EVOLUTIONARY ECONOMICS AND HOUSEHOLD BEHAVIOR

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Friday, August 8, 2014

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Dr. Reynaldo B. Vea

- Received his B.S. in Mechanical Engineering *magna cum laude* from the University of the Philippines in 1978
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- Received a Ph.D. in Engineering from the University of California, Berkeley, in 1991.
- Served as Naval Architect and Marine Engineer at a number of U.S. companies
- Served as professor and dean of the College of Engineering of the University of the Philippines
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What Is Economics? (1)

- Economics is a science that studies human behavior.
- It is different from other social sciences because it uses more mathematics and statistics, constructing rigorous theoretical models to describe human behavior and testing these models through rigorous statistical analysis.
- Thus, it is much closer to the natural sciences than the other social sciences in terms of the methodology used.
- For most of the previous century, physics was the natural science whose methods economics sought to emulate the most closely.

What Is Economics? (2)

- In more recent decades, however, economists have shown increasing interest in biological concepts and methods.
- One excellent example of this trend is evolutionary economics, which is the incorporation of evolutionary biology into economics.

What Is Evolution?

- Charles Darwin (1809-1882) , British biologist, *On the Origin of Species* (1859)
- Species evolve over time, with beneficial traits (traits adapted to their specific environment) becoming more and more dominant and disadvantageous traits being gradually phased out.
- For example, in certain environments, giraffes with long necks will be more likely to survive and procreate than giraffes with short necks because they can reach leaves that are higher up in the tree, and hence giraffes with long necks will gradually come to dominate giraffes with short necks, eventually causing the latter to become totally extinct.
- Called "natural selection" or "survival of the fittest."

Applications of Evolution to Economics (1): Herbert Spencer

- Herbert Spencer (1820-1903), British philosopher, *First Principles of a New System of Philosophy* (1862)
- Evolutionary processes are at work throughout the cosmos, applying to everything from stars and galaxies to biological organisms and human social organization.
- Spencer is known for his theory of "Social Darwinism," which applies the concept of evolution to human society (in particular to laissez-faire capitalistic societies) and argues that the "strong" (however defined) would see their wealth and power increase whereas the "weak" (however defined) would see their wealth and power decrease and perhaps perish altogether.

Applications of Evolution to Economics (2): Karl Marx

- Karl Marx (1818-1883), German philosopher, economist, and revolutionary socialist, *Das Kapital* (1867-94)
- Developed a theory of economic development that contains elements of evolutionary biology.
- Argues that economic systems evolve over the course of history, with superior economic systems replacing inferior economic systems, as the latter are beset by contradictions between technological progress and emergent human possibilities on the one hand and inefficient property rights on the other, which prevent them from surviving over the long term.
- In Marx's scheme, feudalism was replaced by capitalism, which would eventually be replaced by socialism due to evolutionary forces.

Applications of Evolution to Economics (3): Joseph Schumpeter

- Joseph Schumpeter (1883-1950), Austrian-American economist and one of the most influential economists of the twentieth century, *The Theory of Economic Development*, first published in 1911, and *Capitalism, Socialism, and Democracy*, first published in 1942.
- Applied the concept of evolution to innovation or technology
- Argued that macroeconomic equilibrium obtains during normal times but that the successful introduction of new innovations or technologies (which he called "disruptive technologies") by entrepreneurs forces already existing technologies and means of production to lose their positions within the economy, leading to "creative destruction."
- Argued that capitalism could only be understood as an evolutionary process of continuous innovation and creative destruction and hence can be regarded as the forefather of evolutionary economics.

Applications of Evolution to Economics (4): Joseph Schumpeter (cont'd)

- Moreover, Schumpeter believed that economic systems as a whole also evolve, just as Marx did, and predicted that competition would force firms to co-opt entrepreneurs, which in turn would destroy their entrepreneurial spirit and ultimately lead to the demise of capitalism.
- Thus, both Marx and Schumpeter believed that economic systems as a whole evolve and that capitalism would be replaced by socialism but they differed with respect to the mechanism that they thought would cause this transition and with respect to whether or not it was desirable, with Marx rejoicing in the demise of capitalism and Schumpeter bemoaning it.

