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How Do We Choose? Towards an Alternative Theory of Consumer Behavior

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Abstract

In this paper we explore how economists have addressed consumer behavior. We begin by analyzing the fundamental underpinning of neoclassical consumer behavior, utility maximization. We show how the contributions of behavioral economics, which prides itself on finding moments of nonconformity within the theory of consumer behavior, has put into question the validity of mainstream consumer choice modeling. Accepting that the orthodox theory provides a poor model, the question remains: What alternative theories of consumer behavior exist? We discuss two alternative frameworks for consumer behavior: the endogenous preferences literature and the post-Keynesian notion of consumer choice. While both frameworks have provided valuable insights into consumer

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behavior, we argue that neither theory fully captures the complexities of consumer behavior. As such, we turn to literature in Business and Psychology surrounding how consumers actually behave. We find three common principles in the literature: consumer cannot process all information, preferences are malleable, and preferences are categorized eliciting varied behaviors dependent upon the category. We posit a basic neural network model that captures the three principles and illuminates some of the complexities of consumer behavior.

**Keywords:** Consumer Behavior, Network Models

**JEL classifications:** B50, D11, D90

Microeconomic theory attempts to model the interactions between consumers and producers. Plenty has been written – both by orthodox and heterodox economists – about production. Consumer theory, on the other hand, has strangely attracted lesser attention. It remains unclear as to why consumer behavior receives proportionately less attention. One possibility is that the fundamental underpinnings of neoclassical consumer behavior, utility maximization, are accepted as general approximations. Lee and Keen argue that most economists are trained in orthodox microeconomic theory, no matter if they attend an orthodox or heterodox institution. (Lee and Keen, 2004) Many arguments have been levied against the mainstream theory regarding its theoretical and empirical validity, yet it continues to be the dominant theory taught on all levels (undergraduate and graduate). An entire sub-discipline of economics, behavioral economics, prides itself on finding moments of nonconformity within the theory of consumer behavior. The burgeoning sub-discipline of behavioral economics proves that the behavior of consumers does not conform to the theoretical outcomes predicted; yet it does not provide an alternative theory of consumer behavior. Accepting that the orthodox theory provides inaccurate modeling of consumer
choice, the question remains: What alternative theories of consumer behavior exist?

Tension exists in neoclassical microeconomic behavior between how consumers should behave and how consumers actually behave. The first part of this paper will briefly discuss the neoclassical theory of consumer behavior. Some notable arguments against this theory will be highlighted. Next the paper will address the behavioral economics literature. The paper will then discuss two alternative frameworks for consumer behavior: the endogenous preferences literature and the post-Keynesian notion of consumer choice. The last part of the paper will address literature surrounding how consumers actually behave.¹ Shaikh provides a starting point for an alternative (robust) theory of microeconomic phenomena.¹(Shaikh, 2012) He argues that the typical assumptions of utility maximizing, egoistic, ultra-calculating individuals are not needed to obtain the necessary properties that are empirically validated. In fact, many emergent properties in aggregation stem from a few basic assumptions which consumer behavior adheres to. Following the advice of Shaikh, the last part of this paper analyzes how consumers actually behave.

1 The Neoclassical Consumer Behavior

² An economic agent is assumed to make decisions based upon a set of mutually exclusive alternatives over which the agent has rational preferences. Preferences are defined as rational if they posses the traits of completeness and transitivity. Neoclassical economists commonly use utility functions to represent preferences, where the agent expresses the preference relation through comparison of commodities (or bundles of commodities) possessing

¹“There is a great difference between studying how people actually behave and positing how they should behave.” (Shaikh, 2012, 3)
²This section will follow the influential text of Mas-Colell, Whinston, and Green to exemplify the neoclassical consumer choice theory.
different utilities with respect to a budget constraint. Utility is posited as the satisfaction derived through the act of consumption. The amount of utility extracted during the act of consumption is completely subjective to the individual agent. The final outcome of the decision process (the choice) is a function of the budget set and choice rule utilized by the agent. Many of the factors affecting decisions are assumed into the budget sets, and therefore removed from the decision process. One practical implication of utility theory arises in measurement, as one cannot directly measure utility. Samuelson provided a solution in the form of revealed preference theory, where observed choices made by agents reveal their preference structures. Imposing the weak axiom of revealed preference (WARP) allows for maintaining some form of consistency and is a corollary of the rationality constraint on preferences. In the case when choice is defined for all subsets, WARP ensures a (unique!) rational preference relation; however these assumptions prove too restrictive to garner much economic meaning. The strong axiom of revealed preference (SARP) therefore arises as a necessary and sufficient condition to obtain rational preferences when choice is not defined over all subsets.

