An Economic Multipoint Gravitational Model Expression Of A Transactional Analysis Game: An Application To Recreational Private Land Use Decisions

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ABSTRACT

The outcome of interactions between various economic actors has a decided subconscious component. Transactional analysis (TA), which was developed in the late 1950s, provides a cognitive theory about the way that human beings interact with each other on a subconscious level that can be applied to investigation of economic decision making. TA, founded by physician Eric Berne, explains a number of potential human interactions, or social transactions, by framing them as subconscious games. Individual economic actors in markets interact with each other. Those interactions may be influenced at least somewhat by subconscious cognitive processes and TA games. Additionally, because individuals gain experience through each interaction, there may reasonably be expected to exist an historical component in which the subconscious response of economic actors to others in the market and to the subconscious games of others in the market may change over time based on their experiences in prior games. As an extension, an individual's subconscious response to other economic actors may in part be based on the influence of information, either conveyed through games or via other sources. This study investigates decision strategy in the context of marketplace interaction in which outcomes are influenced by subconscious social transaction games played between individuals. The decision by land owners of whether or not to open private land to outside parties for recreational use is considered as an example. Because interaction necessarily involves some form of influence, the interaction and decision strategy are modeled mathematically by an economic multipoint gravitational model in which each actor both influences all other actors and is influenced by them.

Keywords: Land Use; Transactional Analysis; Gravitational Model; Consumer Behaviour

INTRODUCTION

Transactional analysis (TA), which was developed in the late 1950s, is a cognitive theory with practical applications based on the way that human beings interact with each other on a subconscious level. Today TA continues to develop and expand in knowledge, scope, and application. Its founder, the physician Eric Berne, explained a number of potential human interactions, or social transactions, by framing them as subconscious games. Because economic markets comprise individuals interacting with each other, and since business transactions are a form of social transaction, it is reasonable to expect that those interactions may be influenced at least somewhat by subconscious cognitive processes and TA games. Additionally, because individuals gain experience through each interaction, there may reasonably be expected to exist an historical component in which the subconscious response of economic actors to others in the market and to the subconscious games of others in the market may change over time based on their experiences in prior games. As an extension, an individual's subconscious response to other economic actors may in part be based on the influence of information, either conveyed through games or via other sources.

The framework of marketplace interaction in which outcomes are influenced by subconscious social transactions between individuals in the marketplace may effectively be modeled mathematically by an economic multipoint gravitational model. That approach may be used potentially to resolve some of the unexplained anomalies sometimes found in economic empirical analysis.

In a general gravitational model, it is typically the case that there is a large actor and a number of smaller actors, each of which is influenced primarily by the large actor, on whom they do not have much of an impact, similar to small objects in space around a large planet. In a multipoint gravitational model, each actor both influences all other actors and is influenced by them. The magnitude of that influence is determined by the relative strength of influence and the effective "distance" between the two actors, where that effective distance is not necessarily a physical measure, but rather refers to accessibility to transactional situations between the two actors. Indeed, through the internet and other technology today, information may easily bridge enormous distances quite rapidly, lowering the effective distance in terms of information, even though the physical distance may remain quite large. In economic markets, the interaction between individuals in business transactions, and hence also in social transactions necessarily involves each individual influencing the other individuals that are party to the transaction. The strength and effective distance of that influence, which can impact the outcome of the interaction, may in part result from subconscious TA games. This study applies the multipoint gravitational framework to model a classic Eric Berne game, called "Now I've Got You," in an economic market situation. An historical component is also utilized in order to incorporate the learning process by economic actors. The situation of private land owners deciding whether or not to open their land to outside recreational use is provided as an example. A private land use decision is one that may reasonably be considered to be subject to influence by one or more market actors or outside parties. The historical component may also play a role, as both the owner and potential recreational clients may have their decision strategy influenced by past experience. Additionally, such land use negotiations are not only inherently transactions, but may also be influenced by one or more transactional analysis games on the part of the owner and/or clients.