Applications of Evolution to Economics (5): Summary So Far

- For the most part, however, economists such as Marx, Schumpeter, and their immediate followers used evolutionary theory only as a metaphor or analogy without any explicit attempt to link economic behavior directly to the implications of biological Darwinian theory for human and social behavior.
- Many of Darwin's observations on human sociality, cooperation, and altruism, as contained in his other great work, *The Descent of Man* (1871), are only now being seriously incorporated into economic thinking is occurring today in what is now called evolutionary economics proper.

Applications of Evolution to Economics (6): Richard R. Nelson and Sidney G. Winter

- Richard R. Nelson (1930-) and Sidney G. Winter (1935-), American economists, *An Evolutionary Theory of Economic Change* (1982)
- Widely regarded as being the fathers of evolutionary economics
- Applied the concept of evolution to firms and argued that more successful firms (firms that have found innovative (or imitative) solutions to improve their profits) would grow at the expense of less successful firms, at times driving less successful firms out of business altogether.

The Role of Technology

- Thus, economists have applied the concept of evolution to individuals (as in the case of Spencer), to technologies (as in the case of Schumpeter), to firms (as in the case of Nelson and Winter), and even to economic systems as a whole (as in the case of Marx)
- Technology plays an especially crucial role in the evolution of economies and economic growth.

The Role of Technology (cont'd)

- Like everything else, technology evolves over time, with newer and better technologies driving out older and inferior technologies, and this in turn leads to increases in productivity (or equivalently, reductions in production costs), improvements in product quality, and the development of new goods and services, all of which lead to economic growth and improvements in people's quality of life.
- To put it another way, technology increases the size of the pie that can be baked from a given amount of capital, labor, and other factors of production so that everyone can have more pie without taking any away from others.
- Technology is a "magic pill" for achieving economic growth because it can get you something for nothing.

“Schumpeter’s Challenge”

- Schumpeter fully recognized the importance of the role played by technological innovation in economic growth, and lamented the fact that neoclassical economics did not adequately address technological innovation and, in effect, assumed an economic world that is free of innovation.
- The so-called “Schumpeter’s challenge” was to create a theoretical framework for analyzing innovation-driven economic growth.
- This is the most important *raison d’etre* of evolutionary economics, and it is in this sense that Schumpeter can be considered to be the forefather of evolutionary economics.

The Two Major Defects of Neoclassical Economics

Evolutionary economics improved upon neoclassical economies by remedying the two major defects of neoclassical economics:

(1) Its use of behavioral assumptions that are unrealistic and not empirically grounded

(2) Its failure to address technological innovation

(1) Unrealistic Behavioral Assumptions

- Neoclassical economics is a deeply flawed theory of human behavior and of the behavior of human organizations in any context, static or dynamic, because it makes behavioral assumptions that are not realistic or empirically grounded.
- For example, it assumes that households maximize utility and that firms maximize profits, even though it is highly unlikely that households and firms have the enormous information-gathering and information-processing capabilities needed to maximize their utility or their profits.

(1) Realistic Behavioral Assumptions

- Evolutionary economics has tried to remedy this defect by making more realistic and empirically grounded assumptions about household and firm behavior—in particular, by assuming that both households and firms suffer from “bounded rationality” and “satisfice” instead of maximizing utility or profits (more on this later).

(2) No Technological Innovation

- Neoclassical economics is that it assumes that economies are static and free of technological innovation and therefore does not adequately address technological innovation.

(2) With Technological Innovation

- Evolutionary economics has tried to remedy this defect by developing a dynamic theory of capitalist economies that are always in motion and always generating and reacting to technological innovations of all types.

The Two Major Defects of the Neoclassical Theory of Household Behavior

(1) It makes behavioral assumptions about household behavior that are not realistic or empirically grounded.

(2) It is static rather than dynamic and, in particular, it does not adequately address the reaction of households to the introduction of new goods and services.

