University Press; Clarendon Press.

or someone being "addicted" typically has negative connotations. Generally, it produces images of downtrodden drug users who are spiraling out of control, as they become "enslaved" by the disease through a state of constantly seeking reinforcing and rewarding stimuli. The American Psychiatric Association and *Diagnostic Statistical Manual of Mental Disorders* definition of addiction primarily focuses on the "substance abuse" aspects of the condition and views it is as a chronic brain disease that causes compulsive substance use despite harmful consequences. Addiction is defined as a maladaptive pattern of substance use and a disorder of the brain's reward system leading to clinically significant impairment or distress, as manifested by three (or more) of the following, occurring any time in the same 12-month period: tolerance, withdrawal, difficulty controlling in use, negative consequences, spending significant time or emotional energy, desire to cut down.[15] Roots of addiction often lie in both "nature" and "nurture" of an addicted individual, i.e. both genetics and the environment, such as peer pressure, socioeconomic and family circumstances, play a role. However, the primary emphasis in the mainstream definition of addiction is the view that it is a "chronic, relapsing disease" that primarily stems from biology: neurotransmitter dopamine is the primary factor that is responsible for substance abuse.[16]

The only behavioral addiction currently recognized by the DSM-5 is gambling addiction. However, the word "addiction" is often used colloquially to apply to any favored good or activity that has the potential to be overconsumed: cocaine, sex, sweets

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[15] Winter, H. (2011). *The economics of excess: Addiction, indulgence, and social policy*. Stanford, California: Stanford Economics and Finance, an imprint of Stanford University Press.

[16] American Psychiatric Association, http://psychiatry.org/patients-families/addiction/what-is-addiction (accessed December 26, 2015).

or Netflix shows can all be grouped into the same category as humans can develop a tendency to binge on these and experience a certain level of regret. Therefore, for the purpose of this paper's discussion, I intend to define and refer to addiction in broader terms: addiction is a condition that results when a person ingests a substance (e.g., alcohol, cocaine, nicotine) or engages in an activity (e.g., gambling, sex, shopping) that can be pleasurable, but the continued use/act of which becomes compulsive, interferes with ordinary life responsibilities, such as work, relationships, or health and results in regret and self-reported inability to stop. It is also plausible that individuals may not be aware or may be in denial about the fact that their behavior is out of control and is causing problems for themselves and others.[17]

The current psychiatric definition of addiction, which emphasizes the role of neurotransmitter function and pathway, has come under scrutiny. For example, it can be said that all activities, in some form, elevate the dopamine release system. If it is stipulated that dopamine elevation is the primary and necessary condition for addiction, then other non-addictive substances or activities that are part of a healthy life would unnecessarily be grouped under this definition. In *Addiction, a Disorder of Choice*, Gene Heyman argues that current research does not support the general perception that addiction is purely rooted in biology and should be treated as a chronic physiological disease as, for example, diabetes and schizophrenia. He notes that of all psychiatric conditions, addiction has one of the highest remission rates and most recoveries are done without medical intervention. Heyman argues that addiction should be viewed as a self-correcting disorder where "choice problems" are at the root of addiction. Unlike a chronic

[17] American Psychological Association, http://www.apa.org/topics/addiction/index.aspx (accessed December 26, 2016.)

health condition over which an individual may not have control, an addict has voluntary control over his choices. Heyman develops an argument that people differ in how they frame a sequence of choices: those who act from a "local choice standpoint" where they choose between items one at a time and are only concerned with short-term consequences, are more likely to become addicted than those who use a "global choice perspective" in which they organize choices into sequences and then choose between different sequences. Choices are, therefore, embedded within strategies that take into consideration "global view" or "local view;" choice is not a matter of free will as it is often dependent on external circumstances and heredity.[18] One of the critiques of the framing approach is lack of explanation of how these choices can actually be framed.[19]

As mentioned earlier, most "soft" addictions or compulsive behaviors are not classified as psychiatric ailments by the American Psychiatric Association. This paper does not seek to support or negate the view that negative compulsive behaviors should or should not be classified as a mental disorder, which is defined as a dysfunctional thought process or behavior that causes harm. In my interpretation, there is currently no clear definition of "addiction" as psychologists still struggle with a clear definition which is constantly in the state of flux as new research in the area of neuroscience, cognitive and behavioral psychology emerges and the DSM manual undergoes periodic updates. For the purposes of my argument, I intend to treat any behavior that we would perceive as voluntary, i.e. where an individual "should" possess a choice of whether or not to act upon a particular urge to engage in it, while intellectually wanting to do the opposite, as

[18] Heyman, G. M. (2009). *Addiction: A disorder of choice*. Cambridge, Mass: Harvard University Press.

[19] As noted in Kurti, A. N., & Dallery, J. (2012). Review of Heyman's Addiction: A disorder of choice. Malden: University of Kansas. doi:10.1901/jaba.2012.45-229

an “addiction” or a “compulsion.” Many sources (substances or behaviors) may form a low or a high level of neurobiological and psychological dependency; they range from those compulsions that are socially deemed positive, such as exercise; those behaviors that society has defined as “illegal” or “immoral,” such as substance abuse; and those that constitute a grey area such as food and sex addictions (there is an ongoing professional disagreement on whether or not these should be treated as “addictions”). The more encompassing terminology is particularly relevant to paper’s future discussion on conflict of successive motivational states and dissociation of “personalities” within an addicted individual, as one “self” wishes to constrain or entirely quit in the long-run and another “self” succumbs to temptation of immediate gratification; one self wants to act in accordance with good judgement, while the other attempts to undermine this goal. There is a significant internal ambivalence, which is the first aspect that appears to violate rationality of *homo economicus*.

Chapter Two: Exploring the Basics of the Neoclassical Economic Theory

The neoclassical model of rational choice has had limited success in explaining economic and certain non-economic behavior in simplified terms, but it has not been successful in explaining psychologically and ethically motivated behavior. The following chapter will focus on briefly presenting the core foundations of the conventional economic theory and the concept of "rational man" or *Homo economicus*:

Summary of the Neoclassic Economic Theory

Standard economic theory of consumer choice exemplifies economic agent's motivation to obtain pleasure and avoid pain, in thereof maximizing her well-being. Economic agent has come to be represented as *homo economicus*: he is often described as an "enlightened egoist." The origin of the idea of "economic man" is generally traced back to John Stuart Mill, while the Latin use of *homo economicus* can be found in works of other 19th century economists such as Jevons, Walras and Pareto (the general concept of a self-interested individual can be found in works of Aristotle as well as classical economists). Mill's "economic man" possesses four primary goals: accumulation, leisure, luxury and procreation, which should be attained with the least amount of labor and "physical self-denial." In Mill's view, these primary drives were enough in order to avoid complicating the theory and supporting empirical evidence and rising "indeterminacy". Mill recognized that certain motives, such as procreation, may cause the economic man to act irrationally. Mill used "economic man" and his undeveloped psychology to

demonstrate that institutions matter; his concept of rationality is different from the neoclassic sense of rationality, i.e. rationality of choice, which views *homo economicus* as an agent with complete knowledge and choice selection of out self-interest and desire for highest possible level of utility or well-being.[20]

Homo economicus serves as a model human being that exhibits rational maximization of self-interest and represents the society as a whole. The fundamental economic motive of self-interest was originally described by Adam Smith. Within the neoclassical model the agent maximizes a utility function in which utility is a function of the quantity of goods and services consumed by the individual: the utility function places the individual at the center dismissing any "humane" attributes. Jeremy Bentham, in his case of utilitarianism, has proposed a conception of "felicific calculus." He argued that utility is a net sum of positive over negative emotions and it contributes to happiness of every rational human being. Utilitarianism also considers consequentialism where an action must be judged for its consequences on the happiness of the largest number.[21] However, this view of "utility" as an indication of person's overall well-being ran into issues of quantifying "happiness" and finding a the measure for the amount of utility.

During the dawn of neoclassical school revolution, William Jevons, Carl Menger and Leon Walras sought to advance and reformulate some of the classical assumptions. While classical theory focused on how a commodity derives its value from the labor and production costs, the neoclassical theory focused on marginal utility to further explain

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[20] Persky, J. (1995). "Retrospectives the ethology of homo economicus." The Journal of Economic Perspectives (1986-1998), 9(2), p. 223-24.