BACKGROUND

The explicit inclusion of psychological aspects of the individual into economic analysis is at least several decades old. Russell and Thaler (1985), among others, investigated with individual deviations from classical rationality. Such individuals were termed quasi-rationals. Rabin (1998) explored the effects of experiencing a loss on an individual's utility during a recovery period, which was termed the loss premium. Johnson (2011) and Johnson (2016) investigated the behaviorally-based segmentation of markets into distinct groups based on revealed consumer preference, yielding different market result from that predicted by classical economics.

Individuals, however, are the subject of environmental influence even more than they may think. It is, therefore, essential to consider the role of other people and their interaction with others in economic decision-making (Bargh & Ferguson, 2000; Huang & Bargh 2008). Markets comprise groups of individuals who do not exist in their own "bubble," but interact with others in some way and may be influenced by others in one way or another. Of particular note is that decisions are rarely made on the conscious level (Bargh & Marsella, 2009). Individual decision and interactions between market actors are often determined subconsciously (Mlodinow, 2012). Reaction on a subconscious level of individuals to external stimuli impacts decision strategy and economic behavior (Bargh & Marsella, 2009). Because so much of decision strategy is determined on a subconscious level, understanding the interactions with other individuals that may impact the subconscious processes is of particular merit to understanding the psychology of economics.

Transactional analysis is one means of categorizing human interactions that have an overt, conscious component of which the players are aware and also a subconscious part, of which the players are not aware. In typical transactional analysis (TA) terminology, interactions with a subconscious component may be expressed as a "game" being played in between the individuals. Individuals interact with others in the subconscious level of a "parent," an "adult," or a "child." All three "persons" are present to one degree or another in everyone's psyche. They each serve a specific purpose. The "adult" is necessary for survival and is the state that gathers, processes, and analyzes data for dealing with the outside world. The "parent" level helps automate decisions, e.g., "This is the way we always do things." The "child" level provides intuition, creativity, spontaneity, and enjoyment. When two individuals interact, it is possible that they can be on the same level or on different levels. If they are interacting on the same level (parent-parent, adult-adult, or child-child), then there is a state of effective communication. Critical gossip about others is a manifestation of "parent-parent" interaction, while problem solving is indicative of "adult-adult" interaction. Play is a common form of "child-child" interaction. Communication is hindered, however, if the interaction between two individuals is not on the same level. For example, one player may be in the parent level at the moment of interaction, while the other is in the adult level, leading to a situation in which one person (the "adult") may feel being controlled, talked down to, or

treated like a child by the other person (the "parent"). Also, just as the level at which an individual operates at a given moment may change over time, the level may actually change during the course of an interaction. An adult-adult interaction may evolve to a parent-adult interaction, for example. Level imbalances in interactions between two individuals can cause disturbances in the outcome of even the simplest of transactions (Berne, 1964). Thus, the subconscious state of economic actors has the potential to impact directly the outcome of economic transactions.

In addition to games, other transactions within the TA framework include procedures, rituals, and pastimes. All three are less complex than games. Religious and moral beliefs, which form part of the categories of procedures and rituals, may influence economic outcomes on individual, national, and global levels by influencing decision strategy (Hawtrey & Johnson, 2010; Oslington, et al. 2011; Calomiris, 2001; Johnson, 2009; Johnson, 2011; Johnson, 2013). Marketplace outcomes and individual decision strategies may also be influenced by social beliefs regarding various relevant issues (Golan, Kuchler, Mitchell, Green, & Jessup, 2001; Teisl, Roe, & Hicks 2002; Johnson et al. 2011). Social beliefs in particular can be quite dynamic, as recently seen in Europe and the United States regarding the issue of homosexual marriage. The economic impact of those decisions is outside the scope of this study. However, it is worth noting here as an example of how fluid and dramatic change can be in terms of social belief.

Pastimes are transactions designed to fill a specific period of time, usually spanning in between procedures and/or rituals. Games are an ongoing series of transactions and are differentiated from procedures, rituals, and pastimes by the presence of some form of ulterior motive and some form of subconscious, psychological payoff. These games are played by individuals engaged in duplex transactions of which they are not fully aware (Berne, 1964).