(1) Unrealistic Behavioral Assumptions

- The key assumption of the neoclassical theory of household behavior is that households pick their consumption bundle optimally (i.e., so as to maximize their utility). The problem with this assumption is that it is unrealistic due to the presence of "bounded rationality," a concept borrowed from the Carnegie School of Herbert A. Simon (1916-2001) (Simon (1955, 1959)), the winner of the 1978 Nobel Prize in Economics, and others.

(1) Unrealistic Behavioral Assumptions (cont'd)

- Simon argued that, in order to make decisions rationally and to maximize their utility, individuals need to identify all possible alternatives, determine the consequences of each alternative, and select the alternative that confers the greatest utility on them. This requires an almost infinite amount of information and information-gathering and information-processing capabilities, which human beings do not have due to their "bounded rationality."

(1) Unrealistic Behavioral Assumptions (cont'd)

- Thus, Simon argued, individuals are forced to settle for "satisficing" (a portmanteau of the words "satisfy" and "suffice") rather than utility maximization, searching through the available alternatives until an acceptability threshold is met rather than searching through *all* possible alternatives and picking the one that maximizes their utility.

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(1) Unrealistic Behavioral Assumptions (cont'd)

- Nelson and Consoli (2010) acknowledge that the neoclassical theory of household behavior may not be a bad approximation of reality in the case of relatively small changes in the prices of goods and services with which households have considerable experience, where "changing the mix" is all that is required. However, they argue that their own theory based on bounded rationality has at least as much explanatory power even in this case and that it is based on much more plausible and empirically grounded assumptions.

(2) No Technological Innovation

- The other major defect of the neoclassical theory of household behavior is that it does not incorporate the reaction of consumers to the introduction of new goods and services even though, as evolutionary economists emphasize, technological innovation plays a central role in economic growth and development and a significant portion of technological innovation in capitalist economies consists of the development of new goods and services.

(2) No Technological Innovation (cont'd)

- The neoclassical theory of household behavior may do an adequate job of addressing, predicting, and explaining the response of households to changes in the prices of familiar goods and services but does not address the response of households to the introduction of entirely new goods and services.

(2) No Technological Innovation (cont'd)

- The problem is that "[neoclassical] theory represses the uncertainties, and the time involved, for households to make significant changes in their patterns of behavior, particularly when these entail learning about and learning to do new things. We note two important weaknesses of neoclassical theory here. One is the assumption that households have well defined preferences regarding goods and services they never have experienced. The second is failure to recognize that even awareness of choice sets is to a considerable extent dependent on what has in fact been chosen and the process of choosing (Nelson and Consoli (2010))." In reality, preferences will be influenced by which goods and services households have already experienced and which they have not yet experienced, meaning that preferences will be endogenous, path-dependent, and potentially unstable.

(2) No Technological Innovation (cont'd)

- To put it another way, learning (learning about, learning to use, and learning the value of new goods and services) is ignored in the neoclassical theory of household behavior. Moreover, another deficiency of the neoclassical theory is that it assumes that household preferences are fixed and ignores the possibility that new wants emerge from time to time and that these new wants often lead to the emergence of new goods and services capable of meeting those wants.

Evolutionary Theory of Household Behavior

- Until recently, evolutionary economists have focused mostly on the supply side—namely, firm behavior and technological innovation—and have paid little attention to the demand side, especially household behavior. But this is an important omission because a significant portion of technological innovation in capitalist economies consists of the development of new goods and services, as a result of which a theory that realistically describes how consumers react to new goods and services is badly needed.

Evolutionary Theory of Household Behavior (cont'd)

- Fortunately, Richard R. Nelson and Davide Consoli published a paper entitled "An Evolutionary Theory of Consumption Behavior" in the *Journal of Evolutionary Economics* in 2010 that addresses this very topic and propose the broad outlines of a behavioral or evolutionary theory of household behavior that does not suffer from the two major defects of neoclassical household behavior discussed above.

Evolutionary Theory of Household Behavior (cont'd)

- One option is to have separate theories to deal with dynamic contexts in which change, especially technological innovation, is rapid and another to deal with static contexts in which change is slower or more episodic, but Nelson and Consoli (2010) start with the assumption that a unified theory that can explain household consumption behavior in all contexts is preferable to having separate theories for different contexts.