Subsumed within the argument of neoclassical theory lies the capability of agents to compare all commodities. It has been argued that certain commodities, or commodity bundles, may be incomparable for the agent. Moreover, the rational preference theory may suggest an agent is indifferent between two commodities (bundles) when infarct the agent may not have yet formalized a decision between the two. Claiming the preference of indifference between commodities, or commodity bundles, is something quite different

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3 “The budget sets in \( B \) should be thought of as an exhaustive listing of all the choice experiments that the institutionally, physically, or otherwise restricted social situation can conceivably pose to the decision maker.” (Mas-Colell et al., 1995, 10)

4 (Harbaugh et al., 2001, Samuelson 1938 in)

5 The weak axiom of revealed preference states if \( x \) is revealed at least as good as \( y \), then \( y \) cannot be revealed preferred to \( x \).

6 See “On the Rationality of Preferences” in (Putnam, 2002)
from not yet formalizing a preference between them. Examples abound that violated the internal consistency of choice which label the economic agent as irrational, yet external context may justify the choice by the economic agent. Thus, the rationale for internal consistency of choice has been called into question with respect to representation of choice behavior.\footnote{See “Internal Consistency of Choice” in (Sen, 2002)}

\section{Behavioral Economics}

Behavioral economics attempts to increase the realism of the psychological underpinnings of economic analysis in the hopes to improve the field of economics \textit{“on its own terms.”}\footnote{(Camerer and Loewenstein, 2004, 3)} According to Camerer and Loewenstein, behavioral economics need not imply a wholesale rejection of neoclassical economics, instead the theories developed should be seen as modifications of the neoclassical doctrine to more accurately represent empirical findings on behavior. Consequently, most of behavioral economics literature attempts only to modify one or two assumptions in standard neoclassical theory. Relaxing certain assumptions, that are not pivotal to the (ideologically) fundamental neoclassical model allows for more accurate representation of agent behavior. Camerer and Loewenstein acknowledge, although hidden in a footnote, that behavioral economics does not require one to utilize the neoclassical economic modeling stating

\\[ \ldots \therefore \text{there is nothing inherent in behavioral economics that requires one to embrace the neoclassical economic model. Indeed, we consider it likely that alternative paradigms will eventually be proposed that have greater explanatory power. (Camerer and Loewenstein, 2004, 4-5 fn. 2)} \]
Camerer and Loewenstein, following Stigler (1965), suggest evaluating behavioral economics based upon congruence with reality, generality, and tractability. One major point of contention with behavioral models is that the manipulation of models often makes them less tractable. However, in certain circumstances the models can provide more precise predictions than allowed in the standard theory. Much of the behavioral economics literature follows a four step process: 1) identify normative assumptions or models that are ubiquitously used by economists, such as Bayesian updating, expected utility, and discounted utility; 2) identify anomalies – i.e. demonstrate clear violations of the assumption or model, and painstakingly rule out alternative explanations, such as subject’s’ confusion or transaction costs; 3) use the anomalies as inspiration to create alternative theories that generalize existing models; 4) construct economic models of behavior using the behavioral assumptions from the third step, derive fresh implications, and test them. However, Fudenberg argues that while this approach of modifying one or two assumptions within mainstream theory may produce a logically consistent model, it may simultaneously provide a model without a clear domain of application. Fudenberg’s solution to this issue is to reevaluate the model after the initial one or two modifications to determine if the remaining group of assumptions “are likely to be at least approximately correct in the situations the model is intended to describe…”

Behavioral economics literature typically classifies research into two broad categories: judgment and choice. According to Camerer and Loewenstein, judgment research deals with the processes that people use to estimate probabilities. Choice, on the other hand,

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9e.g. “Lucas (1986) noted that rational expectations allow for multiple inflationary and asset price paths in dynamic models, while adaptive expectations pin down one path. The same is true in game theory: Models based on cognitive algorithms (Camerer, Ho, and Chong 2003) often generate precise predictions in those games where the mutual consistency requirement of Nash permits multiple equilibria.” (Camerer and Loewenstein, 2004, 4)

10(Camerer and Loewenstein, 2004, 4)

11(Fudenberg, 2006, 697 emphasis added)
deals with the processes people use to select among actions, taking account of any relevant judgments that they may have made. Thus, the choice category obviously dominates for consumer behavior, however judgment also plays a role. Behavioral economics has incorporated such effects as: framing effects, anchoring effects, the effect that the method used to elicit preferences can produce preference reversals, context effects, and coherent arbitrariness.\textsuperscript{12} All of these demonstrate flaws in the standard theory, but by themselves do not constitute an alternative theory.\textsuperscript{13} Fudenberg furthers this point by arguing that behavioral economics exhibits “choice overload in modeling choice.” He suggests that too many models exist within behavioral economics with very little guidance as to when and where each model is appropriate. Moreover, Fudenberg argues that behavioral economics has given too many models with high degrees of specificity and placed little emphasis on creating generalized assumptions causing issues with integrating behavioral economics into orthodox theory.\textsuperscript{14} Thus, the argument of having more tools in one’s toolbox holds water as well as a sieve when no guidelines exist for proper application of those tools to choice behavior.