THE GAME

"Now I've Got You" is a subconscious game in transactional analysis in which one player ends up in a position in which the other player is at his mercy, and that fact becomes more important than the gains from the strong position. An example given by Berne is excerpted below from *Games People Play:*

> *White needed some plumbing fixtures installed, and he reviewed the costs very carefully with the plumber before giving him a go-ahead. The price was set, and it was agreed that there would be no extras. When the plumber submitted his bill, he included a few dollars extra for an unexpected valve that had to be installed – about four dollars on a four-hundred-dollar job. White became infuriated, called the plumber on the phone, and demanded an explanation. The plumber would not back down. White wrote him a long letter criticizing his integrity and ethics and refused to pay the bill until the extra charge was withdrawn. The plumber finally gave in.*

In the above example, both White and the plumber were playing games. The plumber was in the wrong because he had promised that there would be no additional charges. White, however, rather than simply discussing the matter on the Adult level, used the situation set up by the plumber to react with enraged fury, attacking even the plumber's whole sense of ethics. On the Adult-Adult level of interaction, it would have sufficed to point out the problem calmly and in a dignified manner and discuss the disputed sum of money. However, what took place was a Parent-Adult interaction. White exploited his superior position of being in the right to, perhaps, find an outlet for years of pent-up frustration and various real or perceived wrongs done to him by others. His own mother or father may perhaps have done the same thing to him when he was young (Berne, 1964). The "other" Golden Rule: "He who has the gold rules."

It should be easy to understand why that game is called "Now I've Got You." (Berne devised an entire array of clever names that were quite descriptive of the games they represented.) It is a form of Parent-Adult interaction, with the aggressor on the Parent level and the victim on the Adult level. Depending on how the victim responds, it may switch to Parent-Child interaction. There are plenty of situations in which it might occur, including different permutations and manifestations of the commercial transaction example above. It is also seen in marital relations, in which one spouse uses the errors of the other as an excuse to exploit the morally-justifiable position and extend it to released pent-up rage. It can also be seen in the workplace, where a manger might use a mistake that an employee made as an excuse.

MARKETPLACE APPLICATION OF THE GAME

The number and type of applications of the game "Now I've Got You" in the economy are quite numerous and perhaps even virtually limitless. Even the example given by Berne was of a commercial transaction. Normal marketplace transactions are inherently Adult-Adult. When they deviate, problems can arise. There are, of course, other games that are applicable to economics, but they are outside the scope of the present study.

Gains from "Now I've Got You" are, on a sub-conscious level, from having the other player at one's mercy. That is in fact what drives the aggressor. There is, therefore, a utility component that comes from the pleasure thus gained. However, it may not be the only form of gain, as the aggressor, by playing "Now I've Got You," may make financial gains as well as having the victim relent. On the other hand, sometimes the aggressor may lose financially by playing the game, but the gain to utility from being in the position of power outweighs the loss to utility from financial loss. Therefore, it stands to reason that the game terms and the financial terms of the utility function are weighted in a way that is inherent to the individual.

Given that the games in TA are subconscious presents an interesting challenge in terms of decision strategy analysis. An individual's strategy may have an overt nature potentially observable, at least in part, by others coupled with a subconscious component that the individual may not be aware of. Ironically, it is sometimes the subconscious component that is most obvious to outside observers of an individual's behavior at the point of decision.

An individual's decision strategy may logically be influenced by other individuals. The strength of influence of an individual and hence the degree to which they influence others may depend on whether or not they are playing a psychological game. Decision strategies are also iterative in growth, i.e., the experiences of the past may cause modifications in an individual's decision strategy as learning takes place and as subconscious reactions take place.

In the Berne example of White and the plumber, White's strategy had a definite subconscious component. On the one hand, his strategy might be such that he might respond on the Adult level to an Adult-Adult situation, but then possess a certain trigger that causes a shift to an alternative strategy. The plumber, on the other hand, may have a decision strategy that likewise has an accompanying alternative when the game "Now I've Got You" is encountered. The plumber exerted influence on White such that White's strategy changed, and then the plumber's strategy subsequently changed in response. In both cases, the shift in strategy in response to influence of others was made to achieve maximize utility (not necessarily financial gain) given the situational conditions.

