Imitation and Learning under Uncertainty : A Vignette Experiment

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Abstract

Existing theories regarding effects of social networks on trust problems stress the influence of information about behavior of potential partners in the past and possibilities to sanction untrustworthy others in the future. Effects of *imitation* are less extensively elaborated in the literature. In this paper, we develop a theory about (rational) imitation in combination with other network effects on trust. We introduce a distinction between imitation and other types of learning based on whether trustors know that a trustee has been trustworthy, or only that other trustors have been trustful in transactions with this trustee. The theory predicts that imitation as well as learning has effects in trust situations. In addition, both imitation and learning are predicted to become more important if the trustor is more uncertain about various aspects of the focal trust problem. We designed a vignette experiment that enables us to distinguish between imitation and learning for different levels of uncertainty. The effects of learning and imitation find empirical support but the association of the strength of the effects with uncertainty is only partially supported by the results of the experiment.

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1. Introduction

In the 90s, in front of the main building of the university of Turin, there was a big parking lot, which was (and probably still is) always completely full. The system by which the parking lot was managed and utilized by students is quite interesting. Two guys were looking after the parking lot every day from early in the morning till very late in the afternoon. They were neither authorized nor paid by the town council, but they received tips from the students to optimize the space in the parking lot and monitor their cars. The guys did not look very reliable, they wore poor and dirty clothes and they were covered by self-made aggressive-looking tattoos. It was not unusual to see one of these guys sitting in a very expensive sports car, smoking stinky cheap cigarettes and listening to loud music from the car-stereo. In fact, when the parking lot was completely full, students used to leave their car to the guys who parked it as soon as a place was available. The Italian author of this paper never had such an expensive sports car, but he did leave his old runabout to the unauthorized parking lot attendants several times during his studies. What made these students think that these two guys were trustworthy? We believe that the most sincere answer to this question should be: simply the fact that everybody else seemed to trust them.

The idea that social embeddedness promotes trust is well known and accepted in sociology (Granovetter, 1985). Existing theories address the importance of social networks hypothesizing effects of reputation (Raub & Weesie, 1990), learning and control (Buskens & Raub, 2002), and gossip (Burt & Knez, 1995; Burt, 2001). Nevertheless, these theories do not account for all possible mechanisms affecting individual decisions in trust problems. Particularly, we believe that effects of *imitation* on trust problems are largely neglected. By imitation we refer to situations where actors facing a trust problem base their decision upon observing the behavior of other trustors in similar conditions. If several other trustors trust a certain trustee their behavior can be perceived as a signal that trust can be placed safely, even though it is unknown whether this trustee eventually honored trust. In other words, sometimes individuals decide to trust somebody just because they see others do so.[1] Imitative behavior is traditionally considered a form of social learning that plays a very important role in socialization process (see, for example, Bandura & Walters, 1963: ch. 2). Imitation might be performed if it is seen as the most convenient way to arrive at a better decision and in this specific sense it can be rational behavior (Hedström, 1998). This does not exclude that imitation can have pervasive effects. If actors realize that their partners' best option is to base their decision on behavior of similar others without knowing outcomes, there will be more room for opportunistic behavior compared to situations where outcomes can be observed as well. This paper studies imitation and other types of learning in trust problems. Empirical evidence for the importance of imitation is provided by means of a vignette experiment that tests hypotheses about imitation and other types of learning under different conditions.

The anecdote of the parking lot attendants displays all the essential features of a trust problem as defined by Coleman (1990: ch. 5).

1. The opportunity for one actor (*Ego*) to place some resources at the disposal of another actor (*Alter*) who has the option to honor or abuse trust. If Ego leaves her car to Alter, Alter could look after it or leave it unguarded running the risk that the car is stolen.[2, 3]
2. A structure of preferences such that Ego prefers to place trust if Alter is trustworthy, but regrets placing trust if Alter is untrustworthy; while for Alter abuse of trust is preferred over honoring, but honoring trust is preferred over the situation in which trust is not placed.
3. There is no formal guarantee that protects Ego from the possibility that Alter abuses trust.
4. There is a time lag between the decision of Ego and the action of Alter. The strategic risk is caused either by these "time asymmetries" (Coleman, 1990: 91) between the decision of Ego and Alter, or by information asymmetries about the object of the transaction (Kollock, 1994), or more generally, the strategic risk is generated by the actors' interdependence (Raub & Weesie, 2000).

FIGURE 1 ABOUT HERE

A simple trust problem between a pair of actors can be represented by a scheme (Camerer & Weigelt, 1988; Dasgupta, 1988; Kreps, 1990) also known as the *trust game* (see figure 1). This formalization captures the essential features of the problem. The game begins with a move by Ego who has a choice between trusting and not trusting Alter. If Ego withholds trust, the game ends. In this case, Ego receives P_1 and Alter receives P_2. If Ego chooses to place trust, Alter has the possibility to honor or abuse trust. If Alter honors trust, he obtains $R_2 > P_2$ and Ego obtains $R_1 > P_1$, while if he abuses trust Alter receives $T_2 > R_2$ and Ego is left with $S_1 < P_1$. This game can be seen as a one-sided version of the well-known prisoner's dilemma. Assuming perfect information and a one shot non-cooperative game, trust will not be placed.[4] If Ego would place trust, Alter would abuse it because $T_2 > R_2$. Consequently, a rational Ego, who knows the payoff structure, will withhold trust because $P_1 > S_1$. "No trust" and

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[1] This argument closely resembles Podolny's definition of market status as "…a *signal* of the underlying quality of a firm's product." (Podolny, 1993: 831).

[2] We could even hypothesize that Alter could steal the car himself, but this possibility is not necessary to create a trust problem assuming that guarding cars is more costly for the attendants than just smoking and listing to music. Considering the introductory example, the risk that the car is stolen is real, because many students leave the keys on their car relying on the attendants.

[3] For reader friendliness and in correspondence with conventional use of pronouns in the literature, we use female gender for Ego and male for Alter.

[4] In a game of perfect information each node is a singleton, which means that each actor always knows exactly where he is in the game tree. A game is non-cooperative when no binding commitment between the players is allowed (Rasmusen, 2001).

"abuse" are equilibrium choices (in figure 1 this is represented by double lines). The payoffs in equilibrium are therefore P_1 and P_2. This outcome is sub-optimal, because both actors would prefer the payoffs yielded in the situation in which trust is placed and honored, R_1 and R_2. As for the prisoner's dilemma, the choices in equilibrium yield payoffs that are not Pareto optimal.

This formalization of a trust game resembles an isolated encounter between two isolated actors, but a single encounter between two actors is too simplistic to account for the real complexity of human transactions. Transactions between pairs of actors are more often embedded in a complex system of social relation (Granovetter, 1985), which promotes trust reducing the risk derived from interdependence (Raub & Weesie, 2000). In the situation described in the example, what would a hypothetical first-year student do, when confronted with the unauthorized attendant the first time that she drove to the university? Some students would drive away and look for another parking place, but some would plausibly have a look at how many cars are parked there and consequently consider the attendant to be trustworthy, if so many other students leave their car to him. In this example, the information provided by the network is minimal; nevertheless, it might suffice to persuade the student that the parking attendants are trustworthy. If the student decides to park and tip an attendant, she is indeed *imitating* the trustful behavior of other actors who belong to the same network.

