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Affective relationships: role, dynamics, and modeling

Frans van Winden

Professor emeritus
Amsterdam School of Economics
University of Amsterdam

Abstract

Affective relationships, like friendships, are neglected in standard economic theory, but play an important role in reality. This entry is about the state of the art regarding their role, dynamics and modeling. Although other-regarding payoff preferences have recently received substantial attention and support in behavioral and experimental economics, this is less so regarding affective relationships. Most prominent in that respect are kindness-reciprocity models, where intended (un)kind behavior is assumed to intrinsically motivate reciprocal behavior. However, by focusing on (higher-order cognitive) beliefs of forward-looking agents and static equilibria, they do not cover some important features of affective relationships, like their dynamics based on emotional interaction experiences and their persistence and spread. These characteristics are covered, though, by a very different approach: the affective tie mechanism model, which relies on backward-looking emotional appraisals of interaction experiences. The model's nature, empirical support, and some implications are discussed.

Keywords: relationships, social ties, endogenous social preferences, affective tie mechanism, behavioral model

Introduction

A hallmark of standard economic theory is the use of methodological individualism as the approach, with a rational and selfish *Homo economicus* as the key agent, who is endowed with stable preferences. This entry goes into its neglect of affective relationships, like friendships and enmities. Classical writers already pointed at the importance of such relationships, and by now substantial empirical evidence to that effect exists.[1] According to the relevant literature, affective relationships are dynamic (they develop and can reverse in valence), are based on emotional interaction experiences, generalize across time (persistence) and individuals (spread), and provide (like a social preference) an intrinsic motivation to care about the relationship partner. Role, dynamics and modeling of affective relationships are discussed.

Studies in behavioral and experimental economics provide strong evidence that people can be intrinsically motivated to care about the welfare or utility of other people.[2] Most relevant for our topic and focus on modeling are kindness-reciprocity models, comprising: (i) an assumed fairness norm; (ii) beliefs of various orders whether, compared to this norm, intended behavior is better (kind) or worse (unkind); and (iii) an assumed intrinsic motivation to reciprocate (un)kindness with (un)kindness.[3] More specifically, an individual's utility is extended by attaching a belief-dependent weight to the utility of a counterpart (which makes it a psychological game[4]). As the focus of these models is on (higher-order cognitive) beliefs of forward-looking agents and the derivation of static (time-independent) equilibria for a specific interaction context, they do not quite cover the aforementioned characteristics associated with affective relationships. Moreover, by relying on an internalized norm for intrinsic motivation, in fact, these models would seem to presuppose already affective relationships. The reason is that internalization as such requires an emotional bond, namely with the educator instilling the norm (e.g., a parent, teacher or peer). A positive emotional bond generates the negative feeling of guilt or shame anticipated from violating the norm – as it implies letting an emotionally valued educator down – which functions as internal disincentive.[5]

A very different approach regarding the emotional process determining the weight attached to the utility of another agent underlies the *Affective Tie Mechanism* (ATM) model, which involves the evolutionary old automatic emotion circuitry of the brain rather than the more recently developed deliberation and planning circuitry that kindness-reciprocity models are particularly concerned with.[6] It focuses on backward-looking emotional appraisals of interaction experiences rather than forward-looking beliefs, and captures the different characteristics of affective relationships mentioned above. This model and its empirical support are discussed next, followed by some implications.

Affective Tie Mechanism

The ATM model consists of three modules. The <u>first module</u> concerns an agent-type (friend or foe) appraisal based on the experienced action of an interaction partner. A deviation of this action from a reference point - called an *Impulse* - triggers an emotion.[7] The (positive or negative) valence and arousal (intensity) of this emotion provides an appraisal of the agent's type, represented by the value of a parameter α. If a type assessment (prior) already exists, the updated (posterior) α is represented by a weighted combination of the existing α and the Impulse, which enables persistence of the Impulse.[8] The <u>second module</u> is crucial for bonding and an intrinsic motivation for caring. It assumes that the type appraisal generates a weight (equal to α) attached to the utility of the relevant agent, called the *tie-value*. By implication, an endogenous (social) preference is generated, dependent on interaction experiences.[9] Formally, this leads to an extended utility function, with another agent's tie-value weighted utility added. Note that if $\alpha = 1$ the joint welfare is taken into account in decision-making. As mental resources are limited, attention to interaction experiences may vary. Therefore, in the model an *attentional weight* is attached to a context (reflecting its memory association strength). The third module assumes that through generalization tie-values may spread. Generated in a specific context they will impact an agent's attitude towards a novel agent in the same context (a generalized other), through a *generalized tie-value* (GTV) attached to that agent's utility. In case of interaction experiences with multiple agents, this GTV is related to the average of the relevant tie-values. For a novel context, the GTV is determined by the (attention weighted) similarity with already experienced contexts.[10]

