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On Embedded Choice Theory: Re-framing and Emotions

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Abstract: In an earlier paper, I suggested a model of embedded choice in which choice structures were embedded in *framing super-structures* defined and supported by social norms, moral values and the like. Although I did mention the role of emotions as possible embeddedness super-structures, I did no focus explicitly on them, or on their ability to affect choice behaviour. This is the main topic of the present paper. We discuss the concept of emotional embeddedness and its connections with choice problem's features and analyze how emotions operate on choice super-structures' *intensity* and *valence*, thus affecting how individuals re-frame choice problems. Interestingly, in doing this, we shall confirm the relevance of well-known phenomena in behavioral studies on framing effects: *preference reversal*s, *preference confidence* and *internal framing.*

Keywords: Emotions; Choice; Frame effects
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1. Introduction

In last decades, philosophers have widely discussed if emotions can be conceived as rational/ normative judgments and not only irrational occurrences outside from human being's control[1]. Despite obvious existing differences of opinion regarding how, and how much, emotions can influence rational behavior, on their basic traits as speculative entities some consensus has been reached.

Firstly, emotions are commonly associated to arousal, intentionality, cognitive antecedents and beliefs. The causes of an emotion are rooted in certain kinds of beliefs and explanations on its object - practically justified by past experience, cognitive shortcuts, expectations and the like - and our emotional conditions can vary when our opinions change. Secondly, emotions can have positive, or negative, valence and they can be first-order emotions or second-order ones (emotions on emotional states). In all cases, they have a clear *action-tendency* which can alter choice behavior. From this viewpoint, emotions, like value judgments, are actions that involve behavioral responses to emergency situations, unexpected events or information[2]. Finally, emotions can shape, and be

[1] Solomon (1980) and de Sousa (1987) are the classic references for those interested in arguments against claims that human beings are passion's slaves and emotions are simply irrational and unpurposive feelings. Elster (1996) discusses how emotions can be related to rationality and to the means/ends logic of optimizing choices. Nussbaum (1998), (2001) argue in favor of the intelligence of emotions now seen as value judgments able to drive human behaviour towards well-being goals.

[2] By pushing this view to its extremes, Slovic *et al*. (2004) consider emotions as heuristics which operate whereas rational behavior is not possible because the decisional process is complex and mental resources limited.

shaped by, social norms or socially-regulated informal institutions. Consistently, they are *socially-embedded* [3].

In an earlier paper (Lanzi, 2010), I suggested a model of embedded choice in which choice structures (i.e. choice sets and order relations) were embedded in *framing super-structures* defined and supported by social norms, moral values and the like. Although I did mention the role of emotions as possible embeddedness super-structures, I did no focus explicitly on them, or on their ability to affect choice behavior. That role is the main topic of the present paper.

For doing this, I shall interpret frames of choice as embeddedness super-structures as suggested in Lanzi (2011) [4]. In that paper, I show how framing effects can be nicely operationalized through framing super-structures and well-specified descriptions of those moral, aesthetically, cultural and social values that shape them. In this way, it is easy to explain apparently inconsistent choices, to work with preferences context-dependency and to rationalize some well-know paradoxes of the theory of choice, just to quote some benefits [5].

Exactly this link between frames and choice-superstructures allows us to extend our choice model to deal with emotions and emotional responses. The direction of such an enlargement is the one discussed in Druckman and McDernott (2008), Chong and Druckman (2007) or Bandelj (2009), contributions where emotions are seen as *framing modulators*, *mediators*, or as the main mechanism of *situational adaptation*. When facing unexpected and unknown choice problems, rather than to select instrumentally-optimal alternatives under full information, comprehension and command of the situation, individuals can use, emotions as guiding principles for action and/or mechanisms for letting a certain frame of choice to prevail on others. Thus, choice problems can be conceived as embedded in emotional contexts, systems of somatic makers, bundles of emotional reactions and exactly as they are framed by social or contextual norms. In short, we can use the idea of *emotional embeddedness* for relating emotions to choice.