In section 2, we elaborate on the distinction between imitation and learning. We present a theoretical model of effects of embeddedness on trust and extend this model incorporating uncertainty in order to derive hypotheses about the effects of different types of information on the decision to place trust. From section 3, this paper presents a vignette experiment that provides evidence of the effects of both imitation and learning in a specific trust problem. The experiment is designed to define specific conditions such as uncertainty that could facilitate imitative behavior. Section 3 describes the experimental setup and the methods of analysis. Section 4 presents the results of the empirical analysis. Section 5 concludes and identifies possibilities for future research.

2. Theory

First, we introduce another example of a trust problem that will provide a frame for the theoretical model as well as a suitable scenario for the experiment. Imagine a student (Ego) who has the idea of setting up an e-business. The investment requires an initial capital of about €5000, but Ego has only €3000 available. This money is not sufficient to realize the investment before the conditions of the market change, making the business less profitable. Within her year group there is another student (Alter) who is a stockbroker. Alter is known to make money investing small amounts on the stock market. Alter offers Ego the possibility to invest her money in the stock market in order to obtain the capital for the e-business. In exchange, Alter asks for 10% of the profit, but he does not share the losses if the investment fails. Since Ego does not have the competence to invest alone, Alter has the possibility to lie about the outcome of the investment and walk away with Ego's money. This scenario displays all essential features of a trust problem as defined in the introduction. Ego prefers to invest her money if Alter is trustworthy, but to keep the money and renounce the e-business if Alter is untrustworthy. Alter, on the other hand, realizes a greater gain by abusing trust, but prefers honoring trust to the case in which trust is not placed. The scenario has two additional desirable characteristics. First, the stock market accounts for the type of uncertainty that we are trying to model and, second, it is realistic enough to use as a frame for our experiment.

As noted before, we do not expect Ego to trust Alter in an isolated trust game. However, social embeddedness might facilitate trust. The concept of embeddedness covers different dimensions: time, networks, and institutions (Raub & Weesie, 2000). Institutional embeddedness refers to mechanisms that affect the structure of incentives introducing some form of constraint that limits the desirability of opportunistic behavior, by means of any kind of formal guarantee. (Weesie & Raub, 1996; Snijders, 1996). We neglect institutional embeddedness in this paper. Dyadic embeddedness refers to the possibility that two actors have a common history and future of transactions with each other. Dyadic embeddedness enforces cooperation casting a shadow on the future that discourages opportunistic behavior (Axelrod, 1994), or through a history of past cooperative relations (Gautschi, 2000). Network embeddedness represents the possibility that actors are not only involved in bilateral transactions, but also have contacts with third parties. Information about trustworthiness of actors circulates in the network determining the emergence of reputation (Raub & Weesie, 1990). Dyadic and network embeddedness affect trust problems in two ways: *learning* and *control* (Buskens & Raub, 2002). Control is modeled as Alter's anticipation of future sanctions for abuse of trust (see Buskens & Weesie [2000a] or Buskens [2002, ch. 3] for a game-theoretic model about control effects through social networks). Learning is determined by information diffusion within networks, and therefore learning effects are stronger for networks where information circulates faster. Trust increases in denser networks if information about Alter is positive, and decreases if information about Alter is negative (Buskens & Yamaguchi, 1999; Buskens, 2002, ch. 4). These theories account for mechanisms by which rational actors trust is build on outcomes of past transactions and expectations about future transactions in spite of incentives to behave opportunistically in the present transaction. However, existing theories do not take imitation into account neglecting situations in which actors only have information about past behavior of other trustors but not about the outcomes of these transactions.

In this paper we focus learning and imitation through social network. In order to study the role of learning and imitation in supporting trust, we first elaborate on some existing theories with respect to learning. Learning mechanisms have been studied and modeled by several scholars. In these models learning is often modeled as updating of beliefs about aspects of a choice situation. Actors update their beliefs when they receive information that is relevant for the decision they have to take. This information can come either from one's own experience or from experiences of others who have to make similar decisions. Mostly, updating beliefs is modeled applying Bayes' updating (Savage, 1954; Harsanyi, 1967-68; Bower et al, 1996). The models that apply Bayes' rule are strictly rational, but it is questionable whether it is realistic to expect individuals to make decisions "as if" they apply such complex algorithms. More likely, individuals apply heuristics that are more straightforward. The more costly or complicated decisions are, the more we can expect people to base their decisions on simple heuristics (Pingle, 1995). Nevertheless, these heuristics are not necessarily irrational, insofar as they do not prevent individuals to reach optimal payoffs (Pingle and Day, 1996). These heuristics can be based on the extent to which actors are satisfied with outcomes in the past. In such boundedly rational models, actors look at their own past and repeat choices that proved to be successful (Macy, 1990), or they update their behavior after observing the (or a sample of) choices made by others and the outcomes that these actors obtained (Ellison, 1993; Ellison & Fudenberg, 1995; Erev & Roth, 1998, 1999). Similar adaptive (social) learning models are used in evolutionary game theory (Weibull, 1996; Fudenberg & Levine, 1998). Some scholars who developed these models (Pingle, 1995; Pingle & Day, 1996; Schlag, 1998) use the label "imitation" for models in which individuals decide after receiving information about the outcomes obtained by others and compare them employing some efficiency criteria. Yet, there are situations in which these learning models do not apply. For instance, if actors can observe other people's behavior but not their payoffs, existing models do not make predictions about the effects this kind of information has on the behavior of Ego. Such decision problems have been largely neglected in the literature.

In this paper we focus precisely on this type of decision with respect to a trust problem. From now on, we use the label 'learning' for any decisional process based on information concerning the outcomes of a given transaction. The term 'imitation' is restricted to situations where individuals base their decisions on the behavior of others who are in a similar position as Ego, e.g., they are also trustors, *without* having any information about the outcomes obtained by these others. Moreover, Ego might observe behavior of third parties in relation with even "fourth" parties and base her decision on this information. To distinguish clearly between these different types of third parties, we introduce the label "Other Egos" for third parties who have transactions in a similar role as Ego, i.e., they also have to decide whether or not to trust someone else. We use the label "Other Alters" for third parties that are in a similar role as Alter and with whom Other Egos have been involved in trust problems.

Situations in which actors observe behavior of others and then choose a strategy are not difficult to imagine, but also situations in which information regarding choices made by other individuals would not be sufficient are conceivable. When deciding whether a parking lot is safe, we observe how many other people parked there in order to have a clue. When deciding whether to confide in somebody about some personal problems, we would consider the number of others that confide in him irrelevant. It is hence plausible that some *conditions* facilitate imitation in trust problems and others hinder it. Generally speaking, we might expect imitation to take place preferably in relatively unfamiliar situations (Pingle, 1995;[5] Podolny, 1993, 2001) and in situations in which an eventual abuse of trust is not "life-threatening."

More precisely, we expect imitation as well as learning to be associated with uncertainty (cf. Podolny, 2001). Uncertainty refers to situations in which actors have to choose between alternative actions that yield certain payoffs with unknown probabilities (Knight, 1921). Knight distinguished between *risk,* associated with situations resembling lotteries where all possible outcomes and relative probabilities are known, and *uncertainty,* referring to situations where the probabilities of the events are not known.[6] We claim that individuals facing trust problems with Knightian or radical uncertainty (see also Nooteboom, 2002) about the possible outcomes will imitate others especially when adaptive learning is difficult and better information is not available. This implies that actors base their choice only on behavior of other actors facing a similar trust problem, even though they do not receive any information about the outcomes of the transaction. While Knightian uncertainty explicitly excludes that actors have any knowledge about the probabilities of events, we will make a less strict assumption, namely, that actors do not know precise probabilities of events, but still have a subjective estimation of the distribution of events. In order to derive hypotheses about the interdependence of uncertainty with learning and imitation we incorporate such uncertainty in the standard trust game. In our example, uncertainty is related to the probability that Alter will succeed in making a good profit at the stock market if he does his very best.