[21] *Stanford Dictionary of Philosophy*. http://plato.stanford.edu/entries/utilitarianism-history/ (accessed December 20th, 2015).

and understand consumer preferences and behavior. Richard Langlois points out that neoclassical framework explores "means and ends" as "agent's behavior reflects the solution to a logical problem of allocation;" this foundation then allowed neoclassical economists to frame the "logical problem with the mathematical problem of optimization" while incorporating elements of "utilitarian psychology."[22]

Through "calculus of pleasure and pain" Jevons explained that rational people base decisions on extra marginal utility. Humans seek to procure the "greatest amount of what is desirable at the expense of the least that is undesirable" and this needs to be tied to a commodity which is defined as an "object, substance, action of service which can afford pleasure or ward off pain."[23] It is implied that individuals possess all the necessary information to analyze various commodity alternatives, agents can then rank commodities in the order of preference; utility value is inferred from observed preferences. People choose the best bundle under a given budget constraint; observing several consumption choices can then allow for an estimation of an individual utility function which can be used to predict future choices. Consumers also operate under the law of diminishing marginal utility, with a limited desire for specific commodities that falls after an optimal level of such commodity is received; commodities may not be perfect substitutes for each other in the satisfaction of specific yearnings.[24] Jevons also stated that "anything which an individual is found to desire and to labour for must be

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[22] Langlois, R. "Rationality in economics." http://www.sp.uconn.edu/~langlois/r700.htm (accessed January 31, 2016).

[23] Jevons, W. S. (1888). *The Theory of Political Economy* (Third ed.). London: Macmillan and Co. http://www.econlib.org/library/YPDBooks/Jevons/jvnPECover.html (accessed November 20, 2015).

[24] Varian, H. (2010). *Intermediate Microeconomics*. New York: W.W. Norton & Company.

assumed to possess for him utility."[25] This statement implies that even what can be viewed as irrational detrimental behavior can be viewed as utility maximizing. Jevons has also suggested that time preference and anticipation permeate economic behavior:

> The cares of the moment are but ripples on the tide of achievement and hope. We may safely call that man happy who, however lowly his position and limited his possessions, can always hope for more than he has, and can feel that every moment of exertion tends to realize his as-pirations. He, on the contrary, who seizes the enjoyment of the passing moment without regard to coming times, must discover sooner or later that his stock of pleasure is on the wane, and that even hope begins to fail.[26]

Homo economicus operates within the framework of rational choice theory making his or her choice based on individual preferences under constraints of scarcity and seeking efficiency, as he weighs opportunity costs of various alternatives in order to find the best long-term returns from least immediate investment. As mentioned previously, the individual is assumed to possess perfect information in order to make an efficient choice; even when the outcome is uncertain, an individual can make a judgement call based on expected utility. Individuals exhibit rational behavior which equates to acting consistently with one's utility function and constant rate of time preference, which is not context dependent. Standard theory presents a discount rate, or a rate at which individuals discount the future relative to the present based on the opportunity cost of delay, which is exponential in nature, modeling consistence of preference over time with preference for smaller immediate rewards and larger ones in the future. *Homo economicus* consistently chooses options to maximize positive or pleasurable with allowance for reduced value of delayed rewards. This implies that once

[25] Jevons, p. 9.

[26] Ibid.

an individual makes a choice to pursue a positive behavior, he or she will not deviate from such intention. Exponential curves are a form of normative economic modeling as they attempt to demonstrate subjective judgements of neoclassical assumptions and do not describe people's actual valuations; the rational agent in the model *should* be discounting at a constant rate over time and should not want to deviate from original preferences in order to ensure the outcome that is *ought to be*. The model does not allow for "irrational" behavior.

In general terms, neoclassical economics is founded on the notion that people have a limitless capacity for rationality, willpower and selfishness. We set goals and pursue them with intellect by using all available information and resources. Microeconomic theory focuses on individuals involved in bargaining for various goods and good bundles within an enclosed market system, undergoing real and hypothetical games, to make a price or value determination. Rational choice theory further takes this concept and applies it to quantifying people's behavior toward unpriced objects within social institutions such as crime and marriage with the scriptures of economic laws. This approach represents economics behavior as a solution to a constrained optimization problem "faced by a fully informed individual in a virtually institution-free environment."[27] *Homo economicus* presents an idealistic view of human nature, governed by rational behavior with illusion of control, void of powerful emotions within an existence that is complex, dynamic and chaotic. It can then be concluded that our decision-making is not governed by the context of thoughts, desires, feelings, values and

[27] Bowles, S. (2004). *Microeconomics: Behavior, institutions, and evolution*. New York; Princeton, N.J;: Russell Sage Foundation, p. 9.

other intrinsic states. Any phenomena that do not fall in line with canonical Walrasian assumptions are referred to as "anomalies," which are defined as an empirical result if it is "difficult to rationalize" or if implausible assumptions are necessary to explain within the paradigm of the standard economic view that most behavior can be explained by rational agents with stable well defined preferences interact in markets that eventually clear.[28]

Overview of the Rational Choice and Rational Addiction Theories

A prominent economist and philosopher Amartya Sen concisely summarizes some of the tenets of the rationality conception as presented by the standard economic theory**:**

> It seems easy to accept that rationality involves many features that cannot be summarized in terms of some straightforward formula, such as binary consistency. But this recognition does not immediately lead to alternative characterizations that might be regarded as satisfactory, even though the inadequacies of the traditional assumptions of rational behaviour standardly used in economic theory have become hard to deny. It will not be an easy task to find replacements for the standard assumptions of rational behaviour ... that can be found in the traditional economic literature, both because the identified deficiencies have been seen as calling for rather divergent remedies, and also because there is little hope of finding an alternative assumption structure that will be as simple and usable as the traditional assumptions of self-interest maximization, or of consistency of choice.[29]

Drawing on premises of the neoclassical economic model, rational choice (action) theory is a framework that is commonly used in modeling social and economic behavior in which a rational agent bases his choices on a consideration for his personal utility function. It describes human behavior as determined by rational individual decisions as

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[28] Richard Thaler in Ibid.
[29] Sen, Amartya. (1990). "Rational Behavior," in Eatwell, John, Milgate, Murray, and Newman Peter, Utility and Probability (New York: W. W. Norton & Company), p. 206.

people seek to maximize expected utility. There are several underlying assumptions: 1) an individual faces a known set of alternative choices; 2) preferences are complete and transitive 3) consumer possesses information about all choices and outcomes of any given choice 4) individual has the time and ability to weigh choices against one another.[30] Standard economic models that attempt to explain human behavior as related to akratic behavior are largely based on rational choice theory. There are several Rational Addiction models all of which assume rational consumers with stable time preferences and emphasize individual differences in discounting.[31] Most take the following approach: since addictions produce tolerance, current consumption increases marginal utility for future consumption and manifests itself as habit formation. Consumption decisions that may be viewed as excessive or harmful are defined as "rational" since addicted individuals exhibit optimizing economic behavior within the context focused on time allocation and consumption decisions.

In their influential 1988 article "A Theory of Rational Addiction," Gary Becker and Kevin Murphy presented a framework, based in an earlier rational choice theory of addiction model by Stigler and Becker, aligned with neoclassical postulates demonstrating that addictions are rational overtime and are consistent with optimization of stable preferences.[32] The model explains present and future behaviors as a part of a

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[30] Green, S. (2002) "Rational Choice Theory: An Overview." https://business.baylore.edu/steve_green-green1.doc (accessed December 16, 2015).