One of the more prominent contributions toward choice theory in Behavioral economics has been prospect theory, put forth by Kahneman and Tversky (1979). Kahneman and Tversky reject the expected utility model of neoclassical economics and argue that prospect theory provides an alternative model for individual decision making under risk. Prospect theory includes a two phase decision process marked by an initial editing phase and followed

\textsuperscript{12}(Camerer and Loewenstein, 2004, 12-14)
\textsuperscript{13}“Most evidence that preferences are constructed comes from demonstrations that a feature that should not matter actually does. The way in which gambles are ‘framed’ as gains and losses from a reference outcome, in which the composition of a choice is set, and whether people choose among objects or value them separately, have all been shown to make a difference in expressed preference. But admittedly, a list of a theory’s failings is not an alternative theory. So far, a parsimonious alternative theory has not emerged to deal with all of these challenges to utility maximization.” (Camerer and Loewenstein, 2004, 14)
\textsuperscript{14}(Fudenberg, 2006, 697-698)
by a subsequent evaluation phase. The purpose of the editing phase “…is to organize and reformulate the options so as to simplify subsequent evaluation by choice.”

During the editing phase individuals code final outcomes as gains or losses relative to a reference point instead of fixating on the final states of wealth or welfare as posited by expected utility theory. Kahneman and Tversky posit that the editing phase also consists of operations such as: combination, segregation, cancellation, simplification, and the detection of dominance. Individuals utilize these operations in order to manipulate the vast array of choices into a cognitively feasible list of prospects from which to choose. One interesting implication of the editing process is that the final prospects could depend upon the order of operations used by the individual. Therefore, individuals could display seemingly inconsistent preferences (something disavowed by neoclassical rationality) depending upon the sequence of editing. Kahneman and Tversky further argue that the editing process explains many observed preference anomalies, which implicitly causes their theory to provide a more realistic grounding for observed behavior.

After the editing phase, the individual moves on to the evaluation phase of choice. The individual evaluates each of the edited prospects and chooses the prospect with the highest value. Starmer (2000) keenly points out that Kahneman and Tversky never utilize the

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15 (Kahneman and Tversky, 1979, 274)

16 “The reference point usually corresponds to the current asset position, in which case gains and losses coincide with the actual amounts that are received or paid. However, the location of the reference point, and the consequent coding of outcomes as gains or losses, can be affected by the formulation of the ordered prospects, and by the expectations of the decision maker.” (Kahneman and Tversky, 1979, 274)

17 While Kahneman and Tversky acknowledge this potential, they leave it for future investigation. (Kahneman and Tversky, 1979, 275)

18 Kahneman and Tversky provide three examples of preference anomalies explained by the editing phase: 1) “…the inconsistencies associated with the isolation effect result from the cancellation of common components;” 2) “…intransitivities of choice [can be explained by eliminating] small differences between prospects;” and 3) “…preference order between prospects need not be invariant across contexts.” (Kahneman and Tversky, 1979, 275)
term “utility” to describe the value function, nevertheless the value function is commonly interpreted as a utility function.\textsuperscript{19} The value function typically takes a specific S-shape–kinked at the reference point ($x = 0$), concave for gains, convex for losses, and steeper in the domain of losses. This provides what Starmer termed the “reflection effect” where the concavity exhibited in the gains quadrant is mirrored by the convexity in the loss quadrant. This allows for the individual to exhibit risk-aversion in a choice among non-negative outcomes (gains) while exhibiting risk-seeking behavior if all choices are changed to negative outcomes (losses).\textsuperscript{20} This specific manifestation of the utility function provides a better fitting explanation for some observed choice behavior under risk; however, this appears to simply re-shape the utility function of individuals in the orthodox theory and then proceed with the standard assumption of optimizing over the newly defined utility function.

As noted above, prospect theory attempts to provide an explanation of behavior under risk. No doubt the reader can easily think of many situations in which consumer choice contains little, if any, risk. However, this has not deterred attempts to model consumer behavior utilizing prospect theory. List (2004) analyzes the predictions and outcomes of neoclassical theory and prospect theory of consumer behavior. The experiment takes place at a baseball card convention as a representation of a “marketplace” with two commodities (a chocolate bar and a university coffee mug) of approximately the same value ($\approx \$6$). While the value of the commodities approximately equal one another, nevertheless a $\$6$ coffee mug is a relatively cheap coffee mug and $\$6$ is relatively expensive for a bar of chocolate. This bias should be considered, yet it is seemingly overlooked in the analysis. Furthermore, money, and therefore the act of purchasing, is absent within this experiment.