Evolutionary Theory of Household Behavior (cont'd)

- Nelson and Consoli (2010) argue that the assumption that households have a stable, well-defined general utility function and maximize their utility subject to a budget constraint is unrealistic and propose instead that "a household has a set of particular wants…, that the goods and services it purchases are intended for use in meeting those wants (Nelson and Consoli (2010)),," and that households can judge at least roughly whether, and to what extent, particular wants are being met, given what they know and believe.

Evolutionary Theory of Household Behavior (cont'd)

- Nelson and Consoli (2010) make a distinction between:
- (1) Circumstances where the purchases of goods and services are largely a matter of routine, involving little in the way of self-conscious selection
- (2) Circumstances which require the household to dedicate a certain amount of thought and effort to deciding what to do

Evolutionary Theory of Household Behavior (cont'd)

- Examples of the latter include:
- (1) Circumstances that require households to engage in certain activities for the first time such as buying baby goods for their first baby
- (2) Circumstances that require a major commitment of resources such as the purchase of cars and other big-ticket items
- (3) Circumstances that involve the purchase of newly introduced goods or services

Evolutionary Theory of Household Behavior (cont'd)

- Households need to do a substantial amount of learning when new goods and services are introduced (about what wants the good or service satisfies, about how to use the good or service, etc.), especially if the new good or service is unlike any existing good or service, and thus new goods and services provide challenges as well as opportunities and require a considerable amount of learning on the part of households.

More on Behavioral Assumptions

- Loss aversion
- Self-interest vs. altruism

(1) Loss Aversion

- Getting back to our discussion of the objections evolutionary economists have to the neoclassical assumption of utility maximization by households, another objection they have is that other assumptions may be more relevant depending on the environment in which the individual or household is placed. For example, when an individual is living at a subsistence level where a reduction in resources may mean death, it may be rational for him or her to place greater value on losses than on gains (i.e., to exhibit loss aversion).

(1) Loss Aversion (cont'd)

- The concept of "loss aversion" was first proposed by Daniel Kahneman (1934-) and Amos Nathan Tversky (1937-1996), a renowned team of Israeli-American and Israeli psychologists and behavioral economists, the former of whom received the 2002 Nobel Prize in Economics, in their 1984 paper (Kahneman and Tversky (1984)).

(1) Loss Aversion (cont'd)

- "Loss aversion" refers to the fact that the decrease in an individual's utility from losing 100 dollars (say from gambling) is greater than the increase in that individual's utility from winning 100 dollars. This tendency has been observed in numerous economic experiments although there have been some experiments that find no evidence of loss aversion, and even one experiment that used non-human subjects (capuchin monkeys) found evidence of loss aversion. This widely observed empirical regularity can be explained by evolutionary economics but not by neoclassical economics.

(2) Self-interest vs. Altruism

- Yet another objection that evolutionary economists raise to the behavioral assumptions of neoclassical household theory is that it assumes that individuals are completely selfish, caring only about themselves and deriving utility only from their own consumption, even though individuals often exhibit altruistic or cooperative behaviors in the real world.

(2) Self-interest vs. Altruism (cont'd)

- These altruistic and cooperative behaviors are difficult to explain using neoclassical economists but they can easily be explained using evolutionary biology. Here are a few examples of seemingly altruistic or cooperative behaviors in the animal world than can be explained by evolutionary biology.

(1) Kin Selection

- If individuals are concerned not about maximizing their own utility but about perpetuating their own genes, they may sacrifice their own life in order to save the life of a blood relative because doing so will help perpetuate their own genes ("kin selection").

(1) Kin Selection (cont'd)

- Example 1: The male Australian redback spider *(Latrodectus hasselti)* "somersaults" and twists his abdomen directly onto the fangs of his mate while copulating, and approximately 65% of males are consumed by their mates at this stage. Males that "sacrifice" themselves in this manner enhance the survival prospects of their own genes because the mother of their progeny will be better nourished as a result of their sacrifice and be more likely to give birth to healthy progeny.