FIGURE 2 ABOUT HERE

The trust game with uncertainty is a game with imperfect and asymmetric information (Rasmusen, 2001: 48). In the first move of the game, Nature chooses Alter who, with probability $\pi > 0$ realizes the promised profit if he honors trust (see figure 2). Conversely, $1-\pi$ represents the probability that, although Alter honors trust, something goes wrong and Ego loses her money. In fact, π is drawn from a probability distribution $F(\mu_e,\sigma_e)$ representing Ego's subjective distribution of the probabilities that potential Alters succeed at the market (in terms of the example, this is the stock market). We assume that Alter knows his own probability to succeed. After Alter has been chosen by Nature, Ego's

[5] In Pingle's experiment subjects obtained information about the outcomes of decisions taken by others that they could observe, hence the definition of imitation does not coincide with ours. Nevertheless, we expect to find a similar relation between imitation and lack of familiarity.

[6] Building on Knight's distinction the Ellsberg's paradox shows that individuals have a preference for known probabilities and dislike choices that yield outcomes with ambiguous probabilities (Ellsberg, 1961)

estimate of π equals μ_e, the mean of F. Ego's uncertainty about the goodness of her estimate is reflected by the variance σ_e: the greater σ_e, the more uncertain Ego is. After Nature has drawn Alter, Ego chooses to place or to withhold trust. If Ego withholds trust she receives P_1 and Alter receives P_2. If Ego places trust, Alter has the possibility to honor or to abuse trust. If he abuses trust, he obtains T_2 and Ego obtains S_1. If Alter honors trust, he receives R_2 with probability π and P_2 with probability $1-\pi$, while Ego receives R_1 with probability π and S_1 with probability $1-\pi$. The introduction of a move by Nature after Alter's move accounts for the possibility that the transaction yields negative outcomes for Ego, in spite of Alter's choice of honoring trust. We assume that Ego is not able to deduce from the payoffs whether things went wrong intentionally or unintentionally. In both cases, she receives S_1. We assume that if things go wrong after trust is honored, Alter receives the same payoff that he would obtain if trust was not placed in the first move. The two payoffs Alter receives in these two cases do not need to be equal, but the payoff that Alter obtains when things go wrong after trust is honored, should not be lower than the payoff for no trust. This latter case would change the model in the sense that an incompetent Alter has no incentive to honor trust, because he is not afraid of future sanctions since his expected payoff of no trust is larger than his expected payoff of honoring trust.

Before looking at the relation between uncertainty and information coming from Other Egos we need to examine how uncertainty affects the payoffs of the trust game in figure 2. Game-theoretic models can be interpreted in a *normative* or *descriptive* way (Rapoport, 1992). In this sense our model is purely descriptive, in fact we are not interested in how people *should* make their choices, but we rather want to describe how they decide in real life situations. Empirical evidence shows that individuals do not always act according to the normative prescriptions of game-theoretic models (Roth & Erev, 1995; Erev & Roth, 1998, 1999). Some descriptive models for a normal trust game have been proposed by Snijders (1996). Snijders' models account for actors' concerns about a "fair" decision (social orientation, regret, guilt). These concerns are incorporated in the utility function of the models and assumed to depend on the payoffs of the game. In these models, Ego's decision depends on constructs of the payoffs defined as *risk* and *temptation* that capture these concerns and can be used to derive testable hypotheses. First, Ego's tendency to trust decreases with

$$risk_{\mathrm{s}} = \frac{P_1 - S_1}{R_1 - S_1},$$

where the "s" indicates that this definition applies to the standard trust game. The meaning of this formula is rather intuitive: $R_1 - S_1$ represents the potential gain for Ego if Alter is trustworthy. $P_1 - S_1$ represents the portion of that potential gain which is secured by simply choosing not to trust Alter. If the probability that Alter honors trust is larger than *risk*, the expected utility of placing trust is larger than the expected utility of withholding trust. Second, Ego takes into account her anticipation of the incentive for Alter to abuse trust, which is indicated by

$$temptation_s = \frac{T_2 - R_2}{T_2 - S_1};$$

Also this ratio is rather intuitive: $T_2 - R_2$ represents the gain for Alter deriving from abuse of trust, while $T_2 - S_1$ captures Alter's feeling of guilt expressed by the difference between Alter's gain for abusing trust and the loss inflicted to Ego (we assume $T_2 > S_1$). In the trust game with uncertainty, Ego's expected payoffs when trust is placed and honored are: $\mu_e R_1 + (1 - \mu_e)S_1$ for Ego and $\mu_e R_2 + (1 - \mu_e)P_2$ for Alter. This implies that the generalized expressions for *risk* and *temptation* in the trust game with uncertainty are:

$$risk = \frac{P_1 - S_1}{\mu_e (R_1 - S_1)} \tag{1}$$

$$temptation = \frac{T_2 - P_2 - \mu_e (R_2 - P_2)}{T_2 - S_1} \tag{2}$$

It follows from (1) that risk decreases with μ_e, and Ego will therefore be more reluctant to place trust if μ_e is smaller. It follows from (2) that temptation decreases with μ_e implying that Ego's trustfulness increase in μ_e.

So far, the uncertainty of Ego does not play a role. If Ego would be certain about the probability π, i.e. $\mu_e = \pi$ and $\sigma_e = 0$, the considerations presented above would be the same. Similarly, Ego's uncertainty would not play a role if Ego plays the trust game with uncertainty with Alter without any possibility to learn about the probability that Alter will perform well. Since π is assumed to be drawn from a subjective probability distribution F (with mean μ_e and variance $\sigma_e > 0$) of potential partners, the information that Ego receives about past interactions of Alter affects the subjective distribution F and, consequently, Ego's decision-making process.

The probability that an investments turns out to be successful depends on Alter's capacity/knowledge of the market, and on properties of the market itself. σ_e represents the variance of "relevant capacities" in the population of potential Alters and the predictability of what happens in the market at a given point in time. Therefore, μ_e and σ_e are both functions of

- Ego's knowledge about the investing ability of Alter;
- Ego's knowledge about the investing abilities of the population of potential Alters;
- Ego's knowledge of the properties and predictability of the market; and
- The objective predictability of the market (in the example this represents the earning possibilities in the stock market and contingent behavior of the stock market at the time of the transaction).

We assume that μ_e increases with positive information Ego receives about Alter and the population of Alter's. Moreover, μ_e increases if the opportunities in the market are better. We assume that σ_e decreases with the Ego's knowledge about Alter, the population of Alters, and the market. In addition, σ_e decreases if the market behaves less erratic. As a result of these assumptions, information about behavior of Other Egos, Alter, Other Alters, and information about the market will affect $F(\mu_e,\sigma_e)$. Clearly, Ego learns from information about the behavior of Alter in his own previous interactions with Alter as well as interactions of Other Egos with Alter. In addition, Ego will adapt F if she obtains information about Other Egos trusting Alter without knowing the behavior of Alter. Here, we assume that at least some Other Egos have good reasons to trust Alter implying that the information about such trust is considered to be positive, although it is less ambiguous and will therefore have a smaller effect on F than if information about Alter's behavior is available as well. Information about interactions of Other Egos with Other Alters provides Ego with insight in the population of Alters and in the working of the market. Therefore, information about performance of Other Alters will affect F and again to a lesser extent information about Other Egos trusting Other Alters without knowing the outcome. For all types of information described above, we hypothesize that μ_e will increase (decrease) with positive (negative) information. In addition, we assume that the change in μ_e is larger for a given piece of information if the uncertainty related to this piece of information is larger.[7] For example, if Ego is very uncertain about the capabilities of Alter, information about Alter will affect her estimation of the probability that a transaction will succeed more, than if Ego exactly knows the capabilities of Alter and is uncertain only about the fluctuations in the market. This implies that the effect of a given piece of information is larger if the uncertainty related to that piece of information is larger

This leads to following set of testable hypotheses about the effects of learning, imitation, uncertainty and control. We have three hypotheses about learning from incoming information and one for imitation: Hypothesis 1 refers to dyadic learning, while hypothesis 2 is related to network learning about trustworthiness of Alter and Other Alters.