\textsuperscript{19}(Starmer, 2004, 127 fn. 17)
\textsuperscript{20}(Starmer, 2004, 128-129)
as the participants are *given* the mug or chocolate (and allowed to trade if desired).\textsuperscript{21} Thus, it cannot be inferred that any of the participants would have purchased one, both, or neither of the goods. List concludes that the findings in the study indicate consumers with little “market experience” display a large endowment effect (compatible with prospect theory) but with sufficient “market experience” the consumers overcome the endowment effect (displaying behavior consistent with neoclassical theory). However, List’s conclusions rest on thin ice as the variables “trading intensity” and “years of market experience” are not statistically significant at $p < .05$.\textsuperscript{22}

It remains peculiar that behavioral economics provides (replicable) evidence that individuals do not behave in the way posited by mainstream theory, yet attempts only to modify aspects of mainstream theory. The nihilistic approach towards real consumer behavior posited by mainstream theory does not directly come under attack – only tangentially through the manipulation of assumptions in order to more accurately model specific contingent behaviors. Neoclassical theory posits that agents behave (or *should* behave) in accordance with the ideological manner of hyper-rational utility maximization. The theory marginalizes the true behavior of humans as imperfect and suboptimal if it contradicts the theoretical prediction. Behavioral economics simply provides small adjustments in an attempt to provide a more realistic representation of mainstream theory, but does not constitute a rejection of, nor a fundamentally different alternative to, mainstream theory.

\textsuperscript{21}List argues that the participants *earn* their good by participating in the survey.

\textsuperscript{22}(List, 2004, 623 Table III “Summary of Empirical Estimation Results”)
3 Endogenous Preferences

Many have questioned the neoclassical hypothesis of consumer preferences. The static, defined nature of preferences contradicts the reality facing many consumer choices where preferences have not been formed or change over time. The endogenous preferences literature attempts to model the evolution of preferences over time.\textsuperscript{23} Heifetz \textit{et al} (2007) argue that the endogenous preferences literature arises out of the behavioral economics literature in response to the criticisms against the consistency of preferences. Bowles (1998) highlights five effects of markets and institutions on preferences: framing and situational construal, intrinsic and extrinsic motivations, effects on the evolution of norms, task performance effects, and effects on the process of cultural transmission. These effects help shape the evolution of preferences of economic agents. Yet one oddity of the endogenous preference literature lies in the formulation as an equilibrium model.\textsuperscript{24} The model suggests that preferences evolve over time, moving to an equilibrium position. The rapidity in which an equilibrium is reached (or if an equilibrium is reached at all) depends upon the initial conditions and strategies chosen. Moreover, endogenous preference models are typically expressed within game theoretic terms and therefore contain a payoff matrix for different preference outcomes. Assuming the hyper-rationality of agents, it can be said that agents strategically choose their preferences with the highest payoff knowing the de-

\textsuperscript{23}See (Bowles, 1998) and (Heifetz \textit{et al}., 2007) for theoretical discussions and (Gerber and Jackson, 1993) and (Palacios-Huerta and Santos, 2004) for empirical verifications.

\textsuperscript{24}The oddity of an equilibrium state of preferences does not seem to hinder the analysis of endogenous preferences even though the authors fully acknowledge the equilibrium underpinnings. This inevitably creates a framework in which agents exhibit herd-like behavior with respect to the evolution of their preferences. Moreover preferences adjust in response when structural changes have caused disequilibrium. “The basic intuition is that the distribution of cultural traits in a population is determined as the equilibrium of a system whose exogenous elements are subject to long-term influence of markets and other economic institutions. Economic institutions affect the evolution of preferences by changing these exogenous determinants of the cultural equilibrium.” (Bowles, 1998, 83)
cision process of the other agents. The endogenous preference literature highlights the effects of economic institutions on changing preferences and raises important insights in agent behavior. Empirical studies show that agent preferences adapt to changing political and economic institutions. Nevertheless, the formulation appears as an addendum to neoclassical theory. Thus, many of the critiques of neoclassical consumer choice remain.

4 Post-Keynesian Consumer Choice

It has been argued that neoclassical microeconomic theory has been completely undermined by heterodox approaches. The totality of the many critiques dispel the basis of the neoclassical microeconomic theory. Thus it is necessary for a different theory of consumer behavior. The post-Keynesian theory provides one place to look. Marc Lavoie articulated the foundational elements of post-Keynesian consumer choice common in the writings of post-Keynesian and other non-orthodox economists such as Joan Robinson, Luigi Pasinetti, Edward Nell, Philip Arestis, and Alfred Eichner. Lavoie argues for six principles that underpin the post-Keynesian theory of consumer behavior: procedural rationality, satiable needs, separability of needs, subordination of needs, growth of needs, and non-independence. Procedural rationality is analogous to the concept of bounded rationality put forth by Herbert Simon. Procedural rationality posits that agents lack perfect knowledge and lack the ability to process a significantly large amount of knowledge even if possessed by the agent. Satiable needs achieves a result similar to the diminishing marginal utility posited by neoclassical economics. The post-Keynesian notion of satiable