(1) Kin Selection (cont'd)

- Example 2: Some termites and ants engage in autothysis (the release of a sticky secretion by fatally rupturing a specialized gland), which protects the colony from invading ants by creating a tar baby effect. This enhances the survival prospects of the colony as a whole at the expense of the individual insect. This behavior can be attributed to the fact that ants share their genes with the entire colony, as a result of which it is evolutionarily beneficial (not necessarily for the individual ant but for the continuation of its specific genetic make-up).

(2) Reciprocal Altruism

- Individuals who want to perpetuate their own genes may help a complete stranger to survive in the expectation that the stranger will return the favor in the future when one's own life is in danger ("reciprocal altruism").
- One example of this phenomenon in the animal world is that of vampire bats. Vampire bats commonly regurgitate blood to share with unlucky or sick roost mates that have been unable to obtain enough blood on their own, presumably in the expectation that the beneficiary of their generosity will return the favor when the tables are turned.

(2) Reciprocal Altruism (cont'd)

- As another example, the evidence suggests that male wild white-handed gibbons (a type of chimpanzee) groom females partly as a quid pro quo for being groomed by the female and partly as a quid pro quo for sexual favors from the female.

(3) Group Selection

- An individual may help ensure the survival of the group to which it belongs, whether or not the other members are their blood relatives, since enhancing the survival prospects of the group as a whole will enhance the survival prospects of each member of the group including the individual himself or herself ("group selection").

(3) Group Selection (cont'd)

- Example 1: Wolves may hang out in packs because this facilitates the capture of prey
- Example 2: Chimpanzees may live in groups because this provides defense against predators and promotes the defense of valuable territory.
- Example 3: Vervet monkeys give alarm calls to warn fellow monkeys of the presence of predators, even though in doing so they attract attention to themselves, thereby increasing their personal chance of being attacked.

(2) Self-interest vs. Altruism (cont'd)

- As these examples illustrate, evolutionary economics can explain seemingly altruistic or cooperative behaviors if we assume that animals or humans are selfish in the sense that they care about the perpetuation of their own genes or of the group to which they belong.

(2) Self-interest vs. Altruism (cont'd)

- Our discussion has focused thus far on examples from the animal world, but I would now like to turn to examples from human behavior. There is no doubt that humans engage in seemingly altruistic or cooperative behaviors to the same extent as, or to a greater extent than, animals

(2) Self-interest vs. Altruism (cont'd)

- To cite a few examples, humans make enormous sacrifices for their children's education and well-being, they leave large bequests to their spouses and children, they make large contributions to various charitable organizations, they volunteer large amounts of their time and labor to others, they donate their organs and blood to complete strangers, etc., etc. Thus, human behavior is seemingly at odds with the neoclassical assumption of utility maximization.

Bequest Motives

- Note, however, that seemingly altruistic or cooperative behaviors can be selfishly motivated in the case of humans as well. Taking the case of bequest behavior as an example,
- (1) Strategic bequest motive
- A parent who leaves a bequest to his or her child is selfishly motivated if the bequest is a *quid pro quo* for nursing care, financial assistance, visits, phone calls, etc., from that child during old age (i.e., if the threat of disinheritance is used to induce their child to provide care and/or attention during old age) (Bernheim, Shleifer, and Summers (1985)).

Bequest Motives (cont'd)

- (2) Dynastic bequest motive
- A parent who leaves a bequest to his or her child is selfishly motivated if the bequest is a *quid pro quo* for carrying on the family line and/or the family business (Chu (1991)).
- (3) Altruistic bequest motive
- The parent does not demand any *quid pro quo* in exchange for leaving a bequest to their child and leaves it out of intergenerational altruism (Becker (1991)).

Bequest Motives (cont'd)

- The first case can be regarded as an example of reciprocal altruism, the second case as an example of kin selection, and the third case can be regarded as an example of pure altruism.
- Since some bequest motives are consistent with the neoclassical assumption of self-interest while others are not, we need information not only on whether people leave bequests but also on their motives for leaving bequests in order to know whether or not their behavior is consistent with neoclassical economics.