Importantly, note that the ATM model can be straightforwardly incorporated into a more general behavioral model to accommodate forward-looking and strategic behavior, because it only (temporally and contextually) fixates the weight attached to another agent's utility.[11]

Empirical support[12]

Support for the ATM model comes from different sources, crossing disciplinary borders, as follow:

Econometric support. The estimated ATM model shows a better predictive performance regarding public good games than other applicable models (regarding fixed altruism, inequality aversion, and reinforcement learning), with as best fitting reference point what selfish *Homo economicus* would contribute.

Tracking experimental game findings. Consistent with the ATM model, interaction appears to affect one-shot (non-strategic) behavior towards a specific other that one interacted with, mediated by emotions.[13] Findings regarding rejection (destruction) in the ultimatum (power-to-take) game, and return-transfers in the trust game can be explained this way. This also holds for the observed propagation ('cascades') of cooperative behavior in public good games – that is, persistence over time across different counterparts and spread across different agents –, and the finding that a gift receiver appears to favor an actual gift over an intended gift.

Neurobiological support. Linking the estimated model parameters to brain activity (using fMRI) during a public good game suggests a neural substrate for the ATM: (1) activity in a region implicated in inferring the behavioral relevance of others, the pSTS/TPJ, tracks the development of the tie-value (α); (2) in its turn the pSTS/TPJ modulates activity in a region implicated in the valuation of choices and decision-making, the mPFC; while (3) this mPFC activity is related to the participant's contribution to the public good.[14] The observed role of the pSTS/TPJ, furthermore, fits into an emerging neural network model of maternal care, regarded as a primordial neural system of bonding in mammals.

Other species. Suggestive of the ATM model's reliance on an evolutionary old mechanism is the substantial evidence of prosocial and antisocial behavior and of enduring relationships among very different species, including even plants and bacteria.[15]

Further implications[16]

Collective action. The ATM model predicts that interaction experiences can cause a social preference drift – formally captured by a (more or less) extended utility function – which helps explain collective action in (local) public good environments, such as political participation or collusion in noncompetitive markets. Moreover, its automatic (impulsive, nondeliberate) character can explain why people (with a positive GTV) become more cooperative and generous under time pressure or cognitive load. For large groups, collective action can be facilitated through emotional bonding with a charismatic leader or compliance with an internalized norm. While, through the propagation of trust, bridging friendships (and their related affective networks) appear important for overcoming negative attitudes between groups.

Happiness and identity. Utility extended by the utility of people with whom affective ties are maintained seems consistent with the robust finding that beloved ones and friends are a major source of happiness. Affective networks, finally, challenge the definition of what an individual – as in methodological individualism – or an individual's identity actually is. In line with the ATM model it is suggested that an individual's identity comprises all agents – selves and others – one is intrinsically motivated to exert effort for (albeit to a different, attention and tie-value related extent).[17]

Conclusion

In view of its empirical support and implications, the Affective Tie Mechanism model appears to offer a promising approach to the formalization of affective relationships (like friendships or enmities) that are missed in standard economic theory. Rooted in evolutionary old emotional mechanisms, it endogenizes the weight attached to the utility of interaction partners, based on backward-looking emotional appraisals of interaction experiences. The Affective Tie Mechanism can be incorporated in a more general model allowing for (forward-looking) strategic behavior.