25 The concept of hyper-rationality is used following (Shaikh, 2012)
26 See (Gerber and Jackson, 1993)
27 For example see (Lee and Keen, 2004)
28 See (Lavoie, 1994) and (Lavoie, 2004)
29 (Lavoie, 1994, 543-544)
needs posits that there exists a threshold level where an agent will consume a commodity up to the threshold and then cease consumption of that commodity. Contrary to neoclassical theory, this phenomenon of satiable needs arises with positive prices and finite income.\(^{30}\) The separability of needs states that distinguishable categories of needs exist. If agents separate needs into different categories, then one cannot aggregate all needs into a single utility function where all commodities become measurable on a single quantitative scale. Subordination of needs yields a hierarchical ordering of needs.\(^{31}\)

Accepting the hypotheses that needs are satiable, separable, and subordinate, the theory then must account for how agents move up the hierarchical structure of needs. This is solved through the growth of needs hypothesis asserting that income effects allow upward movement in the hierarchy. When agents receive more income (either in absolute terms or through income effects) they change their relative position in the needs hierarchy thereby resulting in increased needs.\(^{32}\) The post-Keynesian theory of consumer demand places most of the attention of consumer choice on income effects, rejecting (or at minimum cautiously acknowledging) substitution effects.\(^{33}\) While significant changes in prices may lead to overall substitution effects, most relative price changes will give rise to negligible changes in consumer behavior.\(^{34}\) This suggests relatively inelastic demand for all goods. While this may prove true for broad categories of commodities (such as food or

\(^{30}\) Neoclassical theory posits satiation with either zero prices or infinite incomes.

\(^{31}\) “. . . needs are ordered according to a lexicographic preference ordering, with satiation.” (Lavoie, 1994, 549)

\(^{32}\) At a certain income level one could assume that the increase in needs is synonymous with an increase in wants. The theory makes no attempt to distinguish between needs and wants. While making this distinction may digress to a philosophical argument, it may provide clarity for changing consumption patterns as income increases.

\(^{33}\) “The Post Keynesian theory of household demand begins with the fundamental assumption that in an economic system it is the income effects rather than the substitution effects which are most important.” Arestis (1992) as quoted in (Lavoie, 2004, 2)

\(^{34}\) (Drakopoulos, 1999)
clothing), it becomes tenuous when considering consumer behavior on a more detailed level (e.g. apples versus blueberries, jeans versus khakis). The principle of non-independence posits that preferences are not made independently of others.\(^\text{35}\) This principle is similar to Veblen’s notion of conspicuous consumption where agents consume specific commodities that reflect the lifestyle associated with their income level. Agents emulating others within their income class contradicts the neoclassical notion that agents have widely varied tastes, which in turn leads to varied consumption patterns.\(^\text{36}\) The principle of non-independence asserts that individuals with similar income levels consume in similar patterns, thereby adjusting to the consumption patterns of the cultural-social-economic group with which they identify. Ultimately this assumption suggests that personal preferences and lifestyle choices conform to relative income levels.

5  Real Consumer Choice: a neural network model from evidence of decision processes

The marketing literature provides a vast amount of research directed towards consumer behavior. This section engages in this area of research in an attempt to formalize a notion of real consumer behavior. The intention here is not to dismiss what economists have contributed to consumer choice and behavior \textit{per se}. Rather, an exploration into the literature that analyzes actual consumer behavior provides an ideal starting point in which to ground, and verify, a theory. In the literature on consumer behavior, while utilizing varied techniques of analysis, three common principles emerge: consumers cannot process all information; preferences are malleable; and preferences are categorized so that different

\(^{35}\text{(Lavoie, 1994)}\)  
\(^{36}\text{(Lavoie, 1994, 552)}\)
categories elicit varied behaviors. A basic neural network model is presented following these principles and illuminating some of the complexities of consumer choice.

The vast world of commodities which confront the consumer appears as the natural starting point of a theory on consumer choice.\textsuperscript{37} The consumer must choose amongst the seemingly infinite number of commodities available. Hence, one of the two input nodes in this model of real consumer behavior represents the vector of all commodities available.\textsuperscript{38} Except for in theoretical vacuums, the consumer does not innocently confront the act of consumer choice. External factors exert influence over many of the consumption choices made. Thus, they must not be ignored and are represented by the second input node.

\textsuperscript{37}Although seemingly trivial, it is worth noting that the act of consumption is already subsumed within the model.

\textsuperscript{38}The model could be represented with more individual nodes to represent, say, each commodity, or various groupings of commodities. However, for the sake of simplicity commodities have been represented as a single node. Multiple arrows emanating from the input node to the first hidden layer remind the reader that the node represents a vector containing all commodities.
The first principle derived from the literature on consumer behavior, that agents cannot process all information, is not new to economic modeling. This principle follows from Herbert Simon’s proposition of bounded rationality, from which the post-Keynesian concept of procedural rationality stems. Contrary to the assumptions of the neoclassical theory, consumers do not possess perfect knowledge over which to make decisions. Even if the neoclassical assumption that consumers possess all information with which to make decisions holds, two practical issues arise. First, the time necessary to assess all information and compare all alternative choices becomes prohibitive. Even with limited information, de-

\[ y_j \]

Lee and Keen set up a thought experiment to exemplify the problem. “...if it is assumed that there are thirty different goods and services and the quantity of each \( y_i \) can vary from zero to
cision making process may take the consumer a considerable, possibly prohibitive, amount of time. Another practical procedural issue arises when consumers must make comparative calculations for all choices. Although the human brain possesses an astonishing ability to process information, the immense number of complex calculations necessary for comparison of all commodity choices may not be feasible even if it can be made algorithmic. Thus, Conlisk (1996) argues that “... bounded rationality is not a departure from economic reasoning, but a needed extension of it.”