Hypothesis 1a (dyadic learning): The more positive (negative) experience Ego has had with Alter or Other Alters herself, the more (less) trustful Ego is.

Hypothesis 1b (dyadic learning): The more positive (negative) information Ego has about the capabilities of Alter, the more (less) trustful Ego is.

[7] We do not only find this assumption intuitively appealing. Formally, it can be proven that for a Beta-distribution and assuming Bayes' updating, the difference in the mean of the prior and the posterior distribution is larger if the variance of the prior distribution is larger.

Hypothesis 2 (network learning): The more information Ego has received from Other Egos that Alter or Other Alters were (un)trustworthy in past transactions with Other Egos, the more (less) trustful Ego is.

Hypothesis 3 (imitation): The more Ego knows that Other Egos trusted Alter or Other Alters, the more trustful Ego is.

Other studies have included variables for dyadic embeddedness (Buskens, 2002; Gautschi, 2000). These variables represented the history of the relation between the two focal actors and the effects of these variables were as expected. However, in our experiment we do not want to consider the case in which Ego and Alter have a common past. We expect that, consistent with the earlier findings, Ego's own common past with Alter has such a strong effect that it obscures the network effects that are the focus of this paper. For example, if Ego has already made stock market investments with Alter, she does hardly need to learn from the network or to imitate Other Egos, for she can decide primarily on her own experience. Therefore, we will not test hypothesis 1a in this paper. In an experiment as the one described below, one always has to restrict the number of variables that are varied. In addition to the decision to focus mainly on network effects, we decided to focus on effects of *positive* information, and consequently we will also neither test the hypotheses on dyadic learning about Other Alters nor the hypotheses related to Ego receiving negative information about Alter or Other Alters. [8]

Since network learning refers to more complete information from transactions of Alter than imitation, we expect learning effects to be larger than imitation effects both when information regards Alter and Other Alters.

Hypothesis 4 (learning versus imitation): The effect of learning about trustworthiness of Alter (Other Alters) is stronger than the effect of imitation of trustfulness towards Alter (Other Alters) for information about similar transactions.

As explained in the theory, we expect the effects of information to be more important if uncertainty is larger, e.g., if Ego has less knowledge about the market. More specifically, we expect information about Alter to be more important if uncertainty about Alter's capabilities is larger.

Hypothesis 5: The effects of information about Alter's trustworthiness and Other Egos' trustfulness toward Alter are larger if the uncertainty about the capabilities of Alter is larger.

Hypothesis 6: All effects of network learning and imitation are larger if Ego has less knowledge about the market.

[8] Note that according to our theory, imitation will have profound effects if Other Alters often turn out to be untrustworthy while Egos base their decisions only on information about Other Egos behavior.

In addition to the learning effects, we will test some control effects. For the specific theory and a similar experiment about these effects we refer to Buskens & Weesie (2000a, 2000b). The existence of a common future creates sanction possibilities for Ego after an abuse of trust. Moreover, the faster Ego can inform third parties about an abuse of trust of Alter, the larger Alter's loss after an abuse of trust, and thus the less likely it is that Alter will abuse trust.

Hypothesis 7 (dyadic control): The more transactions Ego and Alter expect to have in the future, the more trustful Ego is.

Hypothesis 8 (network control): The more Ego is able to inform Other Egos and the denser the network among Egos, the more trustful Ego is.

3. Method

In social dilemmas with uncertainty about the size of the risk, actors search for information that might reduce this uncertainty. Assuming that imitative learning affects trust problems, such a mechanism is not easily observable in real life, because it relies on mental processes that are intrinsically difficult to observe. Although some empirical evidence of *mimic trust* from "real life" data is available (Wittek, 2000), experimental data are particularly suitable, for they can reproduce simple situations in which actors are required to make choices given very little—but very well specified—information about a dilemma. Precisely for this reason, we realized a vignette experiment in which we vary the kinds of information that distinguish imitation from other types of learning. Vignettes are simple descriptions that sketch hypothetical situations reproducing real-life problems. Respondents are normally selected voluntarily and asked to imagine how they would solve the dilemma that is depicted in the vignette. Rossi and his colleagues introduced vignette experiments in sociology in the 70s (for an overview of their research see Rossi and Nock, 1982). Recently, vignettes experiments have been applied to study economic transactions (Buskens and Weesie, 2000b; Rooks et al., 2000). We opted for a design similar to that applied by Buskens and Weesie. In their experiments they presented pairs of vignettes with different characteristics to respondents and asked them to give a simple preference for one vignette out of each pair. This method is called paired comparison. Assuming that subjects find it easier to express a preference for a vignette out of a pair rather than rate several vignettes according to their preferences, we expect choices with paired comparison to be easier for the subject and to provide more realistic results, especially when differences between options are rather subtle.[9]

[9] Comparing two vignettes only requires a decision about which one is better, while rating also requires positioning them on some absolute scale and making a decision about the difference between the two vignettes on this scale.

3.1 The scenario

Normally, a vignette experiment begins with a scenario that provides the "frame" for the actor's decision. Subsequently, the actor has to evaluate a series of vignettes in which crucial information is varied. The scenario must reproduce a trust situation in which actors choose under uncertainty, and the independent variables of the vignettes should include information giving room to learning and imitative behavior. In our scenario, Ego is a student and network embeddedness is provided by the year group that attends the university with Ego. The experimental network is imaginary, but it refers to an existing group to which Ego belongs, which provides him with a realistic and effective network of informants. It should be relatively easy for subjects to imagine themselves in the hypothetical situation because the subjects are students of a Dutch university and members of a year group.

In our experiment, it is hypothesized that Ego needs some money to set up an e-business and it is important that he realizes this investment quickly not to lose the opportunity. Alter is a schoolmate of Ego who is stockbroker. There is a possibility for Ego to let Alter invest her savings on the stock market in exchange for 10% of the potential profits. The trust problem arises from asymmetry in the information available to Ego and Alter: Alter knows the probability that he can realize the profit, and he has an incentive to claim that the investment failed and walk away with the money, given that he does not share potential losses. Some details are emphasized in the instructions to make the story more concrete: Ego wants to conclude the business as quick as possible, she needs €5000 as initial capital and she only has €3000; a loan from the parents or from a bank is not an available option. We decided to use the example of the stock market in our experiment for two reasons. First, the stock market accounts in a credible way for the possibility that the transaction yields a negative outcome for Ego, even if Alter has the will to perform well. Second, the scenario was particularly realistic for the students who participated in the experiment because they were studying IT management and economics and, according to their professor, they were expected to have a certain familiarity with the type of problems described in our experiment.