Data Source

- “Preference Parameters Study of Osaka University”
- Conducted in 4 countries by a team from Osaka University.
- This survey asked respondents about their bequest motives, asking them to choose from among the following choices:

Question about Bequest Motives

- (Responses consistent with altruism)
- I plan to leave an inheritance to my child(ren) no matter what.
- I do not plan to leave an inheritance to my child(ren) under any circumstances because doing so may reduce their will to work.
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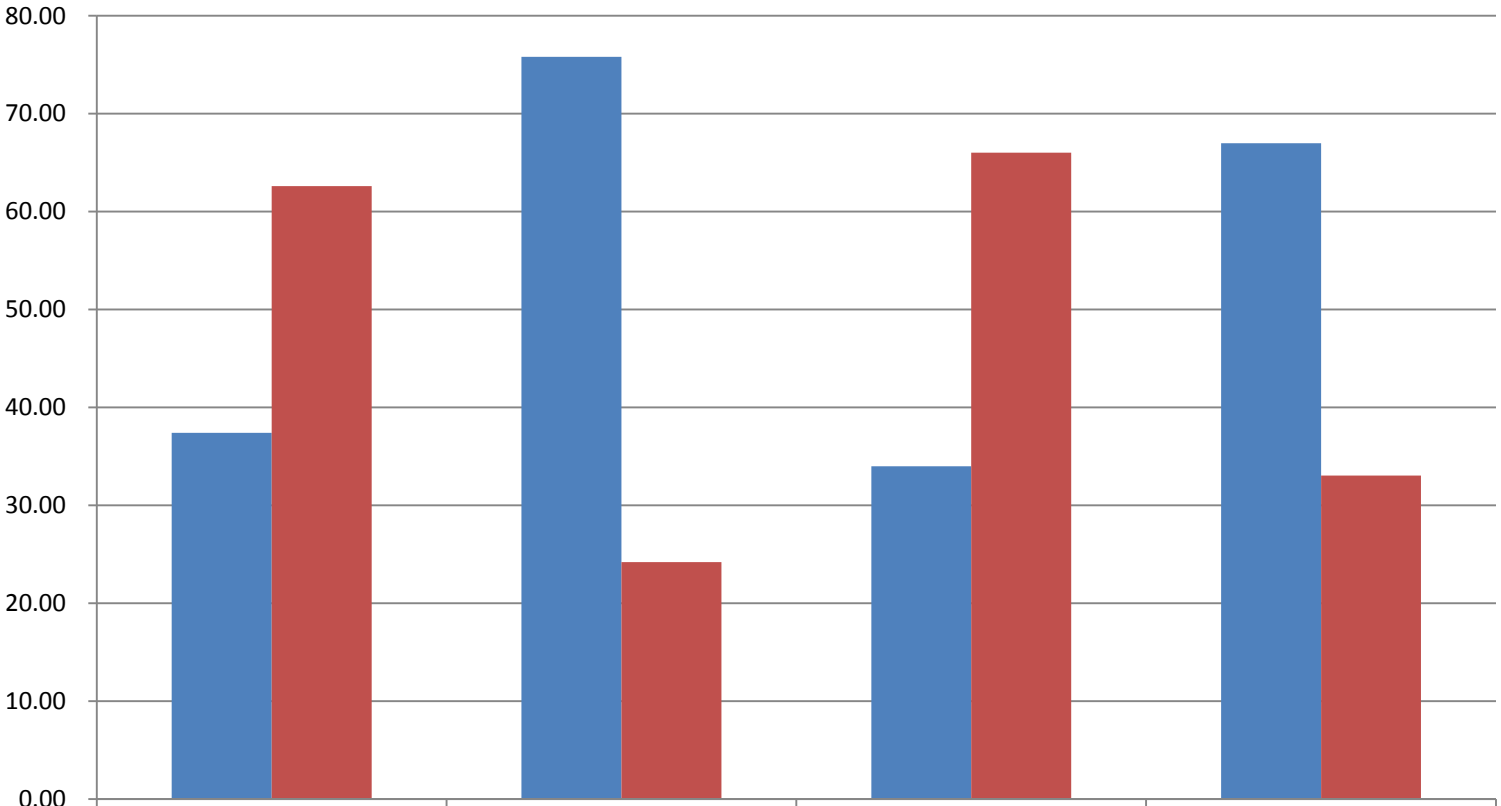
- (Responses consistent with self-interest)
- I plan to leave an inheritance to my child(ren) only if they provide care (including nursing care) during old age.
- I plan to leave an inheritance to my child(ren) only if they provide financial assistance during old age.
- I do not plan to make special efforts to leave an inheritance to my child(ren) but will leave whatever is left over.
- I do not plan to leave an inheritance to my child(ren) under any circumstances because I want to use my wealth myself.
- I plan to leave an inheritance to my child(ren) only if they carry on the family business.