Now assume for simplicity that in a population there is only one principal subconscious game, "Now I've Got You." The only other game that exists is one that is also a trigger for "Now I've Got You" (NIGY). Consider that each individual has the potential to interact with every other person in the population, though clearly not all individuals may actually interact. At each point of interaction between two individuals "A" and "B," there is a probability that exists for each of the following situations:

1. A plays NIGY. B provides the trigger.
2. B plays NIGY. A provides the trigger.
3. A has the potential to play NIGY. B does not provide the trigger.
4. B has the potential to play NIGY. A does not provide the trigger.
5. A and B both have the potential to play NIGY. Neither provides the trigger.
6. Neither has the potential to play NIGY.

So, in each interaction, there exists a probability that NIGY will result based on the probability that at least one player has the potential to play NIGY and the probability that the other player will provide the trigger. In that framework, influence of one individual on another depends on whether or not the trigger and/or the NIGY game exist. As games take place, an historical component necessarily arises in which the decision strategy is modified based on past experience. That is, a player who does not have the potential to play NIGY but provides the trigger to another who does (situations 1 and 2 in the list above) might modify the decision strategy such that there is less likelihood of providing a trigger. On the other hand, the result of that historical experience could be that a player who did not play NIGY develops the ability the play NIGY. A player in situation 6 above for several iterations may end up in situation

3 or 4 when encountering an NIGY player. However, a player that is in situation 1 or 2 may eventually develop a subconscious desire to play NIGY. Environment matters in the case of learned behavior, though it is certainly not the only factor. The decision strategy of each individual may be influenced by the cumulative effect of subconscious transactions taking place during interactions with others. The strength of influence stemming form these other individuals may vary.

GRAVITATIONAL MODEL

Considering the presence of subconscious forces that both influence decision strategy and also may provide a source of utility themselves, a utility function of the consumption of some good may be expressed as a function of consumption, income, and a subconscious component, *S.* This is given as Eqn. 1.

$$U(x|S,S) = f\big(Y, S(N)\big) \tag{1}$$

Since the subconscious component may be modified according to the influence of others in interactions, *S* is expressed as a function of that influence, *N.* Utility from consumption of *x* is conditional on *S,* and utility also is expressed as a function of *S* directly. A multipoint gravitational model may be used as a means of expressing the interaction between individuals within a population in the presence of the NIGY game, holding all other things equal. An historical component can be added to account for reactions to game outcomes that result in modifications to decision strategy over time (Johnson, 2017). Following Johnson (2015), the force of influence in an interaction between to players A and B can be expressed as in Eqn. 2.

$$F_{ABt} = \frac{M n_{At}(h_A, n_{B\backslash t}) n_{Bt}(h_B, n_{A\backslash t})}{f(r)} r_{BA} \tag{2}$$

Eqn. 2 represents the force of A on B, and hence the vector direction is from B to A. As usual, *M* is a general constant, and *f(r)* is the effective distance between A and B. Because the force of influence may vary over time during the course of interaction between A and B, a time component *t* is included. Because the players learn over time, their relative strength of influence, *n,* is dependent upon their historical experience, *h.* In the framework of the Berne game "Now I've Got You," there must be a trigger that causes a change in decision strategy and relative influence. For example, if B provides the trigger to A, then the manner in which and the degree to which A influences B may change, as A's underlying strategy to achieve utility maximization has changed. So, the strength of influence, *n,* of one player is expressed as a function of the strength of influence of the other player at a specific time. And, as always, the relative force of A on B is equal and opposite to the relative force of B on A. Thus, whichever force is stronger at any given time will cause the other player to "move" towards the player with the greater force. The effect of A on B, which may be thought of as the "acceleration" of B towards A, is given in Eqn. 3.

$$e_{BAt} = \frac{q(F_{ABt})}{p(n_{Bt})} r_{BA} \tag{3}$$

Now, consider situation #1, in which A plays NIGY, and B provides the trigger. The interaction begins on the Adult-Adult level. As B provides the trigger, n_{At} changes as A reacts and plays NIGY, since n_{At} is a function of $n_{B\backslash t}$. That shifts the interaction to the Parent-Adult level. Then, B initiates his strategy of response to encountering NIGY, and n_{Bt} changes in response to the current value of $n_{A\backslash t}$, which is representative of A playing NIGY. When the game of NIGY takes place, A gains in utility from the subconscious element of the utility function and/or due to increases in utility from *x.* Although B maximizes utility under the conditions of the game by playing his response strategy, B may very well lose utility as the victim. Ethical considerations aside, if the gains to A outweigh the losses to B, then the outcome is Pareto efficient. However, the levels of consumption of *x* may be different for both players in the presence of the game. Thus the market demand analysis will yield two separate results – one in the presence of the game and another in the absence of the game.