Vignettes are presented to the subjects in pairs and vary with respect to key characteristics of embeddedness and uncertainty. In order to make the comparison easier, the vignettes are presented as referring to two different Alters with different characteristics.[10] Subjects are instructed that two schoolmates in their year group are known as expert stroke brokers (Jansen and De Vries).[11] This expedient only serves the purpose of facilitating the imaginary choice to the subjects associating the

[10] This setting does not allow for an "exit" option. We are only interested in which Alter the subjects choose after the decision is made to do the deal with at least one of the two partners. We do not know whether the subjects find any of the two subjects a reasonable option for such a transaction at all.

[11] Jansen and De Vries are two of the most common Dutch surnames, we expect no preference for one or the other name.

characteristics to two different persons.[12] Figure 3 presents an example of a pair of vignettes among which actors had to choose.

FIGURE 3 ABOUT HERE

3.2 Independent variables

Independent variables are the characteristics that are listed at the vignettes. We assume that the subjects choose according to the utility they associate with each vignette. The characteristics that are varied in the vignettes should refer to those aspects of a trust problem that are indeed relevant for an actor's decision in similar situations. Six characteristics are varied: three for network embeddedness, (information available to Ego, Outdegree, and Density), one for dyadic embeddedness (Future), one for uncertainty (Partner Uncertainty) and one for the city where Alter studied finance (City). Table 1 shows the specific formulations of all vignette variables.

TABLE 1 ABOUT HERE

Partner Uncertainty represents uncertainty about Alter's capability to honor trust. Assuming that education in finance increases one's competence about the stock market, this variable is operationalized as previous formal education in finance, with two categories: previous education in finance versus no information about previous education. Alter's temptation to abuse trust decreases if his competence increases. In addition, Ego will perceive higher uncertainty about Alter if she has no information about Alter's competence, and lower uncertainty if Ego knows that Alter has previous education in finance. Partner Uncertainty takes the value 1 when no information is provided about previous education of Alter, and 0 when Alter had formal education in finance. The category 0 is split into two sub-categories that vary with respect to the city where Alter got his degree. This supplementary variation refers indeed to a different variable, City that will be discussed next. We decided to incorporate the variable City into Partner Uncertainty in order to reduce the total number of descriptions of characteristics at the vignette.

City varies with respect to the city where Alter obtained his degree in finance. One objection against an experimental set-up as the one we propose here is that variation produces some significant effects on the dependent variable, because subject react in some way consistently to the variations the experimenters come up with. In order to challenge this criticism, we decided to include in our design an "irrelevant" variable to test whether this variable produces any effect in the choices of the subjects.

[12] Some of the characteristics (such as some formulations of the variables concerning the type of information available to Ego, for example) do not refer specifically to a person, but more generally to a situation, nonetheless we have no reason to expect subjects to evaluate this information incorrectly.

We opted for the city where the partner attended high school, because this seemed a feasible variable, from which we do not expect any effect. The two towns (Zwolle and Den Bosch) are two middle-size relatively anonymous Dutch towns, hence we do not expect any preference for one or the other.

Future indicates whether Ego and Alter have a common future. It takes value 0 if Alter is going to leave the university soon after his transaction with Ego is finished and 1 if Alter is not going to leave. Future is a variable of dyadic embeddedness, which induces control effects (Buskens 2002). The "shadow of the future" (Axelrod, 1984) provides Ego with opportunities to sanction Alter in case trust is abused. Even if it is less plausible that Alter and Ego have more similar transactions in the future, some other form of control, for example, through social sanctions are plausible in the given context.

Density indicates the closure of the common network. For Density = 1, Alter and the other members of the year group meet regularly out of the university while for Density = 0 they meet seldom. Density induces both control and learning effects, because information spreads quicker in a denser network allowing actors to learn about each other and also to sanction defections.

Other Egos provide Ego with information about Alter's competence or about the population of potential Alters. Actors that can provide this information to Ego are Other Egos who have had similar trust problems with Alter or with Other Alters. This information allows Ego to learn or imitate. The related variable has five categories according to different types of information provided (table 1). The categories will be transformed into four dummy variables in the analysis, with "no information" as reference category. Category 4 provides Ego with information about trustworthiness of Alter (Trustworthiness of Alter): Ego knows that Other Egos made the same type of investment with Alter successfully. In this case, information is specifically about the behavior of Ego's partner. The formulation is very similar to the one utilized in previous experiments (Buskens & Weesie, 2000b). Category 3 regards Alter, but information is less specific. Category 3 provides Ego with information about trustfulness of Other Egos versus Alter (Other Egos Trustfulness vs. Alter): Ego knows Other Egos made the same type of investment with Alter but she does not know whether the investment was successful or not. The information provided here informs Ego about the extent to which Other Egos placed trust in Alter for similar trust problems. A decision based on this type of information leads Ego to imitate Other Egos. In category 2 and 1 information regards the same type of trust problem, but involving a different partner. Category 2 provides Ego with information of trustworthiness of Other Alters (Trustworthiness of Other Alters): Ego knows that Other Egos made the same deal with somebody else than Alter and the investment paid back. The partner is different, but the trust problem is exactly the same. Ego can learn from this type of information, how often this type of transaction was successful in general. Category 1 provides Ego with information about trustfulness of Other Egos versus Other Alters (Other Egos Trustfulness vs. Other Alters):

Ego knows that Other Egos made the same type of investments with other partners, but she does not know whether these investments turned successful. In other words, Ego is informed about the extent to which other people do this type of investments through a partner. As for category 3, the effect of this type of information on Ego's decision is an effect of imitation. Category 0 refers to the situation in which Ego has no information available from the network about this trust problem with the same or a different partner. Summarizing, the information available to Ego presented in the fourth description at the vignette varies along two dimensions: first, Ego receives information about transactions involving the same partner or different partners; second, information includes or does not include the outcomes of these transactions.

Outdegree refers to common acquaintances in the network. It takes value 1 if Ego has some friends in common with Alter and value 0 if Ego has no friend in common with Alter. As for Future, Outdegree mainly induces control effects, in fact Ego has the opportunity to sanction Alter damaging his reputation with the friends.

3.3 Subject Characteristics

Although evidence of how characteristics of actors correlate with trust is quite wide in the literature (see Snijders, 1996 for a review), payoffs are more important than individual characteristics in isolated trust problems. Because we apply paired comparison, subject characteristics do not vary within these choices, and there is no reason to expect that subjects prefer "De Vries" to "Jansen or the other way round. Therefore, subject characteristic can only matter in the sense that some subjects find it more important to know that Alter performed well in the past with Other Egos, while other subjects find it more important that Alter does not leave the country soon after the transaction is finished. This implies that subject characteristic can have only effects in interactions with the independent variables at the vignettes. The only subject characteristic for which we have derived such hypotheses in the theory section is *stock market knowledge*. Nevertheless, to exclude other possible differences between subjects, we included a small questionnaire at the end of the experiment to check that choices indeed do not depend on these individual characteristics.