[31] Bretteville-Jensen, A. L. (1999). Addiction and discounting. Journal of Health Economics, 18(4), 393-407. doi:10.1016/S0167-6296(98)00057-5

[32] For detailed information, please refer to Becker, G. S., & Murphy, K. M. (1988). "A Theory of Rational Addiction." *The Journal of Political Economy*, 96(4), 675; or interpretation Ferguson, B. S. (2000). "Interpreting the rational addiction model." *Health Economics*, 9(7), 587-598. doi:10.1002/1099-1050(200010)

consistent, maximizing plan, represented by utility function U(0), given equation (1) under budget constraint (2); non-addictive goods are defined as *y* and addicting goods as *c* (as described in Vale)[33]:

$$U(0) = \int_{t=0}^{T} e^{-\sigma}\, u[y(t), c(t), S(t)]dt$$

$$(1)\ \frac{\partial S}{\partial t} = c(t) - \delta S(t) + z$$

$$(2)\ \int_{t=0}^{T} e^{rt}\,[q(t) - p_y(t)y(t) - p_c(t)c(t)]dt = A(t), \text{and } \lim A(t)_{t\to T} = 0$$

Individuals recognize the addictive nature of their choices, but pursue them regardless as the gains from a potentially harmful activity exceed any costs of future addiction; consumption of addictive goods today will depend not only on past consumption but future consumption as well. Within the model, the higher past consumption of *c*, measured by accumulative variable *S*, the higher is the marginal utility of the consumption of *c* today and lower is the current total utility. The individual is aware of both short-term and long-term consequences of her consumption, represented by an exponential and stable discount factor σ, which implies consistency in the individual's decisions over time. The model can, therefore, demonstrate that it may be most rational for the agent to choose consumption of addicting good *c* despite that at the moment of choice large *S* value reduces welfare.[34]

The key feature of these models is that a consumer's utility in any given period depends not just on consumption in that period, but also on "consumption capital," which

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[33] Vale, P. H. (2010). "Addiction and rational choice theory." *International Journal of Consumer Studies*, 34(1), 38-45. doi:10.1111/j.1470-6431.2009.00826.x

[34] Ibid.

is consumer's ability to enjoy a particular good. The level of enjoyment is dependent on past consumption. If past consumption enhances current enjoyment, the addiction is viewed as beneficial.[35] Becker and Murphy state that their model can also be used to explain cycles of restriction and bingeing if amendments are made to the analysis based on only one kind of consumption capital. For example, an individual who is overeating and dieting, can have two types of consumption capital such as "health capital" and "eating capital" where food consumption can be both harmful and beneficial. There are elements of utility maximization as an individual goes through cycles of dieting and overconsumptions: as eating increases, health capital falls and eating capital rises.

It is documented that many individuals that experience addictive tendencies with substances (legal or illegal) as well as compulsive behaviors began with "experimenting" prior to increasing consumption up to the level of being dependent. Rational addiction theories use stable preferences to explain this unstable consumption by viewing present consumption as a partial investment behavior, i.e. increase of stock of the addictive substance. According to model's framework, engaging in any addictive/compulsive behavior increases future stocks. It also assumes that individuals have accurate quantitative estimates of effects on these stocks, both positive and negative, as well as external factors such as prices, norms and public regulations. Individuals have the ability to "design a detailed consumption plan for their future life exhausting all gains from all trade-offs across time and goods conditional on opportunities and exogenous factors."[36]

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[35] Green, p. 29.

[36] Rogeberg, O. (2004). "Taking absurd theories seriously: Economics and the case of rational addiction theories." *Philosophy of Science*, 71(3), 263-285. doi:10.1086/421535, p. 271.

Becker and Murphy also state that "addictions, even strong ones, are usually rational in the sense of involving forward-looking maximization with stable preferences" and that addicts "would be even more unhappy if they were prevented from consuming the addictive goods."[37] The Rational Addiction model represents emotions as additional psychic costs, in addition to material costs; the choice is then made on a tradeoff between emotional negative rewards and potential material rewards: emotions therefore only change the parameter and pay-off of choice but not the rational foundation of decision making. Some implications of this model are that demand for addictive goods is generally sensitive to permanent changes in price and that strong addictions must end in a "cold turkey" manner: "rational persons end stronger addictions more rapidly than weaker ones."[38]

The original model has provided basis for next-generation models such as those presented by Orphanides and Zervos in 1995 and Gruber and Koszegi in 2001. Orphanides and Zervos attempted to mitigate the unlikely real-world trait of perfect foresight and planning of an agent in the Becker-Murphy model as well as to address the phenomenon of regret and relapses.[39] They recognize the role of experimentation and subjective beliefs and attempt to explain the paradox of pursuing addicting behaviors and regret. The authors stipulate that addiction results from time consistent expected utility

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[37] Becker and Murphy, p. 691.

[38] Ibid., p 692.

[39] The Becker-Murphy model only shows one scenario when an individual stops using an addictive substance: the stock of consumption capital will gradually reduce, and the desire to consume will be less since the marginal utility declines by the size of *S*

maximization with an explicit tradeoff between rewards of current consumption and the expected costs of lower future utility including the detrimental effect of higher discounting; the model explicitly accounts for uncertainty regarding timing and magnitude of negative effects and illustrate "importance of the resulting heterogeneity in outcomes for understanding addiction incidence and ex post regret."[40] The model assumes that people are either predisposed or invulnerable to addictions. It introduces uncertainty through three postulates:

> Consumption of the addictive good is not equally harmful to all individuals, that each individual possesses a subjective belief structure concerning his potential to become addicted and that this belief structure is optimally updated with information gained through consumption, via Bayesian learning process.[41]

According to the model, in order to find out one's vulnerability to addiction, an individual must first consume an addictive substance and figure out if she is a vulnerable or invulnerable subtype. The authors also state that people are drawn into addiction and that it is an "unintended occasional outcome of experimenting with an addictive good:" it is not a preplanned action but an "incorrect assessment of the possibility of becoming an addict."[42] A critique of the actual model states that it shows the opposite, i.e. that addictions are a deliberate plan as the individual must test her threshold to addiction before making a rational choice to either continue consumption or to quit.

Proponents of Rational Addiction models point out that their construct allows for a straightforward approach to examining such behavior as the only significant factor as

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[40] Orphanides, A., & Zervos, D. (1998). "Myopia and addictive behaviour." *The Economic Journal*, 108(446), 75-91. doi:10.1111/1468-0297.00274

[41] Ibid.

[42] Ibid.

individual consumption over time; there is no need to differentiate between physical and psychological aspects of addiction. Unlike other views on addictions Rational Addiction models simply describe behavior without condemning it; this rules out self-control problems. For example, in a conditional termed as "adjacent complementarity," a consumer will most likely choose/use a product that was used the last time that she was confronted with a choice among it and other alternatives.[43] For example, someone choosing between a "junk food" option and a healthier option that was not tried before, would most likely choose the former as the choice is simpler and requires less mental accounting. An addict rationally chooses to trade off short-term benefits of self-defeating behavior with long-term costs as compromising ones' future health.[44] The approach is simple: an addict weighed both past consumption and forward-looking costs; if the benefits outweigh the costs then the behavior becomes rational in her mind.

The Rational Addiction Theory remains one of the commonly used methods of economic analysis in the markets of legal and illegal addictive substances. It represents a clear case of "economic imperialism." It is important to point out that no empirical tests were performed on the original model; however, it has undergone testing in subsequent years, with mixed results. Most urge "caution" in conclusions drawn from its applications as "at the aggregate level, there is no good reason to expect to see the dynamics predicted by models of individual optimizing behavior reappear."[45] It has come under immense

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[43] Richards, T. J., Patterson, P. M., & Tegene, A. (2007). "Obesity and nutrient consumption: A rational addiction?" *Contemporary Economic Policy*, 25(3), 309-324. doi:10.1111/j.1465-7287.2007.00047.x

[44] Winter, p. 2-3.

[45] Ferguson, p. 597.

scrutiny in the past several years, particularly from its inability to explain as to why rational individuals would start using a product with a risk of dependence and detrimental effects in the first place as well as a commonly observed feelings of regret among addicts. Older and newer models show individuals who choose their addiction even after careful consideration of alternatives and costs, without questioning their actions or being involuntarily hooked. The choice to become addicted is, for example, explained by describing those who became addicted due to a negative shock and used their addiction as a positive consumption capital to offset emotional stress, will still obtain the highest welfare by being addicted, even after the negative effects subside, implying that it is more "rational" to numb out the emotion than to fully experience them.

Economist Ole Rogeberg has referred to the Rational Addiction Theory as "silly" and "absurd" due to the flaws in its basic assumptions, strong reliance on mathematical modeling and convenient explanation: the theory uses "mathematical modeling that is empirically unfalsifiable, based on widely inaccurate assumptions and poorly interpreted in a selective way."[46] Rogeberg contends that economists often claim that mathematical choice models do not need to comprehensively reflect the process by which individuals identify the solution to a decision problem as long as such models can specify at which outcome the decision process will ultimately arrive.[47] The models are critiqued for their lack of supporting evidence and a narrow approach to the decision making process. Some argue that harmful behavior can be explained within a Rational Choice framework only if

[46] Rogeberg, p. 264.