Bettman et al (1998) argue that consumers implement a variety of different filtering strategies for commodities that enter into the choice process. One such strategy is weighted adding where a consumer examines each choice individually and evaluates the characteristics of the commodity weighted by the subjective importance of the characteristics. This strategy typically assumes that consumers subjectively assign values to the characteristics under consideration, which fundamentally follows the theory of utility maximization. However, consumers may also obtain value information from outside sources (such as consumer reports on safety, durability, ease of use, etc.) and assign appropriate weightings for corresponding characteristics and values. The consumer then makes a choice based upon the (summed) overall value, choosing the commodity with the highest value. Consumers may implement this strategy when the choice contains relatively few commodities and important characteristics. However, as the number of commodities and characteristics under consideration grows the mathematical calculations become burdensome and eventually im-

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\[ \text{the number of different } y_i \text{ would be } 11^{30}. \]

If each comparison of \( y_i \) and \( y_j \) took the consumer 1 billionth of a second, it would take him/her 5.53\(10^3 \) years to make all of them; and that period of time is not only longer than the lifespan of the consumer, it is also much longer than the known age of the universe.” (Lee and Keen, 2004, fn 11)

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\(^{40}\)(Conlisk, 1996, 672)
practical.\textsuperscript{41,42} Thus, consumers may utilize a lexicographic strategy where the commodity with the highest overall value on the most important characteristic is selected. The lexicographic strategy is a special case of the weighted adding strategy where the weight assigned to the most important characteristic is unity and all other characteristics are assigned null weights. This effectively reduces the complexity of the choice, however it also disregards other characteristics that may be important for the consumer.

Satisficing is another approach for choice processes where the consumer compares characteristics of commodity choices one at a time to a predetermined threshold level for the characteristic, discarding those that do not achieve this threshold.\textsuperscript{43} If the commodity under consideration fails to meet the satisficing level of an attribute the processing stops and the consumer moves on to the next commodity. The consumer chooses the first commodity that passes all of the satisficing thresholds. If none of the commodities pass the test, then the consumer relaxes the threshold levels and the process starts again. Interestingly, the outcome of this choice process potentially changes depending upon the order in which the consumer compares commodities. In effect, two (or more) commodities may theoretically pass all of the satisficing thresholds, yet the first commodity analyzed is chosen. Thus, the strategy potentially provides an unstable outcome due to a change of the order of analysis of commodities. Consumers may also utilize a strategy of eliminating options that do not meet a minimum threshold for the most important characteristic. If more than one commodity remains after comparing all commodities to the satisficing level of the first

\textsuperscript{41}Bettman \textit{et al} point out that this strategy becomes mentally taxing in calculation for comparison of many commodities with many weighted characteristics (Bettman et al., 1998, 190)

\textsuperscript{42}Shaikh provides an example of a similar type of complex calculation in his section on the origins of modern money. “Two-item bilateral barter gives rise to one exchange rate, three-item to three exchange rates, five to ten, ten to forty-five, a hundred to almost five thousand (4950), and a thousand to nearly half a million separate exchange rates.” (Shaikh, 2016, 169)

\textsuperscript{43}“Alternatives are considered sequentially, in order in which they occur in the choice set. The value of each attribute for the option currently under consideration is considered to see whether it meets a predetermined cutoff level for that attribute.” (Bettman et al., 1998, 190)
characteristic, the consumer repeats the process by assessing the remaining commodities with respect to the satisficing level of the subsequent characteristic. This process continues until one commodity remains. Finally, consumers may utilize any combination of the strategies to arrive at the final choice. None of the above stated strategies are mutually exclusive, thus allowing for the utilization of two or more of the strategies in conjunction. Consumers may wish to utilize strategies that easily narrow a large number of commodities down to a few (such as the lexicographic choice strategy) and subsequently use a strategy that considers more detail for the final decision. Consumers make choices based upon the knowledge that they possess, which invariably necessitates the utilization of filtering processes to narrow the choice set to a manageable size. Therefore, the first hidden layer within the neural network represents the filtering process.