If Ego has some knowledge about the stock market, he can reasonably estimate the risk connected with the described investment, and uncertainty will then be related mainly to Alter's capability to be successful at the stock market. In order to estimate Ego's knowledge, subjects were asked how familiar they are with the stock market and whether they were able to operate on the stock market themselves. Answers were given on a four-point scale (0 = not familiar at all; 1 = some basic knowledge, but not familiar; 2 = some information but do not know how to operate; 3 = familiar enough to invest on the stock market). Other questions about economic knowledge regarded frequency of reading economic newspapers and economic pages and educational background in economics

(Y/N). As economic knowledge is crucial for the choice and for our hypotheses, it seemed preferable to have also some more “objective” measures for this knowledge. For this reason, subjects were asked to estimate the value of AEX, Dow Jones and the exchange rate of US Dollar/Dutch Guilder of the day before the experiment and the highest value of the last 12 months for all three indexes. In addition, we asked them how sure they were about each of these estimates). Subjects were also asked to rank by “risk”: shares, options, bonds, and stock options. Although subjects were not very knowledgeable about most of the issues mentioned above, all issues contained some information about their knowledge. We tried to construct an index for stock market knowledge using different combinations of these variables, and eventually we opted for the solution that seemed to summarize this information most accurately: we ran a principle component analysis using: self-assessment of familiarity with the stock market, self-confidence with the answers about estimates of indices such as AEX and Dow Jones, actual errors in these estimates, and correctness of the answers to the rank of investments by risk. The standardized score of the first principal component obtained with this analysis was used as an index of stock market knowledge (Knowledge).[13]

Now, we describe the other subject characteristics in the questionnaire. *Personal characteristics* we asked are age, sex, and size of the place of residence. *Birthplace* and *place of residence* are included because the preference for the city in which Alter studied finance might be affected by Ego’s birthplace or place of residence. *Religious affiliation* was included for the same reason, because the high school in Zwolle is confessional. Subjects were also asked how realistic they perceived the choice they had to made, and how difficult it was for them to imagine the situation described on a five points scale (0 = absolutely unrealistic/difficult; 1 = pretty unrealistic; 2 = possible but unlikely; 3 = realistic; 4 = absolutely realistic) to check whether subjects who had more difficulty to position themselves in the choice situations made different choices than subjects who did not have this difficulty. Related to this, we build in some controls to compare the scenario with the actual situation of the subjects. *Availability of resources* was measured by asking for the subject’s possibility to lend money (and from whom) and availability of money required for the investment. *Network parameters* for the year groups of the subjects were measures with five questions including the *degree* of the subject, (how many friends are there in your year group with whom you speak about personal problems; your year group consists of how many persons?) and the *density* of the real network (how often did your year group fellows meet out of the university in the last 3 months; how often did you join in these meetings?). Finally, *risk aversion* is measured to test whether risk averse subjects find some aspects of embeddedness more important than others, because risk aversion can affect cooperative behavior in social dilemmas (cf. Snijders & Raub, 1998). Moreover, our scenario implies a certain hazard that

[13] In order to have all cases included in our analysis, missing values of the factor score were imputed with the best possible prediction from the data available for the variables that were used to construct the factor score using the command `impute` in Stata.

might vary with individual risk aversion. Risk preference was assessed using lotteries and probabilities equivalence questions (Donkers et al., 2001) based on Prospect Theory (Kahneman & Tversky, 1979).[14] The hypotheses to be tested with the variables included in the experiment are summarized in table 2.

TABLE 2 ABOUT HERE

3.4 Experimental design

The first strategic choice in the design of the experiment regards the number of pairs that has to be presented to each respondent. In order to avoid boredom and loss of concentration, we decided to limit the number of pairs for each subject to ten. Given that vignettes consist of three variables with two categories each, one with three categories, and one variable with five categories, there are $3 \times 2 \times 2 \times 2 \times 5 = 120$ different vignettes, and hence $(120 \times 119) / 2 = 7140$ different pairs (variables may be constant within pairs). This is the universe of possible pairs from which we chose a sample. We excluded a number of pairs from the set of possible pairs, because for these we considered the choice to be too obvious. For example, a comparison between two vignette with Future = 1 and Future = 0, ceteris paribus, is absolutely uninteresting as everybody would prefer a partner with whom she has a common future (Future = 1). We reduced the number of feasible pairs to unordered pairs in the sense of Pareto ordering, excluding pairs for which one vignettes has only advantages and no disadvantages compared to the other vignette.[15] As a consequence of this restriction accepted pairs of vignettes vary in at least two independent variables. The variable related to information available to Ego has 5 categories, which implies 10 combinations of two different values. Each combination occurs exactly once within the set of vignettes for each subject. We excluded pairs of vignettes that did not vary for this variable. Pairs in which City is constant were also excluded.[16] These restrictions dropped the number of possible pairs to 1700. Variables that are constant within each pair were displayed anyway in order to enable testing hypotheses on interaction effects with these variables. Each vignette was assigned randomly to the left or right side of the pair. The order of variables on each vignette was always the same. Subjects were asked first to choose which vignette with a pair they preferred. After this choice, the subjects were asked to state how strong their preference was on a four point scale: 1 = very weak; 2 = weak; 3 = strong; 4 = very strong.[17]

[14] This set of questions is probably not sufficient to assess the preference structure of an actor, but it provides an indicator that we used as a control variable for risk aversion

[15] A vignette can be represented by a vector $\boldsymbol{x} = (x_1, x_2, x_3, x_4, x_5, x_6)$ where x_i represents the i^{th} variable of the vignette. A Pareto ordering can be defined for a pair $(\boldsymbol{x}, \boldsymbol{y})$ of vignettes such that $\boldsymbol{x} \geq \boldsymbol{y}$ if and only if $x_i \geq y_i$ for all $i = 1, \ldots, 6$.

[16] City is incorporated with Partner Uncertainty that has 3 categories, this restriction excludes 2 of the 6 possible combinations.

[17] This answer was used to transform preference into a scale, which was subsequently used as dependent variable to estimate subjects' choice with an ordinary regression model. However these results are not presented in section 4 because they were not substantially different from the results that will be presented.

4. Analysis

For the statistical analysis of paired comparison we apply a random utility model (McFadden, 1973). This model assumes that subjects attach a certain utility (u) to each vignette, depending in a linear manner on its attributes (z) plus a random component (ε). This random component is included to account for the residual part of the utility that does not depend linearly on the attributes of the vignettes.

$$u(z) = z'\beta + \varepsilon.$$

Subjects' are assumed choose the vignette with the highest utility and this choice depends on the differences between attributes of each pair of vignettes. The probability that one vignette is chosen can be estimated applying a probit model in which the differences between the values of the variables of the two vignettes are used as independent variables. The coefficients β measure the effect of one unit difference in each of these variables on the attractiveness of the vignette. Since independent variables are treated as qualitative attributes of the vignettes, the coefficients can be compared but their size is not straightforward interpretable. Variables that are constant within pairs of vignettes, such as subject characteristics, are used only in interaction terms, because main effects are not identified. Interaction terms are computed as difference of products and not as products of differences. The model does not include a constant, because a constant would imply an a priori preference for the left or the right vignette. Standard errors are modified for clustering using robust (Huber) estimator for clustered data (Rogers, 1993), because observations are not independent, since each subject had to make ten choices. See Buskens and Weesie (2000b) for a slightly extended explanation of this analysis strategy in a similar experiment.

4.1 Main effects

Table 3 shows two probit models on the choice of the vignettes. Model 1 only includes the main effects, model 2 also all the interaction terms. As discussed above, the statistical method implied for the analysis of paired comparison allows interpreting the coefficients straightforwardly as the effects of the independent variables on the attractiveness of a vignette. Hence a positive coefficient implies that an increase in the related independent variable determines an increase in the attractiveness of the vignette.

TABLE 3 ABOUT HERE

In model 1 most hypotheses on the main effects are supported. Attractiveness of a vignette decreases with Partner Uncertainty, because uncertainty about the partner has a negative effect on the probability that trust is placed. All formulations of information available to Ego have a positive significant coefficient, except for Other Egos Trustfulness vs. Alter. The coefficient of Other Egos Trustfulness vs. Alter has the expected positive sign, but it is not significant. Also the hypotheses about the difference between the coefficients is supported, i.e., the effects of information only about trustfulness of Other Egos are smaller than the corresponding effects of trustworthiness of Alter or Other Alters. As expected, Future has a positive significant effect on the attractiveness of a vignette, which is an effect of control via dyadic embeddedness. Density has a positive effect, but it is weakly significant in model 1 and it becomes non-significant in model 2. A possible explanation of this weak effect might be that the definition of Density = 1 in our scenario lacks an explicit connection to Ego. This is in contrast with Outdegree, which is a means of control via network embeddedness and it provides one of the strongest positive effects. Thus, we find evidence for learning, imitation, and control effects through social networks.