Endnotes

[1] See the many references and details in Bault et al. (2017). For an evolutionary perspective, see Damasio (2018, pp. 114, 234-235). Relationship science has become a major bridge connecting social, behavioral, and life sciences, with as influential theories interdependence theory and attachment theory (Finkel and Simpson, 2015; Finkel et al., 2017).
[2] See surveys in: Camerer (2003), Cooper and Kagel (2013), Fehr and Schmidt (2006), Sobel (2005), Rotemberg (2014), Fehr and Schurtenberger (2018).
[3] Rabin (1993), Dufwenberg and Kirchsteiger (2004), Falk and Fischbacher (2006). On the problem of correctly predicting behavior and preferences across affective states (here, appreciating an affectively 'hot' state while being in a 'cold' state), see Loewenstein (2005). The kindness-reciprocity model of Cox et al. (2007) deviates from these studies by focusing on (kindness related) emotions based on experience, instead of intentions, but is again static (and does not look at equilibria). The model of Levine (1998), finally, presumes that people are already endowed with altruism (or spitefulness), the source of which is unexplained. Innate altruism is contested; see Thompson and Newton (2013), Barragan andDweck (2014), Dahl and Brownell (2019).
[4] Geanakoplos et al. (1989).
[5] Knowing the norm is not enough for compliance, one should also have mental access to the emotional foundation ('feeling') underlying its internalization. This is dramatically demonstrated by patients with lesions regarding relevant brain areas; see: Anderson et al. (1999); Marazziti et al. (2013). For a developmental perspective, see Smith et al. (2013).
[6] See: van Dijk and van Winden (1997), Bault et al. (2015, 2017), van Winden (2021, 2023). The circuitries are, respectively, related to Kahneman's (2011) "System I" and "System II". See also Loewenstein et al. (2015) for a similar distinction.
[7] Emotions arise when one appraises an event as relevant for one's concerns, and have a direct hedonic impact; see: Frijda (1986), Loewenstein (1996), Elster (1996, 1998).
[8] van Winden (2023) provides an information-theoretic foundation, based on the following *basic hypothesis*: Agents facing environmental uncertainty, where other agents may turn out to be benefactors or malefactors, will automatically develop a positive or negative (emotive) action tendency regarding an agent interacted with, based on the information regarding the nature of that agent extracted from its behavior; this action tendency reflects an intrinsic motivation to seek the other's proximity or to keep a distance, and to provide benefits or detriments, that is, to care for that agent. In this *informational* ATM (*i*ATM) model, the weight attached to the Impulse is determined by the ratio of two uncertainties, one regarding the behavior of any agent-type, the other regarding the type distribution. The greater (smaller) the uncertainty regarding the type, the more (less) weight will be attached to the Impulse.
[9] A case of preference learning as adaptation through internal state adjustment, different from just behavioral adaptation (Friston, 2010). Whereas the affective tie mechanism is supposed to be innate, it depends on interaction experiences which way it will work out.
[10] The GTV is seen as an uncertainty-based formal underpinning of the psychological Social Value Orientation construct (Van Lange et al. 1997). Incidentally, note that the focus thusfar is on individual-specific ties. If agents are indistinguishable, counterparts would seem like a single agent interacted with. In that case, the same specification is assumed to hold as for a specific agent, even though the actions may stem from different agents. Thus, the ATM model allows for "generalized reciprocity", observed among a wide range of organisms (Pfeiffer et al., 2005; Allen et al., 2016).
[11]See the two-period model of Bault et al. (2017) and Loerakker et al. (2022).
[12] For detail and references, see van Winden (2021), and van Winden (2023) for some additional support.
[13]To investigate first-mover behavior the model should be incorporated in a more general model allowing for strategic forward-looking behavior.
[14]TPJ stands for temporoparietal junction, pSTS for the neigboring superior temporal sulcus, and mPFC for the medial prefrontal cortex. Interestingly, also activity of the Insula – implicated in empathy – appears related to the contribution magnitude. Furthermore, support exists for oxytocin functioning as type-signaling hormone.
[15]As may be expected given the ubiquitous challenge to organisms of adapting to behavioral uncertainty (see 8; Damasio, 2018, pp. 114, 234-235). Interestingly, Schino and Aureli (2009, 2021) hypothesize that social

relationships between unrelated non-human animals constitute an emotionally based bookkeeping system of cooperative and uncooperative behavior received, which appears quite similar to the ATM.

[16]See van Winden (2021, 2023) for detail.

[17]If restricted to the internalization of norms instilled by emotionally valued educators, this can be related to Akerlof and Kranton (2000) who propose to include identity into the utility function, where “identity is associated with different social categories and how people in these categories should behave”. The contextual nature of extended utility in the model, furthermore, seems consistent with the biological concept of “contextual organismality” proposed by Diaz-Muñoz et al. (2016). Finally, see van Winden (2021), for a discussion on how social preferences, time preferences, and risk preferences may be linked through the ATM.

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