44This is a type of updating process of selection.
The second principle acknowledges that preferences are malleable and, as such, are context dependent. The framing of the choice process impacts the final decision made by the consumer. Even if similar choice situations arise, the framing of the choice situation changes to include learning from previous experiences. Razzouk et al (2007) show that choices made by married couples differ from those made by cohabiting couples.\(^{45}\) Whether the decision is made jointly or individually (and, if so, by whom) depends upon the framing of the choice (married or cohabiting). This is analogous to the post-Keynesian formulation of non-independence where economic agents make decisions considering the effects of that

\(^{45}\) (Razzouk et al., 2007)
decision upon others. Surely not all consumer decisions reflect influences by others outside of the choice. Yet many choices (such as purchasing a house, financial assets, diamond rings, and even what to cook for dinner) are made with consideration for other individuals’ thoughts, expectations, and wellbeing.

Consideration of others is not the only context dependent affect on choice. External factors such as the environment within which the act of choice takes place affects the decision as well. The mood of the consumer, the environment, the ambiance in which the choice takes place, etc. all affect the behavior by the consumer. Sherman et al (1997) find that the store setting has an affect upon the decision process and experience of the consumer. They find that the store environment affects the arousal and pleasure (referred to as organism variables) of the consumer. The organism variables, in turn, have a positive influence on response variables, which are linked to both time and money spent in the store. These external factors subconsciously (possibly consciously) influence the consumer’s behavior. Thus, it has been argued that context matching provides the best option for predicting consumer behavior. Firms spend a great deal of time and money framing the context in which consumers make choices. The overall experience influences the likelihood that the consumer returns to repeat a purchase in the future. It is imperative that a theory of consumer behavior includes contextual framing of a choice situation, where some of the contextual influences are conscious (such as concern for others) and some subconscious (such as store design) to the consumer. Considering these facts, the second hidden layer of the neural network model begins with a node representing choice context. From the previous hidden layer, a filtered vector of commodities becomes an input into the choice context node as well as consideration of external influences.

46 (Sherman et al., 1997)
47 (Bettman et al., 1998, 210)
The third principle derived from the consumer behavior literature argues that consumers categorize characteristics of commodities. Essentially this results in different preferences, and different weighting of preferences with respect to importance, amongst differing categories. This principle is a quasi-implicit assumption in many economic theories when agents are assumed to differentiate between necessities and luxuries. As consumers are constrained by a budget, they purchase some minimum out of the necessities category and spend some proportion of the remaining income on the luxuries category. Obviously this categorization can happen between different types of commodities, yet here it is argued that more categories exist from which a consumer determines his/her purchasing choices.
within options amongst similar commodities. This reflects the arguments by Bettman et al in their analysis on choice strategies. They argue that a consumer may rank desired characteristics of a commodity and utilize this ranking as part of a choice strategy. Thus the consumer exhibits a type of involvement with the desired characteristic and the choice becomes directed by, and possibly dependent upon, that involvement. Pelau (2011) find that 68.5% of Romanian consumers in supermarkets do not shop in the canned food aisle. Pelau argues this finding relates to the importance of natural, self-cooked foods to Romanian consumers. Thus, even within the choice of food (representing a necessity) the category characteristic related to food being fresh dominates the purchasing decision.

The previous example highlights how involvement level comes to shape the choice set. Arora (1982) empirically traces involvement linkages between the tripartite of situational, enduring, and response. While the empirical validity with respect to sample size has been questioned, it nevertheless provides elementary insights, via correlation, into the role involvement plays. Moreover, Arora acknowledges that ideas create a higher level of involvement than things do. If a consumer creates a successful linkage between the low-involvement commodity and a high-involvement idea, then purchases become less contingent and more predictable.

Firms attempt to create linkages amongst low-involvement products with high-involvement values. The is the modus operandi of marketing and design departments within firms. It must be acknowledged that firms influence consumer behavior. Schmidt and Eisend (2015)

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48 For example Bettman et al construct a matrix based upon qualities of characteristics for choosing a car. Such qualities include reliability, price, safety, and horsepower. A consumer may make the decision to purchase a car based upon the characteristic of safety over, say, horsepower as this characteristic is more fundamentally important to him/her. (Bettman et al., 1998, 189)

49 (Pelau, 2011, 103)

50 See (Beatty et al., 1988)

51 As an example Arora suggests low-involvement milk and cholesterol-free egg substitutes linking with high-involvement health related values. (Arora, 1982, 515)
conduct an analysis on advertising frequency and effectiveness and find a non-linear course of advertising exposure effects. The results suggest that effectiveness is maximized after 10 exposures.  

Beatty et al find that increasing levels of involvement lead to commitment. Firms attempt to increase the involvement level of consumers with their product to create brand loyalty. Thus, the level of involvement that a consumer exhibits with a commodity helps predict the likelihood of consumption of that commodity. The involvement level of the consumer may arise from within the consumer or may be strategically provided by the firm through marketing campaigns. Thus, the second node in the second hidden layer (the categorization node) receives input from external influences.