5.2 Interaction effects with subject characteristics

The first two interaction effects regard information and uncertainty about the partner's capabilities. The interaction of Partner Uncertainty and Trustworthiness of Alter shows the expected sign, but the effect is very weak. Apparently, the value Ego attributes to this information does not depend on how uncertain she was about Alter's competence. The interaction of Partner Uncertainty and Other Egos Trustfulness vs. Alter is not significant. However, we tested the contrast between no information and having information from Other Ego trustfulness vs. Alter in combination with high uncertainty, and this is significant (p = .04). The test shows that the sum of these two effects is different from zero. This result supports our hypothesis implying that Ego values information of Other Egos Trustfulness vs. Alter, if he is uncertain about Alter's competence, but he does not value this information if he knows (to some extent) that Alter is competent. The fact that Other Egos trust Alter is only important for Ego if she does not know how competent Alter is.

The other four interaction terms refer to interaction between knowledge about the stock market and the information available from Other Egos. Although all these interactions are in the expected direction none of them is even close to significance. There are at least two explanations for this outcome. First, our design is not particular suited to test effects of subject characteristics, because we only have 69 subjects. Thus, in this sense we have only 69 cases to test effects about interactions with subject characteristics. Second, the data show that most subjects had very limited knowledge about the stock market. Hardly any of them was able to give an accurate estimate of the Dutch AEX index, and only a couple had an idea about the order of size of this index. If we want to investigate these interactions further we should try to recruit subjects from a pool with more variance on the knowledge about the stock market.

We tested also a range of interactions of other subject characteristics, just to be sure that there were no clear indications against our statistical assumption that the weights subjects assign to the different variables are the same among subjects. It turned out that we could not significantly improve on our model 1 by adding interactions with subject characteristics such as sex, age, birthplace, risk aversion etc. We did also find no differences between subjects that found the vignettes more or less realistic, or between subjects for whom the described scenario was closer or less close to their own actual situation.

5. Conclusions

In this paper we provided a theoretical explanation for possible effects of imitation in trust problems. The trust problem was formalized using a trust game with uncertainty. Imitative behavior was incorporated in existing theories about the effects of social networks on trust as a particular form of learning by means of information accessible to Ego through the network. We described four different types of information in order to distinguish learning effects from imitation effects. This distinction is based on the information available to Ego about transaction among third parties in the past. On the one hand, if Ego can be informed that Other Egos trusted Ego's partner (Alter) or other partners (Other Alters) and their trust was honored, Ego can learn from this information. On the other hand, if Ego is only informed about Other Egos trusting Alter (or Other Alters) *without* knowing whether their trust was honored, then Ego can imitate Other Egos. The importance of these types of information depends on Ego's uncertainty related to her trust problem with Alter. For example, she might be uncertainty about the capabilities of Alter and she might lack knowledge about the market in which her transaction with Alter takes place. We hypothesized that if Ego is more uncertain about her partner, she will value information about capabilities more, while if she is more uncertain about the market, she will value any information about similar transactions more. We tested these hypotheses by means of a vignette experiment in which subjects had to choose between pairs of vignettes. The results confirmed that actors learn and imitate if they face trust problems with uncertainty. However, we did not find support for the variations in importance of learning and control under more and less uncertainty. We only found a slight tendency that imitation of trustful behavior is more important when uncertainty about the competence of the partner is larger. Conversely, if Ego has (positive) information about Alter's competence he does not imitate, but rather relies on the partner's competence.

Although some hypotheses were not supported by the data we still believe that the core of the theory proved quite effective in deriving meaningful hypotheses about individual behavior in trust problems. This paper only represents a first attempt to account for imitation from a rational choice perspective. The inclusion of imitative behavior in a rational choice model undoubtedly constitutes a major task for future research. Nevertheless, alternative empirical research is necessary for a more extensive test of the theory. In this respect, one promising direction for further research points at abstract experiments using artificial networks. Networks could be created in which actors play trust game and exchange information at the same time. Then, information is not so much predetermined by the experimenter, but is created within the experiment. These types of experiment could succeed in providing the possibility to observe actual imitation at work. In such context, information will not only be positive, but at times also negative. Therefore, this context can be used to study pervasive effects of imitation. We would expect that if networks are dense and the flow of information is fast, small mistakes could have large consequences. Such mistakes are much more likely if uncertainty is high and the content of the information is limited, i.e., if imitation is the best option available for the actor.

Another improvement that could be included in such experiments is that uncertainty is more systematically varied among subjects rather than looking at the knowledge of the subjects in a specific market. Moreover, one could think of other conditions in which imitation could be facilitated. E.g., if information is costly, subjects might be willing to buy information about the behavior of others in similar roles, but might find it too expensive to buy the information about such transactions as well, leaving them with information that allows for imitation only. Finally, experimental tests are typically strong tests of formal social theories, however, they often lack possibilities for statements about external validity. Therefore, it is important to investigate which real-life situations would be suitable to test our theory about imitation in trust situations with survey data.

Figure 1. Trust Game ($R_1 > P_1 > S_1$; $T_2 > R_2 > P_2$)

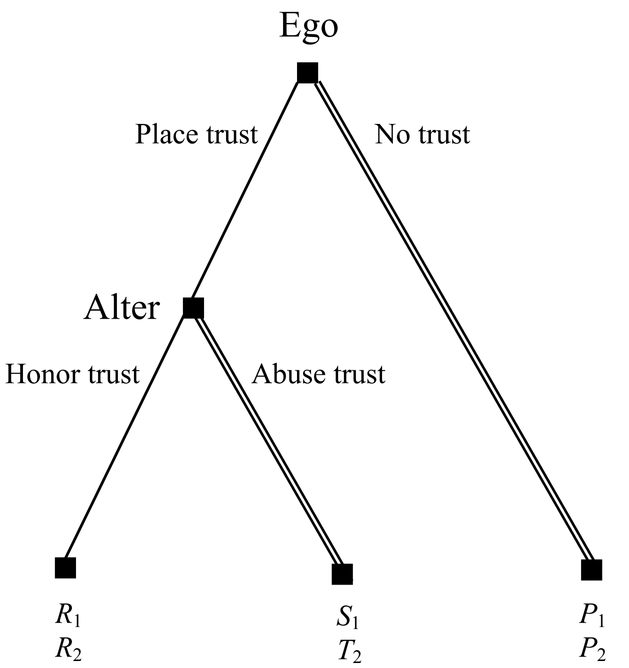

Figure 2. Trust Game with Uncertainty ($R_1 > P_1 > S_1$; $T_2 > R_2 > P_2$)