International Comparison of Bequest Motives



	China	India	Japan	U.S.
Altruistic bequest motive	37.40	75.80	33.98	66.97
Selfish bequest motive	62.60	24.20	66.02	33.03

Finding re Bequest Motives

- Thus, it appears that the prevalence of self-interest varies greatly from country to country, that it applies to the majority of the population in China and Japan, and that it applies only to a minority (but a sizable minority) of the population in India and the United States.

Bequest Motives: Econometric Evidence

- Horioka (2014) conducts a comprehensive survey of econometric tests of whether parents and children are selfishly motivated and finds that Americans are largely altruistically motivated whereas Japanese are largely selfishly motivated.

Evidence from Economic Experiments

- Evidence from economic experiments also sheds light on whether or not people are selfish or altruistic.
- Dictator game: Player 1 is required to decide how to allocate 1000 pesos between herself and player 2, and player 2 simply receives what player 1 allocates to her.
- If player 1 is selfish, she should keep all 1000 pesos for herself, but in virtually all cases, player 1 gives at least part of the 1000 pesos to player 2 (sometimes as much as one-half), suggesting that she is at least partially altruistic.
- In fact, in a well-known paper by Henrich, et al. (2001, 2005), the authors observe how people in different cultural contexts play the ultimatum and dictator games in the real world and find that the selfishness axiom is violated almost consistently across various small-scale societies. Moreover, they find that the degree of unselfishness varies with the degree of cooperation required for survival in a particular society as well as with the experience that the society has had with market exchange.

Conclusion re the Neoclassical Assumption of Self-Interest

- Evolutionary economists are therefore justified in criticizing the neoclassical assumption of self-interest and the fact that evolutionary economics can explain selfish behavior as well as altruistic behavior makes it more realistic than neoclassical economics.

Summary of the Evolutionary Theory of Household Behavior

- Nelson and Consoli's (2010) theory of household behavior is superior to the neoclassical theory because its assumptions are realistic and empirically grounded, because it incorporates technological innovation, the new goods and services that technological innovation often produces, and changes in preferences and because it incorporates learning into the decision-making process.

The Relationship between Evolutionary Economics and Behavioral Economics

- Evolutionary economics and behavioral economics are very closely related and specialists in the two fields are on very good terms with one another because they have a common enemy—namely, neoclassical economics!
- Their common goal is to improve upon neoclassical economics by making it more realistic, and they differ only in emphasis.
- Evolutionary economists place more emphasis on making neoclassical economics more dynamic and incorporating technological innovation.
- Behavioral economists place more emphasis on making the behavioral assumptions of neoclassical economics such as the assumption of selfish utility maximization by households more realistic and empirically grounded.

Summary

- Evolutionary economics is an important, promising, and growing field of economics that vastly improves upon neoclassical economics by incorporating more realistic and empirically grounded behavioral assumptions and technological innovation. It is therefore much better able to explain and predict economic behavior and is able to explain and predict a broader range of economic behaviors than neoclassical economics.

Summary (cont'd)

- It is indeed fortunate for the School of Economics of the University of the Philippines and for the economics profession as a whole that the Vea Family had the generosity and foresight to endow the Vea Family Professorial Chair in Technology and Evolutionary Economics Centennial and to encourage teaching and research in this important, promising, and growing field of economics. For that we are eternally grateful.