52(Schmidt and Eisend, 2015)  
53(Beatty et al., 1988)  
54It may prove interesting to study the difference in consumption patterns of high-involvement commodities that stem from within the consumer versus high-involvement stemming from marketing campaigns. This may provide insight into the relative effectiveness of firms to manipulate consumer behavior.
The combination of the three principles, as seen in the two hidden layers of the neural network, ultimately lead to the determination of the output, the choice.
At first glance, the general model appears complete. Yet as previously discussed, prior choices may have an effect on choice made currently, as well as choices made in the future. Thus, the choice made now (the output of the model) may very well influence the choices made in the future. In other words, individuals learn from their actions and accommodate their behavior accordingly in the future. This learning can be incorporated into the model through backpropogation (a feedback loop represented by the dashed lines). The final choice also feeds back on how external influences affect future choices. For example, firms analyze choices made by consumers in order to determine successful marketing tactics to further boost sales. Therefore, the choice may influence the weight and bias of the external
factors via the feedback loop.

Obviously breaking down the individual nodes of the model into further subcategories would provide a more accurate representation of consumer choice. Many of the processes discussed above that contribute to consumer choice become opaque with this broad rendering of a model on consumer choice. However, the complexity of the model increases greatly with each added node and hidden layer, potentially becoming detrimentally confusing. Therefore, the model was intentionally left in this general form in order to easily motivate a basic understanding of real consumer behavior.
6 A Note on Human Behavior

In the context of consumer choice under normal conditions, many aspects of human behavior disappear. These aspects include but are not limited to: deception, violence, manipulation, nihilism, and exploitation. Many of these aspects of human behavior are affected by social norms, faiths (whether they be of religious, philosophical, or cultural basis), and attitudes. The social structure guides the behaviors of individuals by highlighting preferred behaviors for specific human interactions. When the social structure exists uncontested, consumer behavior follows in the manner analyzed in this paper. However, social structures do not always remain intact and are susceptible to crumbling under social pressure and extreme circumstances. When the social structure fails, the aspects of human behavior hidden by the social structure directly manifest in consumer, and social, behavior. Illegal arms trafficking, illicit drug consumption, sex and slave trafficking, the oppression of women, as well as racial discrimination all appear within consumer behavior.

Theories of consumer behavior at best implicitly allow for, while ignoring, these aspects of human behavior and at worst completely deny their existence. These human behaviors, and their effects on consumer behavior, must be acknowledged by consumer theory. The malleability and contextual framing of preferences allows for the existence of human behaviors to change consumer behavior when the social structure collapses. With a change in the social structure, the context within which a consumer must choose is likely to change as well. The relevant choice possibilities over which the consumer makes his/her decision may contain more, less, or entirely different choice possibilities. Thus, the contextual framing under which the consumer chooses allows for the inclusion of human behavior (if necessary)

55 These can be seen as a list of negative human behaviors. This is not to suggest that positive human behaviors only exist within normal conditions where the social structure remains intact. The behaviors acknowledged here are for illustrative purposes and one could easily think of positive human behaviors that appear when the social structure crumbles.
for the choice outcome.

7 Concluding Remarks

That the neoclassical theory of consumer behavior falls short of reflecting the behavior observed by individuals is well known. It is not sufficient to point to the shortcomings and inaccuracies of the theory alone; an alternative theory of consumer behavior must emerge. However, not many choices exist for alternative theories. The endogenous preferences literature appears to slightly modify some neoclassical assumptions. This provides a more realistic account of consumer behavior by allowing preferences to change over time in response to other variables. However, the endogenous preferences literature ultimately remains within the same theoretical framework as the neoclassical theory. The post-Keynesian framework provides another alternative theory of consumer behavior. It resolves some of the critiques levied against the neoclassical theory of consumer behavior. Yet, the post-Keynesian theory of consumer demand has not, as of yet, been fully formalized. Due to this, some flaws, mainly due to the lack of clarity, remain within the theory.

Following the suggestion of Shaikh, the last section of the paper examines the actual behavior of consumers. Three main principles emerge out of the literature on consumer behavior: 1) consumers cannot process all information and follow filtering strategies in order to assess the information they do possess; 2) consumer preferences are malleable and are subject to change; 3) consumers categorize commodities according to inherent characteristics that represent some level of importance to the consumer. From these three principles, one can begin to model the way in which consumers actually behave. These principles allow for creating context specific consumer choice structures and incorporate the preferences, values, and emotional state of the consumer. Moreover, this allows for changing
social dynamics and the possibility of emerging transitions in, or failures of, the social structure. While this does not define a general outcome for consumer choice, it does allow for analyzing consumer behavior under specific choice structures. Arriving at a general process of consumer choice implicitly results in critiques showing how the framework fails under specific circumstances. The argument here does not finalize an alternative theory of consumer behavior; however, it is a step towards a theory of real consumer behavior. By utilizing and understanding the three principles argued, a more robust analysis of consumer behavior arises when applied to specific consumer choice problems.

\[56\text{This is exactly what Behavioral economics has shown.}\]
References