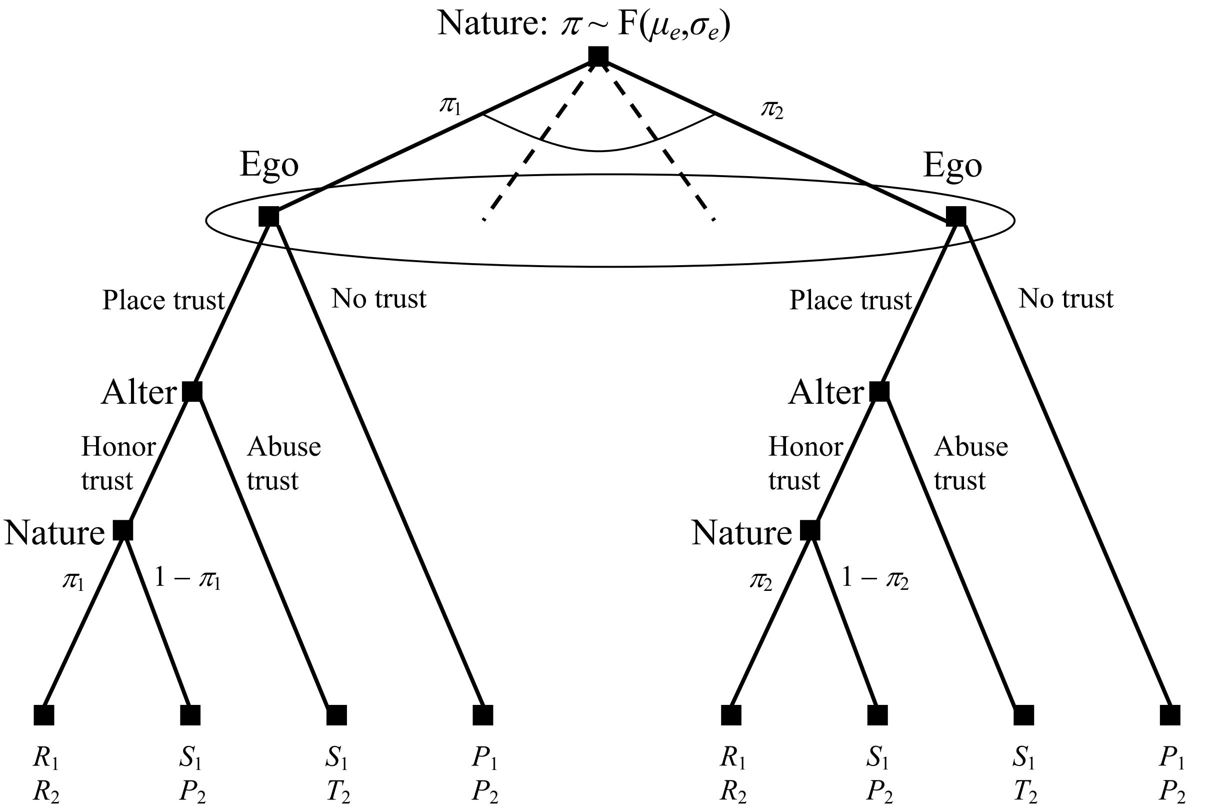

Figure 3. A Pair of Vignettes.

Jansen	De Vries
• You do not know the educational background of Jansen • Jansen will move to a foreign insitute to finish his studies soon after the results of your investment. • Jansen and his friends from the year group meet regularly out of the University. • You know that other students in your year group did similar investment with somedy else than Jansen and they had good results. • You have some friends in common with Jansen	• De Vries studied finance in Zwolle at college level. • De Vries will continue his studies at this university • De Vries and his friends from the year group meet rarely out of the University. • As far as you know, no other students in your year group ever did similar investment with De Vries or with anybody else. • You have some friends in common with De Vries

Which student would you let invest your money on the stock market?

☐ Jansen ☐ De Vries

Table 1. Description of the Variables in the Vignette Experiment

Variable	Value	Text
Partner Uncertainty	0	Jansen (De Vries) studied finance in Zwolle (or Den Bosch) at college level.
	1	You do not know the educational background of Jansen (De Vries)
City	0	Jansen (De Vries) studied finance in Zwolle at college level.
	1	Jansen (De Vries) studied finance in Den Bosch at college level.
Future	0	Jansen (De Vries) will move to a foreign institute to finish his studies soon after the results of your investment.
	1	Jansen (De Vries) will continue his studies at this university.
Density	0	Jansen (De Vries) and his friends from the year group meet rarely out of the University
	1	Jansen (De Vries) and his friends from the year group meet regularly out of the University
No information	0	As far as you know, no other students in your year group ever did similar investment with Jansen (De Vries) or with anybody else.
Other Egos Trustfulness vs. Other Alters	1	You know that other students in your year group did similar investment with somebody else than Jansen (De Vries) but you do not know the outcome.
Trustworthiness of Other Alters	2	You know that other students in your year group did similar investment with somebody else than Jansen (De Vries) and they had good results.
Other Egos Trustfulness vs. Alter	3	You know that other students in your year group did similar investment with Jansen (De Vries) but you do not know the outcome.
Trustworthiness of Alter	4	You know that other students in your year group did similar investment with Jansen (De Vries) and they had good results.
Outdegree	0	You do not have any friends in common with Jansen (De Vries).
	1	You have some friends in common with Jansen (De Vries).

Table 2. Hypotheses on Attractiveness of a Vignette

Hyp.	Independent variable	Expected sign of the coefficient
1b	Partner Uncertainty	–
2	Trustworthiness of Alter	+
2	Trustworthiness of Other Alters	+
3	Other Egos Trustfulness vs. Alter	+
3	Other Egos Trustfulness vs. Other Alters	+
4	Trustworthiness of Alter > Other Egos Trustfulness vs. Alter	
4	Trustworthiness of Other Alters > Other Egos Trustfulness vs. Other Alters	
5	Partner Uncertainty x Trustworthiness of Alter	+
5	Partner Uncertainty x Other Egos Trustfulness vs. Alter	+
6	Knowledge x Trustworthiness of Alter	–
6	Knowledge x Trustworthiness of Other Alters	–
6	Knowledge x Other Egos Trustfulness vs. Alter	–
6	Knowledge x Other Egos Trustfulness vs. Other Alters	–
7	Future	+
8	Outdegree	+
8	Density	+
.	City	0

Table 3. Probit Models of the Choice of Vignettes (69 subjects, 690 observations)

Independent variable	Hyp.	Model 1 Coeff.	Model 1 St. err.	Model 2 Coeff.	Model 2 St. err.
Partner Uncertainty	–	-.45**	.107	-.52**	.120
Trustworthiness of Alter	+	1.54**	.167	1.48**	.189
Trustworthiness of Other Alters	+	.91**	.116	.93**	.117
Other Egos Trustfulness vs. Alter	+	.16	.110	.06	.147
Other Egos Trustfulness vs. Other Alters	+	.39**	.094	.40**	.095
Future	+	.50**	.088	.50**	.088
Outdegree	+	.59**	.093	.59**	.092
Density	+	.18*	.077	.18	.077
City	0	-.04	.096	-.03	.092
Interaction effects					
Partner Uncertainty x Trustworthiness of Alter	+			.14	.243
Partner Uncertainty x Other Egos Trustfulness vs. Alter	+			.26	.213
Knowledge x Trustworthiness of Alter	–			-.08	.078
Knowledge x Trustworthiness of Other Alters	–			-.05	.061
Knowledge x Other Egos Trustfulness vs. Alter	–			-.04	.048
Knowledge x Other Egos Trustfulness vs. Other Alters	–			-.03	.049
Tests of hypothesis 4		χ^2	*p*-value		
Trustworthiness of Alter > Other Egos Trustfulness vs. Alter		55.44	.00		
Trustworthiness of Other Alters > Other Egos Trustfulness vs. Other Alters		24.19	.00		

**$p < 0.01$ and *$p < 0.05$ indicate two-sided significance based on Huber standard errors modified for clustering

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