[47] Ibid., p. 270.

narratives from other fields are used to support such claims. Rationality supposition is then not a restriction if the modeling is flexible in its postulation about human motivation and desire. For example, recent advances in evolutionary biology and understanding of genetics and neurochemistry present a view in which individuals may choose to overeat, leading to obesity, in order to mitigate starvation risk. Consumers can be viewed as rational as they maximize their present and future well-being in a time consistent manner (in this case, constant feeling of satiety). This is true as long as long as psychology of self-control and its non-stationary intertemporal utility function does not interfere.[48] As a result, the mainstream theory is not wrong because it is empirically inaccurate, but because the rationality axiom based on utility maximization also depends on auxiliary assumptions to generate specific results.

This presents a major flaw in the Rational Addiction model, rational choice theory and neoclassical economic theory overall. In his article "On the Limits of Rational Choice Theory," Geoffrey Hodgson states:

> A theory does not explain anything unless it points to an underlying causal mechanism. In the case of individual behaviour, explanations must thus relate to the known mechanisms of the human psyche and human interaction and draw upon psychology, anthropology, sociology and other disciplines. This is precisely what the neoclassical advocates of utility theory refuse to do. They take the utility functions as given and give the job of grounding them theoretically to somebody else. By this refusal they indicate that utility theory itself cannot provide a real explanation.[49]

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[48] Smith, T. G. (2009). "Reconciling psychology with economics: Obesity, behavioral biology, and rational overeating." *Journal of Bioeconomics*, 11(3), 249-282. doi:10.1007/s10818-009-9067-8

[49] Hodgson, G. M. (2012) "On the Limits of Rational Choice Theory', Economic Thought." 1(1). http://www.geoffrey-hodgson.info/user/image/limits-rational-choice.pdf (accessed December 16, 2015).

As mentioned in the previous section, standard economic theory upholds the definition of rationality as a consistent behavior. Models based on the *homo economicus* agent principle assume that this hypothetical individual knows what is best for his long-term physical and mental health and can be relied upon to always make the right decision for himself. Rational choice theory proponents argue that there is evidence that utility maximization can be applied to humans in all forms of society and other species as well. This puts into question of how the theory can then be applied to a rational economic man existing in an environment of developed institutions and cultures. The method of application presents a problem when it fails to recognize the importance of human psychology, human interaction and human society. "Its very weakness, when applied to the human domain, stems from its excessive scope."[50] Rational choice model assumes that desires result in rational choices; however, desires may prevent the necessary information gathering, which may not result in the best course of action when one encounters issues of self-control. It is a normative model in the sense that it can be used to assess decisions as the model, essentially, supposes that human beings should seek rationality and shun irrationality. The model posits that irrationality is a product of an erroneous valuation process and that there is no legitimate reason for an addiction (along with its negative consequences or costs) to occur. The choice is then not an "irrational" choice, but an "erroneous" choice. The model fails to explain why consumers may experience disappointment with their consumption choices and wish they had more control over these choices; no inner conflict exists to prevent an individual from

[50] Ibid., p. 99.

obtaining a desired consumption bundle. According to Andrew Yuengert, "a policymaker using current rational addiction framework can never consistently argue (without recourse to externalities) for involuntary restraints on addicted persons."[51] The RA model explains why someone would completely stop an addiction, but cannot explain why someone might relapse or why someone would seek out external support in ending an addiction.[52] The exogeneity of preferences in the *homo economicus* model is a major distinction from *homo sociologicus*, in which tastes are taken as partially or even totally determined by the societal environment. Further, critics, learning from the broadly-defined psychoanalytic tradition, criticize the *homo economicus* model as ignoring the inner conflicts that real-world individuals suffer, as between short-term and long-term goals (e.g., eating chocolate cake and losing weight) or between individual goals and societal values. Such conflicts may lead to "irrational" behavior involving inconsistency, psychological paralysis, neurosis, and/or psychic pain.

[51] Yuengert, A. (1999) "Rational Choice with Passion: Virtue in a Model of Rational Addiction." https://www.gordon.edu/ace/pdf/Yuengert_Choice.pdf; (accessed February 20, 2016).

[52] Yuengert also notes that the RA model fails not because of the rationality assumption, but due to "full competence" auxiliary assumption; "if reason must contend with passion for control over the budget, many of the shortcoming of rational addiction model can be overcome." (p. 6.)

Chapter Three: The Rise of Behavioral Economics

Assumptions of the rational choice theory and the neoclassical economic theory in general have come under criticism stemming from significant development in psychological research. Even if some tenets of standard assumptions are removed in updated models of consumer choice theory, common principles of neoclassical paradigm are still evident, specifically equilibrium, greed and rationality. Economists view behaviors that violate rationality as idiosyncratic and therefore, abstain from formally analyzing such behavior within established scientific and mathematical parameters. However, considering that experimental subjects consistently exhibit irrational behaviors such as intransitivity and inconsistency in temporal discounting demonstrates that these behaviors are common and should allow for analysis.[53] The standard model of consumer behavior may be "simple and elegant", but is insufficient to describe consumer choice behavior. Three prominent factors the existence of which have been identified as rational choice theory critiques: bounded willpower, bounded rationality and bounded self-interest.

The revealed preferences approach is limited as it does not take into consideration motives and reasons. Neoclassical method still hinges on the its core view that economics cannot take into account subjective states since scientific approach must focus on observable behavior. The utilitarian approach, which takes into account subjective states

[53] Bowles, p. 11.

such as pleasure, pain, satisfaction, is now more relevant as such experiences can now be measured; however, this approach is still flawed as reasons for human activity can include addictions, weakness of will, myopia and other dysfunctional behaviors.[54] Both approaches are limited in their incorporation of preferences, beliefs and institutions. The standard model depicts passage of time as a discount rate without addressing the fact that people have an ability to learn and acquire new preferences over time. While this paper will not address social and evolutionary aspects that influence people's behavior, it is important to acknowledge the need to account for people's heterogeneity, versatility and plasticity.[55] Preferences cannot be viewed as normative and must incorporate common reasons that induce unfavorable behavior such as addiction. As noted previously, conventional theory views preexisting preferences as an explanation for a given behavior. However, psychologists stipulate that people create preferences "through act of choosing and consuming."[56] Herbert Simon further differentiates between the way the two disciplines view rationality by stating that economics is concerned with "substantive theory of rationality" in which a decision is reached objectively based on a given utility function; while psychology is concerned with procedural rationality, seeking to determine the processes that underlie choices and explain how motivations, emotions and sensory stimuli influence behavior.[57]

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[54] Ibid., p.100.

[55] Ibid., p. 125.

[56] Varian, p. 570.

[57] Simon, p. 210.

In recent years, "Behavioral Decision Research" contributed to creation of a field of behavioral economics, which takes into consideration effects of psychological, social, cognitive, and emotional factors on the economic decisions of individuals and institutions. One of proposed definitions of behavioral economics is describes it as "the study of the allocation of behavior within a system of constraint and examines conditions that influence the consumption of commodities."[58] Among other variables, Behavioral Economics attempts to incorporate two aspects taken as givens in the standard model: uncertainty and time. Behavioral economists argue that while individuals intentionally pursue objectives, they do so through "discovered" responses of past experiences rather than by engaging in the cognitively demanding forward-looking optimizing process.[59]

Incorporation of psychology into economics is not a new phenomenon in; after all, prominent classical economists were specifically interested in human nature.[60] The rejection of psychology as a social science began with neoclassical revolution as neoclassical economists wanted to tie the economic discipline to the natural sciences and to root its foundation in scientific inquiry and mathematical basis. Neoclassical economists also wanted to distance themselves from the hedonistic assumptions of Benthamite utility, although psychologists of the time were also rejecting hedonism as the basis of behavior. William James, for example, wrote that "psychological hedonists obey a curiously narrow teleological superstition, for they assume without foundation that

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[58] Bickel, W. K., Vuchinich, R. E., & Ebooks Corporation. (2000). *Reframing health behavior change with behavioral economics*. Mahwah, N.J: Lawrence Erlbaum.

[59] Bowles, p. 11.

[60] For example, Adam Smith's seminal work The *Theory of Moral Sentiments.*

behavior always aims at the goal of maximum pleasure and minimum pain; but behavior is often impulsive, not goal-oriented."[61]

In his essay entitled "A Psychological Perspective on Economics," Daniel Kahneman points out that even after 30 years of integrative research and attempts to integrate behavioral sciences into economics, upon a review of introductory economics textbooks "the same assumptions are still in place as the cornerstones of economic analysis."[62] Significant strides have been made in correction of assumption of selfishness through invention of the ultimatum game, brain-imaging studies of people of people playing games show signs of trust and reciprocation, confirming significance of social situation, showing a progress in modeling agents as Sen's "rational fools."