Further consider the case in which player B encounters more than only player A, but rather a whole series of individuals who may or may not play NIGY. A player seeking to maximize utility under the given conditions, results

in the application of Eqn. 3, summed over all other individuals in the population, to the utility function of Eqn. 1 yields Eqn. 4, where *k* and *v* are functions.

$$maxU\big(x, S(N)\big) = k(x)s.t.v\left(Y, \frac{\langle {}_{B}F_{net}\rangle}{n_{Bt}}\right) \tag{4}$$

Also, in each interaction, there is a probability that B will provide the trigger. For players who have the capability of playing NIGY, they gain in utility in their interactions in others when the trigger is provided. If the trigger is not provided, then their utility level is at is base, or "regular" level that would result from a typical economic transaction. For player B, who does not play NIGY, but may provide the trigger, utility may be decreased if the trigger is provided and the other player plays NIGY. Thus, there is a risk associated with providing the trigger (which could be the result of a game played by B) that it will be played with an NIGY player. Therefore, three principal possibilities exist. The first is that player B deviates from economic rationality and provides the trigger as a form of psychological deficiency. That is, he may be subconsciously lowering his utility. The second possibility is that B provides the trigger innocently, and hence it is a mistake. In that case, the historical component of the gravitational model would suggest that learning may take place, and eventually either the trigger will not be offered in the future or B will adopt NIGY or some other game in response in order to avoid utility loss when encountering an NIGY player. The third possibility is that B offers the trigger in an attempt to *gain* utility, much like the person that has a chip on his shoulder hoping someone will knock it off and engage in a fight, for that is what he wants, but does not want to appear as the aggressor. It is entirely conceivable that someone who starts out offering the trigger innocently learns over time and continues to offer the trigger as a means of driving an interaction towards another game that he wishes to play to maximize utility.

Because each individual does not know *a priori* what type of player the other individual in the transaction is and what their strategy is, and also does not know *a priori* what their own strategy is *on a subconscious level*, there is a probability associated with each choice. Because there is a probability associated with each possible choice, it is logical to express the relative strength terms as expectation values, for they change contingent upon the decisions of the other players. For a player that plays NIGY, the expectation value of the strength term can be expressed as Eqn. 5.

$$\langle n_A \rangle = a_1 n_{A,0} + a_2 n_{A,NIGY} \tag{5}$$

In Eqn. 5, $a_1$and a_2 are probabilities associated with each of the possible relative strengths, the first being the strength of influence if A does not play NIGY, and the second being the strength of influence of A plays NIGY. Player B, then, may likewise have a "normal" influence or may have the influence associated with a response. This is given in Eqn. 6, where β_1 and β_2 are probabilities.

$$\langle n_B \rangle = \beta_1 n_{B,0} + \beta_2 n_{B,Response} \tag{6}$$

Note that in Eqn. 6 there is no separate term for providing the trigger. That is because if B provides the trigger, but A is not an NIGY player, then B's strategy will not change; and if A does play NIGY, then B will follow the response strategy.

Given Eqns. 5 and 6, Eqns. 7 and 8 are the force and effect equations respectively, expressed in terms of expectation value.

$$\langle F_{AB} \rangle = \frac{M\langle n_A \rangle \langle n_B \rangle}{f(r)} r_{BA} \tag{7}$$

$$\langle e_{BA} \rangle = \frac{q(\langle F_{AB} \rangle)}{p(\langle n_B \rangle)} r_{BA} \tag{8}$$

For a player B encountering multiple other individuals, the net effect of the influence of the other players resulting from possible games is given as Eqn. 9.

$$\langle e_{BA} \rangle = \frac{\left({}_B F_{net} \right)}{\langle n_B \rangle} r_{BA} \tag{9}$$