Kahneman further explores the concept of rationality: he states that this assumption has generally been viewed as an "approximation, which is made in the belief (or hope) that departures from rationality are rare when the stakes are significant, or that they will disappear under the discipline of the market."[63] However, not all economists have agreed that small deviations from rationality are irrelevant and that irrational agents are driven out of the marketplace.[64] There are underlying issues even when purely market-based monetary transactions are considered; for example, people value sunk costs more than the equivalent opportunity costs and in experimental gambling situations often

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[61] Camerer, C., Loewenstein, G., & Rabin, M. (2004). *Advances in behavioral economics*. Princeton, N.J; New York, N.Y;: Russell Sage Foundation, p. 4.

[62] Kahneman, D. (2003). "A psychological perspective on economics." *The American Economic Review*, 93(2), 162-168. doi:10.1257/000282803321946985

[63] Ibid.

[64] Referencing works of Akerlof and Yellen.

do not maximize expected value; however people frequently engage in gambling and some even become compulsive.[65] Economists must now take into consideration unpurchaseable goods and factors that influence human choice, which can often lead to an observed irrational behavior.

Neoclassic theory emphasis on utility maximization fails to present empirically testable auxiliary assumptions that describe external and internal factors that contribute to the decision-making process. Critics of standard economic theory of choice stress uncertainty and bounded rationality roles in the making of economic decisions, as opposed to the model of a rational agent who is informed of all circumstances impinging on his decisions. Integration of psychological research into the framework of substantive rationality allows to explore complexity of learning and decision processes. Behavioral economists argue that perfect knowledge never exists, which means that all economic activity implies risk. Kahneman and Tversky further showed experimental evidence that clearly pointed that preferences are affected by framing of decision problems. Several models with various contexts have been developed that further put the notion of "rational agent" into question, including models of quasi-hyperbolic and hyperbolic discounting and models which acknowledge self-control.

The concepts of s*atisficing* and bounded rationality, first introduced by Herbert Simon in 1955, sought to provide a realistic normative standard and is presented in both the "old" and the "new" school of behavioral economics. Bounded rationality contradicts the notion that individuals continuously make perfectly rational decisions due to

[65] Tversky, A. and Kahneman, D. (1981). "The framing of decisions and the psychology of choice." *Science* 211, 453-8.

cognitive limitations and the time available to make decisions. Individuals use heuristics, or mental shortcuts to make decisions due to inability to process the expected utility of every alternative action. It is also important to mention Kahneman and Tversky's prospect theory which accounts for context in which an individual makes a choice, in attempt to reformulate the standard view that preferences are exogenous and purely subjective.[66]

A recognition of suboptimal choices in decision making have contributed to development of behavioral economics which intends to marry standard economic theory with empirical findings from psychology and neurosciences. However, Kahneman points out that, even though current economic analysis now integrates more plausible psychological factors, the analytical methodology is constrained by the number of parameters that can be added to a particular economic model; there are "no immediate prospects of economics and psychology sharing a common theory of human behavior."[67] The majority of behavioral economic research focuses on observing and predicting how individuals make choices under a specific context, within a given option set, at a specific moment; it aims to show a "deviation from a benchmark of rational choice, where the size of the deviation measures the loss of utility." Behavioral economics has been able to demonstrate a "systematic and widespread" deviation from rational choice, while maintaining the link to the rational model.[68] Many of the psychological assumptions

[66] Davis, J. B. (2011). *Individuals and Identity in Economics*. Cambridge; New York; Cambridge University Press, p. 32.

[67] Kahneman, p. 166.

[68] Pugno, M. (2014). "Scitovsky, behavioural economics, and beyond." *Economics*, 8(24), 0_1.

incorporated into economics remain compatible with the standard economic theory since, for the most part, individual economic agents remain the focal point; and while they are viewed under the prism of bounded rationality, agent's main objective remains choice optimization. It is argued that the prospect theory merely "weakens" the atomistic individual view since the theory still treats context as partially influencing choice of individuals with stable, well-defined value functions.[69] Both microeconomic and behavioral psychology and economic models fail to explain these phenomenon which appear to be more psychological and philosophical in nature.

Behavioral economics literature that deals with health-related behavior and decisions, including materials related to addiction and substance abuse, typically revolves around two concepts found in the standard microeconomic theory: elasticity of demand and discounting. This paper specifically focuses on discounting and two different alternatives of how delayed reinforces are valued in comparison to immediate reinforces. As a reminder, Rational Addiction model and its iterations have provided an exponential discounting model, i.e. each unit of time that constitutes the delay in delivery, the value of a reward decreases by a fixed proportion. However, an alternative view regarding choices and long-term health implications has emerged.

[69] Davis, p. 33.

Chapter Four: *Picoeconomics* and Its Application to the Addiction Phenomenon

Overview of "picoeconomics"

Picoeconomics or "micro-microeconomics" blends within itself the standard economic model as well as behavioral economics. There is an internal psychological economy that leads individuals to making choices. It attempts to describe a marketplace of motivations trying to obtain psychological hedonism. It integrates self-control problems into economics and discusses habit formation to demonstrate that people often choose to act in a less than optimal fashion by acting within a framework that is comfortable or habitual. The theory also posits itself as a foundation to investigate "complex struggles with self-control that have traditionally eluded reductionist psychology."[70]

The official terminology for this theory was originally presented by George Ainslie, an American psychiatrist, psychologist and behavioral economist, through various earlier articles and his book *Picoeconomics*, although certain elements of this conceptual framework can be found in a variety of behavioral and philosophical literature. Ainslie was influenced by features of Freudian conception of id, ego and superego as different parts of self or personality come into conflict with one another. Short-term interests can be viewed as Id, long-term interest are similar to Ego and

[70] Monterosso, J., & Ainslie, G. (2009). "The picoeconomic approach to addictions: Analyzing the conflict of successive motivational states." *Addiction Research & Theory*, 17(2), doi:10.1080/16066350802666269, p. 130.

willpower to protect long-term interests from being defeated by short-term impulses is equivalent to Superego. This formulation of theory of decision making is intended to challenge rational choice theory and the supposition that the discount curve of value of expected events is exponential because it is the only way that conventional utility theory can protect its foundation from shifting preferences and ensuring consistency of behavior of the *homo economicus*. The concept of value defined by one's ability to satisfy visceral desires for concrete goods that trade in a cash market is easier to define within standard economic theory parameters than "subtle goods that defy precise characterization and ignore human motivation processes that determine subjective value that an individual places." One may consider that in a society where material needs are supposedly satiated, emotional experience is the important source of reward; this aspect also causes people to try to gain such emotional rewards as soon as possible due to hyperbolically based impatience for short-term rewards. Ainslie presents various arguments and empirical evidence that discounting the future is part of human psychology and cannot be simplified by only looking at specific factors such as uncertainty about the future, pleasure-seeking and yearning for immediate gratification as well as conditioned responses to immediate stimuli (a common trait of addiction). In an addicted individual, the goal of a desired substance is the ultimate fixed value to be obtained at potentially a great cost, while value of everything else fleetingly becomes nothing.[71]

Psychological research has also experienced setback in its approach to motivation; while there is significant empirical evidence for concrete rewards through reinforcement which is similar in its underpinnings to the marketplace model in economics, many

[71] Ibid.

foundational psychological models cannot account for why people often fail to maximize "any shopping list of goods, but rather behave in ways that look internally contradictory."[72] There are several considerations which account for why both economists and psychologists have a difficulty accurately defining desirable commodities or rewards: 1) rewards can function simultaneously or in close succession as both rewards and punishments (paying for cigarettes and for a smoking cure); rewards are changeable wherein an object which is highly desirable to a person (or a society) in one time period may be worthless in the next. Goods can lose their motivating power, for example, in instances of anorexia nervosa, abstinence or suicide; many rewards cannot be produced by direct effort, e.g. emotional responses cannot be controlled; individuals also willingly undergo "painful" stimuli which is counterintuitive to the pleasure-seeking behavior (i.e. medical procedures, etc.) Rational behavior grounded in the merits of utility theory is not realistic, as utility is itself is subjective while consequentialism can only be applied to the external world. An individual who is engaged in a self-harming behavior may only be able to perceive consequences to herself although in many instances, addictive behaviors may have a negative impact on those around.[73]

An important concept that needs to be related to this discussion is the conceptual framework of *discounting*, specifically how delayed rewards are discounted by individuals. As previously explored, delayed discounting is a theory that models a reduction in the present value of reward when there is a delay in obtaining said reward.