The utility maximization problem then becomes Eqn. 10.

$$MaxU\big(x, S(N)\big) = k(x) s.t. v\left(Y, \frac{\langle {}_B F_{net} \rangle}{\langle n_B \rangle}\right) \tag{10}$$

Observing Eqn. 10, it should be easy to see that the constraint equation, because it contains expectation values, is inherently probabilistic. Thus, in demand analysis observing transactional outcomes as a whole will be providing only a measurement of the average in the presence of the game NIGY. If the game does not take place, then typical demand analysis is correct, *ceteris paribus*. If the game does take place, then typical demand analysis provides the average outcome for the population as a whole, but does not provide the direct impact of the game itself to the economy as a whole or to individual players.

RECREATIONAL LAND USE EXAMPLE

Private land owners face a decision of opening their land to outside use for recreational purposes, either for a fee or gratis. In the framework of the present study, the utility maximization problem is based on the following decision logic chart:

1. Open land to outside recreational use or not?
2. If land is opened, then:
    a. What activities are permitted on the land?
    b. How many acres are allocated as available for each permitted activity?
    c. To whom is the land open? (This may vary by activity.)
    d. What is the fee per acre? (This may vary by type of person and type of activity.)

The utility maximization problem is subject to a constraint that contains a subconscious component and the multipoint gravitational influence of others, as in Eqns. 1 and 4. The *x* term in Eqn. 4 for this example, then, can represent, rather than a consumer choice, the land owner's choice matrix for opening land based on the owner's decision chart given above.

Now, there also exists a probability that a transactional analysis game takes place. If a game of NIGY, for example, takes places, it could potentially be in the following form:

> *A (land owner) opens land to B (client). B uses slightly more than the contracted acreage for hunting in order to get the intended quarry. A attempts to recover an additional fee for the land used. B responds with a game of NIGY, feeling that the original contract price was violated. It then continues much as in the previous plumber example.*

That is not, of course, the only possible way that NIGY could play out, and NIGY is not at all the only game that could be seen. The experience of land owners and/or clients with encountering games, both in general and in the specific realm of private land potentially opened for outside use, can impact decision strategies for both sides directly as well as impact the way in which both sides influence each other and are influenced by outside parties.

CONCLUSIONS

Applying the game "Now I've Got You" to utility maximization using a multipoint gravitational model to incorporate influences between individuals in transactions has demonstrated that the presence of such a subconscious game can affect both the explicit outcome and the utility of individual players. Subconscious transactional games are effectively automated processes that cannot be observed except in terms of their overt action and outcome. However, again, the process that led to that action or outcome cannot be observed and is furthermore not directly known by the player.

Utility maximization in the presence of games is inherently probabilistic. The influence of others resulting from transactional games is the source of that probabilistic nature. Also, as individuals encounter other individuals, they may learn and change they underlying probabilities associated with their decision strategy, thereby implying an historical component to the utility maximization problem and to the individual's decision strategy.

The presence of games can significantly distort demand analysis. Furthermore, even if a transaction or series of transactions is Pareto efficient, there may nevertheless be a non-trivial cost to the victims of the games. Victims may, through the historical component of their demand strategy, eventually become game-players themselves – whether those games are beneficial or harmful to themselves or others. Understanding the presence and effects of games on the economy as a whole and on individuals is beneficial not only to improving interpretation of demand analysis but to influencing outcomes through the promotion of self-improvement that seeks to reduce harmful games and promote beneficial games.

In the specific example included in the study, the decision to open private land for outside recreational use is not merely one of simple price and income-driven supply and demand. Both anecdotal and empirical evidence suggest the presence of other factors in the decision strategy for utility maximization (Liu, Pagoulatos, Hu, & Fleming, 2010). A multipoint gravitational model with probabilistic component resulting from the possible presence of transactional analysis games, as well as a general subconscious component can go a long way to explaining land owner decisions regarding opening their land to other parties for recreational purposes. Indeed, distortions from general profit maximization solutions may result as land owners maximize utility subject to a subconscious and potentially-game-driven constraint.

AUTHOR BIOGRAPHY

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