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[72] Ainslie, G. "Beyond microeconomics. Conflict among interests in a multiple self as a determinant of value." In Elster, *The multiple self*. Cambridge [Cambridgeshire];New York; Oslo; Cambridge University Press.

[73] Ibid.

All such choices are intertemporal, i.e. possess a time dimension that calculates tradeoffs between costs and benefits at various times. Normative economic models present a framework in which present value decreases by a fixed proportion per unit of time that an agent must wait for the reward, resulting in an exponential discounting model; under this assumption, a reward that is preferred to another from one "temporal vantage point is preferred from any temporal vantage point."[74] The common type of time preference function can be written as $(1 - r)^t$, with discount rate designated as r and t representing the duration of the delay. The intertemporal choice model of discounted utility, developed principally by Paul Samuelson, is represented as the following, where c_t is consumption in period t, r is the market rate of interest and W (wealth) is the net present value of the consumer's future income plus present wealth, evaluated at time 0; δ represents individual's discount factor, which is assumed to be $0<\delta<1$, showing that future expected utility is considered in current decision, but is less significant than the current utility:[75]

$$(1)\sum_{t=0}^{T} \delta^t u(c_t)$$

subject to

$$(2)\sum_{t=0}^{T} c_t/(1+r)^t = W$$

[74] Kirby, K. N. (1997). "Bidding on the future: Evidence against normative discounting of delayed rewards." *Journal of Experimental Psychology*: General, 126(1), 54-70. doi:10.1037/0096-3445.126.1.54

[75] Laux, F. & Peck, R. (2007) "Economic Perspective on Addiction: Hyperbolic Discounting and Internalities." http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1077613 (accessed: November 24th, 2015).

This model is viewed as one-dimensional, as it hinges on one parameter of δ; smaller values of δ indicate greater impatience, while larger values show patience. Paul Samuelson, who originally proposed the discounted-utility model, himself stated that while it is "simple and similar to present value calculations applicable to financial flows," it is psychologically implausible.[76] It depicts an individual who is not completely myopic, and, while being somewhat impatient, the behavior is consistent and forward-looking, meaning that preferences will not reverse over time. Empirical evidence, particularly that concerning drug-addicted individuals, does not support this view, specifically under the circumstances when loss of control and impulsivity aspects of addiction are noted.

Parametric studies of choice demonstrate a Herrnstein's Matching Law which shows a preference for goods at different delays will change as a function of time. From empirical evidence it is observed that the discount rate curve of both human and non-human subjects is hyperbolic with value inversely proportional to delay as opposed to exponential; delay-discounting rate is inversely related to the amount of the reward and the length of the delay to a reward.[77] There is an inherent tendency of human beings to undervalue future events. We experience regret if we have put off pursuing the more valuable goals in preference of smaller immediate rewards. The key problem in addictive behaviors is their ability to provide immediate gratification in the present, with costs such as negative impact to well-being (physical, emotional, financial, etc.) occurring in the future. Individuals with impulse control problems as well as those with underlying mental

[76] Camerer and Lowenstein, p. 24.

[77] Ainslie, G. (1991). "Derivation of "rational" economic behavior from hyperbolic discount curves." *The American Economic Review*, 81(2), 334-340.

disorders (such as anxiety and depression) have more difficulties with assessing future consequences; they are willing to sacrifice future gains or averting future losses, tangible or intangible, in exchange for an immediate pleasurable experience. However, to revert back to the definition of addiction, there must also be a sense of regret, i.e. the "addict" choses the reward, but later regrets tis choice exhibiting "present bias." People might want to change their negative behavioral patterns in the "now" in order to feel better "later," but when "later" comes, individual "changes her mind" and a relapse happens. There are cognitive processes that are shaped by intrinsic factors and external triggers occur which are uniquely human.[78]

The picoeconomic model demonstrates time inconsistent preferences resulting in hyperbolic discounting. An increased valuation occurs when a fixed unit of time closer to an expected outcome is proportionately greater the closer one is to the outcome; the surge in perceived value as the individual temporarily gets closer to particular reward creates a systematic intertemporal preference reversal. Hyperbolic discounting function shows gaps of time in which a more immediate but inferior reward is temporarily preferred over its alternative. The following formulae and graphical representations show the difference between exponential and hyperbolic discount functions, which demonstrate that for the exponential graph (a) there is no delay for change in preferences, while for the hyperbolic discount graph (b), the smaller reward is valued more just as it becomes available. The following equation developed by Mazur is widely used to calculate the discount rate, in

[78] As noted in Monterosso & Ainslie and selected Ainslie works.

which v_d is the present discount value of a delayed reward, V is the objective value of the delayed reward, k is empirically derived discount rate and d is delay duration:[79]

$$v_d = \frac{V}{(1 + kd)}$$

In the "Précis of Breakdown of Will," Ainslie simplifies both exponential and hyperbolic discounting as the following:[80]

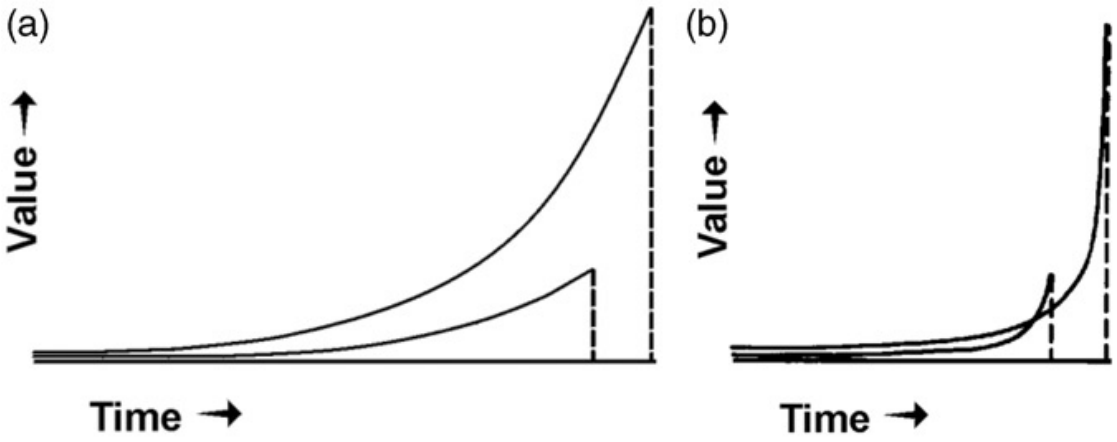
Exponential Discount Function:

$$Value = Value\ at\ no\ delay\ x\ (1 - Discount\ rate\ )^{Delay}$$

Hyperbolic Discount Function:

$$Value = \frac{Value\ at\ no\ delay}{[Constant + (Impatience\ factor\ X\ Delay)]}$$

Figure 1. Exponential Discounting vs. Hyperbolic Discounting (graphical representations by George Ainslie)



[79] Bickel, W. K., & Marsch, L. A. (2001). "Toward a behavioral economic understanding of drug dependence: Delay discounting processes." *Addiction*, 96(1), 73-86. doi:10.1046/j.1360-0443.2001.961736.x

[80] Ross, D., & Spurrett, D. (2005). "Behavioral (pico)economics and the brain sciences." *Behavioral and Brain Sciences*, 28(5), 659-660. doi:10.1017/S0140525X05320115

Figure 1(a) demonstrates two exponential discount curves, smaller-sooner and larger-longer rewards; their height is proportional to their value at the time that the smaller-sooner reward is due. Figure 1(b) shows a reversal in which the smaller reward is temporarily preferred for a period just before it is available (as the smaller-sooner portion of the curve surpasses that of the later-longer reward). Individuals exhibit a present bias seeking immediate rewards due to various factors that are not included in neoclassical considerations such impatience that causes psychological discomfort, uncertainty in knowing that future rewards will produce the same level of satisfaction. As mentioned earlier, a major element observed in self-identified addicted populations is the inability to remain consistent in desire to stop an addicting activity; these populations display a dynamic inconsistency. Those who have a high discount rate seek immediate rewards. The individual also underestimates future impulsivity and exhibits preference reversal.[81] There is substantial evidence across addicted populations showing a steep delay discounting and intake of substance to which an individual self-reports addiction, especially in those who exhibit nicotine, opiate and alcohol dependency. There is also evidence that those who are able to "quit" show discount rates similar to those who do not identify as "addicts." This suggests that discounting rate may decrease after a period of abstinence is achieved or that individuals who are likely to achieve abstinence discount more steeply.[82] While impulsivity and high intertemporal discount rates are common traits among addicted populations they are consistent with, but do not necessarily prove

[81] Ibid.

[82] Bickel, W. K., Vuchinich, R. E., & Ebooks Corporation. (2000). *Reframing health behavior change with behavioral economics*. Mahwah, N.J: Lawrence Erlbaum.

that individual differences in discount rates are responsible for addictive behavior.[83] There are various other characteristics that may contribute to high discount rates such as age, cognitive capacity, cognitive deficit and socioeconomic characteristics. Research contends that substance abuse and unhealthy eating behaviors are higher in urban and low socioeconomic status residential environment, therefore, social context cannot be overlooked as a contributing cause.[84]

Hyperbolic discounting demonstrates instability of preferences creating individual, "temporarily-defined" agents within what standard economics views as a basic single person who is a "straightforward estimator of amounts, probabilities and delays of environmental events with no provision for temptation or self-control."[85] Individuals begin to act "irrationally" as they begin to excessively discount the future. This approach resonates with the view of addiction described by Gene Heyman in Chapter 1, i.e. local and global choice perspectives. The hyperbolic model is remonstrative of the local approach of decision making as the individual chooses a substance or behavior that hold the highest value in the present. Exponential discounting, as it is specifically used in the Rational Addiction model, demonstrated a global choice perspective where an agent is capable of planning and carrying out an optimal, forward-looking consumption plan.[86] However, it is an observable fact that many tend to

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[83] Monterosso, J., & Ainslie, G. (2007). "The behavioral economics of will in recovery from addiction." *Drug and Alcohol Dependence*, 90, S100-S111. doi:10.1016/j.drugalcdep.2006.09.004

[84] In Bickel and Vuchinich; and Heshmat, S. (2011). *Eating Behavior and Obesity*. New York: Springer Pub. Co.

[85] Ainslie (1991).

[86] Heshmat, p. 112-13.

procrastinate on acting in accordance with the optimal plan, since we often tend to choose instance gratification over delayed rewards, such as long-term health. There is a "defective telescopic faculty" that makes us value intensity of sensual and pleasurable experiences in the present more than in the future.[87] Humans also experience a decay of past experiences which makes us forget negative emotions that may have contributed to the prior decision to forego a present commodity or action. For example, a hangover that contributed to the vow to never consumer alcohol again may now be vaguely remembered and does not possess a potent enough negative reinforcement to prevent current consumption.

The basic preference for immediate gratification is also colored by the problem of whether or not a person is aware of her self-control problem. O'Donoghue and Rabin separate individuals into "naifs" where a person is simple and intuitive rejecting a behavior for immediate gratification by overindulging and procrastination; "sophisticates," however, are more complicated and are "influenced by the preference for immediate gratification," but they also make attempts at "self-control;" in extreme cases, such attempts can cause a swing to the opposite side for immediate gratification. The study also shows that situations where a preference for immediate gratification is likely to involve incremental daily or moment-to-moment decisions is where self-control problems are able to influence behavior; for long-run decisions, such as how to divide one's retirement savings among investment accounts, a preference for immediate gratification is unlikely to play a significant role unless an individual puts off making such a decision for a number of years. The study concludes that making a long sequence of daily

[87] Ibid. p. 99

decisions, none of which seems important in isolation, even a small self-control problem can lead a person to behave differently from how she would have wanted to behave in a long-run perspective. This means that most of us are quite different from the "time-consistent super-human" of a traditional economic model.[88] Supporting study by Kang and Ikeda reiterates the claims that health behaviors have correlations with time-discounting properties, including impatience and the present bias, tendencies which are stronger in "naifs" than "sophisticates" and also introduce the concept of "sign effect," which shows that future losses are discounted at a lower rate than future gains.[89]

Self-control and Willpower

Picoeconomic theory is well positioned to explain issues of ambivalence, dissociation, self-control issues and regret that often plague addicted individuals. It is also partially supported by the biological view of addiction as a disorder of dopamine regulation whereas dopamine is responsible for user's sense of time, as dopamine decreases reason and reduces perception of future costs; in this sense, biology lays a contributing factor in hyperbolic discounting, making the present desire more important. For example, dissociation, which can be explained a temporary reveal of preferences, can be so dramatic that it can change what the person acknowledges as his "self." Competing "agents" or interests vie to become the dominant choices on the basis of changing values of rewards; a "future self" can become a potential obstacle when an individual acknowledges that she wants to stop a negative behavior in the "now." According to

[88] O'Donoghue, T., & Rabin, M. (2000). "The economics of immediate gratification." *Journal of Behavioral Decision Making*, 13(2), 233-250. doi:10.1002/(SICI)1099-0771(200004/06)

[89] Ikeda, S., Kang, M., & Ohtake, F. (2010). "Hyperbolic discounting, the sign effect, and the body mass index." *Journal of Health Economics*, 29(2), 268-284. doi:10.1016/j.jhealeco.2010.01.002

Ainslie's view, people are often aware of their changing and conflicting temporal perspectives, which consequently, leads them to attempt self-control in order to suppress the future self and act strategically by incorporating pre-commitment mechanisms to the presently desired alternative (e.g. resolutions, rehab, repression, willpower, etc.) Ainslie also points out that because individuals have imperfect knowledge of their willpower, they must infer it from past choices. Something like a resolution works on people's attempt to preserve their reputation as a way to deter possible lapses and weakness of will.[90] . In *Will as Intertemporal Bargaining* article, Monterosso and Ainslie state that "if people are hyperbolic discounters, they can either impulsively squander long range resources or compulsively imprison themselves for fear of their impulses while still strictly maximizing their expected discounted utility at every moment."[91] Picoeconomic model mimics a game theory-like methodology, where intrapersonal interests come into conflict with one another; present self enters into bargaining with one's future self and can enter a prisoner's dilemma relationship among successive motivational states.[92] In this context, willpower deters against each individual impulse by instilling an anxiety of setting precedents for numerous future impulses. Ainslie connects this view of personal rules and cooperation in the bargaining process to principles specified in Kant's categorical imperative and Kohlberg's highest stage of morality which can, superficially, define rationality. However, Ainslie further argues that willpower is an "awkward expedient, not the ultimate rationality" as it does not truly resolve the problem of

[90] Davis, p.54.

[91] Monterosso and Ainslie (2009), p. 853.

[92] Monterosso and Ainslie (2007).

temporary preferences.[93] While willpower can be viewed as one of the "most flexible and potentially the most powerful of the choice-stabilizing devices" it only formalizes internal conflict and may actually result in negative consequences such as 1) development of obsessive-compulsive tendencies 2) a small lapse can lead to total collapse of restraint and 3) rules may lead to misperception.[94] All of these phenomena have been observed in a clinical addiction treatment setting. The concept of "multiple selves" in one individual certainly opposes the neoclassical view of an atomistic rational agent. Ambivalence, or pursuing a goal that an addict desires to stop, is factor that is difficult to explain via standard theory means. *Homo economicus* modeling cannot explain two "selves" within one individual; nor is there any room for *homo economicus* to be "enslaved" by his appetites: a rational agent cannot at the same time look forward and be apprehensive about a future behavior experiencing a "motivation conflict beyond an uncertainty about magnitudes."[95]

However, the "successive motivational states" approach based on hyperbolic modeling has some gaps. Some find that the model is overly qualitative as it simply describes behavior, but does not explain it.[96] For example, Kent Bach points out that, for the most part, Ainslie presents a descriptive model of the interplay of motivations, but attempts to fit it under parameters of a normative model with the intention of showing

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[93] Ainslie, p.6.

[94] Monterosso and Ainslie, p. 126-27.

[95] Aisnlie, G. (1999). *The Dangers of Willpower.* http://picoeconomics.org/HTarticles/Dangers/Dangers2.html (accessed October 15, 2012.)

[96] Ross and Spurrett.

how to manage motivational interplay.[97] Others have noted that while hyperbolic discount models are good at demonstrating specific contexts, they cannot be applicable to all situation as they cannot account for different contextual factors that influence person's intertemporal preferences; there is significant and systematic variability in individual discounts rates dependent on the context, which implies that the model loses its predictive power; it is also "distant from cognitive processes that underlie decision making."[98] The model also does not provide a detailed explanation of the interplay of affect and cognition, or a person's struggle between emotion and reason. The role of emotion in hindering the self-control process of the deliberative system, is not clearly explained by the model. An individual has a limited "willpower budget" can is influenced by cognitive load, ego depletion, loneliness and social exclusion, age, stress, blood sugar levels (in the base of unhealthy eating behavior), and sleep deprivation, among others.[99] The hyperbolic model captures moment-by-moment preferences which cannot completely address second-order attitudes (a concept in philosophy which signifies that people realize that their values are disproportional to the strengths of their desires and may attempt to act on or else knowingly resist that realization when trying to apply to concepts of procrastination, pre-commitment and personal rule.[100] The notion of "multiple selves" within the intertemporal choice framework is often supported, however

[97] Bach, K. (1995). "Picoeconomics: The strategic interaction of successive motivational states within the person" by George Ainslie (book review). Buffalo, N.Y: State University of New York at Buffalo for the International Phenomenological Society.

[98] van den Bos, W., & McClure, S. M. (2013). "Towards a general model of temporal discounting." *Journal of the Experimental Analysis of Behavior*, 99(1), 58-58.

[99] Heshmat, p. 128-30.

[100] Bach, p. 3.

there is a flaw in attempting to describe this phenomenon purely relying on mathematical and graphical modeling. Additional clinical and neuroimaging studies (including neuroeconomic approach) are suggested to confirm the specific nature of the phenomenon in order to provide basis for its underlying mechanism.[101] Viewing an individual as a population of "partially conflicting interests makes it easier to understand irrationality, however irrational thought process and action should not be viewed as a collection of errors."[102] Regardless, research that builds upon and explores the conception of multiple selves is necessary to make current behavioral models more complete. Ainslie himself agrees that for a subject as complex as addiction, "a unifying discipline will be indispensable;" however, he still insists that the only way this can be attained is if the economic community accepts that "discount curves from expected rewards to be hyperbolic."[103]

While this paper does not intend to delve into the philosophical foundations of choice, self and self-control, it is important to present a particular model that enhances Ainslie's conception of conflicted multiple selves within an addicted individual. Mark White states that an essential problem of economic models of rational choice is lack of distinction between decision/judgement and action; action is a physical manifestation of an agent's choice. According to White, philosophy and specifically the field of action theory, encounter a similar problem and this is why both disciplines have difficulty

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[101] As presented in Jamison, J., & Wegener, J. (2010). "Multiple selves in intertemporal choice." *Journal of Economic Psychology*, 31(5), 832-839. doi:10.1016/j.joep.2010.03.004; van den Bos and McClure; Trenton Smith; Ross and Spurett.

[102] Ainslie, G., & Monterosso, J. (2003). "Will as intertemporal bargaining: Implications for rationality." *University of Pennsylvania Law Review*, 151(3), 825-862.

[103] Ainslie in Ross and Spurett.

explaining akrasia. White quotes R. Jay Wallace and his view of the standard model of choice in action theory as the "hydraulic conception," which "pictures desires as vectors of force to which the persons perform;" a theory that "leaves no room for genuine deliberative agency" resulting in passive agents.[104] The article further points out that it is people's ability to choose to or not to act on our beliefs and desires is what defines rationality as opposed to the standard definition of strictly following one's judgement based on desire and beliefs.[105] While some view this human ability as a unique faculty of "will," Ainslie presented the intrapersonal bargaining between selves to overcome the temporary preferences resulting from hyperbolic discounting as a version of "will": "the will is created by the perception of impulse-related choices as precedents for similar choices in the future."[106] The standard economic theory cannot attempt to incorporate the conception of will since *homo economicus* cannot experience a weakness of will, since he has no will to be weak.[107] White proposes an alternative model which incorporates the philosophical concept of "will" (as proposed by John Searle and R. Jay Wallace) into the model of economic decision-making: choice is depicted as action that is not logically derived from an agent's desire or belief, but instead from her free choice; this choice cannot be modeled, as it is an act of free will and can be represented with a probability distribution representing character or strength of will. This modeling further elaborates on

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[104] White, M. D. (2006). "Does *Homo Economicus* Have a Will?" http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1276495 (accessed January 31st, 2016); p.5.

[105] Ibid., p 7.

[106] Ainslie

[107] White, M. D. (2006). "Multiple utilities and weakness of will: A Kantian perspective." *Review of Social Economy*, 64(1), 1-20. doi:10.1080/00346760500529914, p. 13.

Ainslie's depiction of conflict of successive motivational states through a model of character change and can be specifically applied to the dynamic aspects of addiction. The model partially reconciles Rational Addiction model which stipulated that addiction is an agent's rational choice and that stopping an addicting behavior is also a rational choice, but requires a strong will to accomplish.[108] This resonates with Gene Heyman's view of addiction as a choice, in which recovery from addiction requires a choice and significant motivation and willpower to accomplish. Incorporating these concepts may further take picoeconomic approach into an overtly qualitative direction, so disfavored by social scientists. However, this begs a rhetorical question: does every observable phenomenon necessarily need to be quantified?

[108] Ibid., p. 20-21

Chapter Five: Concluding Comments

Social psychologist Kurt Lewin famously stated that "there is nothing so practical as a good theory," which can be interpreted that if a given theory provides an accurate explanation of an observable phenomenon, it must be able to find useful applications in the real world.[109] This paper intended to make a case that standard economic theory, which, unfortunately, primarily remains the foundation for the economic discipline, cannot justify its assumptions if compared to real-world phenomena. The paper specifically focused on addiction as a type of akratic behavior that is frequently encountered in society. While the definition of "rationality" varies across diverse areas of knowledge and inquiry, the version of neoclassical economic theory that postulates a behavior with time-consistent preferences and choices and utility maximization under availability of full information and cost minimization is too narrow and inconsistent with empirical evidence that demonstrates that people can act in a systematically erratic fashion while making choices that are the opposite of optimal, often shifting between short-term and long-term goals. The need for incorporation of psychology in economics is obvious. Unfortunately, behavioral sciences, including psychology, have also fallen prey to narrowly defined parameters of their respective models and subsequent theories. Social sciences in general have been too focused on constructing mathematical and

[109] Lewin, K. (1951). *Field theory in social science: Selected theoretical papers* (D. Cartwright, Ed.). New York, NY: Harper & Row.

statistical models as a means of depicting and predicting human behavior. Addiction can be a highly destructive behavior that inflicts physical and psychological suffering upon the addict and those around him; however, being fully aware of these costs, the addict still chooses to pursue the destructive option, even when fully aware of consequences. This akratic phenomenon is perplexing and lacks a clear and concise explanation by any of the existing theories, especially within the framework of the neoclassical conception of *homo economicus* and choice. We saw that the Rational Addiction theory cannot explain empirically supported fact that an addicted individual often exhibits ambivalence about her preferences and a desire for more self-control. Picoeconomic theory's view of the self as a population of conflicted selves attempting to refrain from or succumbing to temptation is a promising area of further study which removes some of the limitations of the standard economic theory with evidence-based insights from psychology and elements of philosophical theories concerning self and willpower. I recognize that while the topic is vast and can be approached from a variety of vantage points, it is important to reiterate that human behavior is influenced by an immense number of factors that cannot always fit within a specific methodological framework in order for it to be capable of undergoing scientific scrutiny and analysis. Based on this limited overview and treatment of addiction, the following general conclusion can be reached: neoclassical economics and rational choice theories that stem from its foundations are unable to explain the highly complex and nuanced world of human behavior, particularly a behavior that is akratic in nature. The picoeconomic theory and its underlying principle of hyperbolic discounting and intertemporal bargaining among multiple selves, are capable of

providing some important insights and advantages over the standard economic theory. The theory integrates, albeit not fully, important considerations from psychological sciences and philosophy and demonstrate the obvious flaw in the "rational agent" assumption and neoclassical economics definition of rationality. Its base, nonetheless, continues the "scientific tradition" of attempting to quantify highly subjective aspects of human nature, including emotions, passions and thoughts. Currently, neither picoeconomics, nor any other prominent theoretical framework, are able to comprehensively address the phenomenon of addiction and answer why *homo sapiens* often acts against his own long-term self-interest.

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