Several works have emphasized that emotions matter in economic actions and interactions. Among others, Bandely (2008) points out how emotional states can be the final rationale in foreign direct investment in post-communist countries; Pixel (2004) largely discusses the relevance of emotions in the functioning of financial markets and organizations; Bar-on and Parker (2000) consider the role of emotional intelligence for job performance. However, what lacks in this kind of contributions is a reference model offering theoretical support to applied analyses of emotionally-sensitive decisions. The present paper has exactly the aim of providing some insights on how that model could be built. We shall restrict our modeling effort to (non-strategic) choices under certainty. A companion paper will be devoted to choice in a game-theoretic set-up [6].

The organization of the essay is as follows. In Section 2, we discuss the concept of emotional embeddedness and its connections with choice problem's features and elements. Section 3 is devoted to introducing definitions and notation. Section 4 analyzes how emotions operate on framing super-structures' *intensity* and *valence* and affect the manner in which individuals *re-frame* choice problems. Section 5 is reserved for discussion and examples, while the last one, as usual, concludes.

[3] See Granovetter (1985) on the idea of embeddedness.

[4] The seminal paper on framing effects is Kahneman and Tversky (1981).

[5] Lanzi (2013) extends the set-up to non-cooperative games in which pure strategies Nash equilibria exist.

[6] See, for instance, Mellers and McGraw (2001) to check out this point.

2. Emotional Embeddedness and Choice

In their seminal work, Kahneman and Tversky (1984) mainly discuss the role of equivalence framing to determine individuals risk propensity and their perception of choice problems under uncertainty. Equivalence framing effects occur if *logically equivalent phrases cause individuals to alter their preferences* (Kahneman and Tversky, 1981).

Traditional examples are when people reject labor market reform programs when declared they will result in 5% of unemployment, but prefer them when told they result in 95% employment, or when choosers value differently health policy measures when presented in terms of lost lives or saved lives. Framing effects can be in action in voting campaigns, policy-making decision processes, coalition bargaining and in a large variety of other real world situations. Frames may affect risk propensity too. People appear risk-adverse when facing gains and remain more risk-seeking when comparing losses. This entails the relevance of differentiating emotions that vary in their affect on risk (like enthusiasm, anxiety, distress, hostility or anger) and of assessing their impact on risk-seeking behavior. Let us put it differently: if emotions can influence risk-assessment, and the latter is also sensitive to framing effects, then emotions can operate like mechanisms to frame, or re-frame, decisions. When this happens, we are allowed to speak of the *emotional embeddedness* of choice behavior.

Emotions and choice can be intertwined through the basic constitutive elements of a choice structure (i.e. a choice set X and an order relation $\succsim$). Let us discuss some of the existing links separately:

(i) consider the following choice set $X = \{x, y, z\}$ and a complete, transitive, reflexive and antisymmentric binary order relation on it. In principle, six possible orderings among alternatives may hold: $x \succsim y \succsim z$, $z \succsim x \succsim y$, $y \succsim z \succsim x$, $x \succsim z \succsim y$, $z \succsim y \succsim x$ and $y \succsim x \succsim z$. By affecting how we order choice options, emotions can make one preference ordering to prevail on the others. Thus, for instance, positive emotions (like enthusiasm, love, sympathy) can lead to $x \succsim \{z, y\}$, while negative ones (like hate, anger or hostility) to $y \succsim \{x, z\}$. If this is the case, emotions inculcate a certain ordering of alternatives through processes of mental accounting (i.e. how people organize, evaluate, assess and trade-off various options in their lives);

(ii) take the above choice set, but now suppose that $\succsim$ is incomplete. It could be that, among other cases, $x \succsim y$, $z \succsim y$, but x and z are *incommesurable* options (that is, alternatives for which there is not a basis of comparison with respect to a quality normally subject to evaluation or some known common standards of evaluation). When this happens, decision makers cannot be able to reach the optimal choice and such an impossibility can result in no choice at all. By narrowing down choice sets extension, for instance making z emotionally-unacceptable, emotions can prevent this "inaction" to phase out and make the decision possible;

(iii) finally, suppose that all above alternatives are *roughly equal in value* (Griffin, 1997), that is, they are comparable, but none of them can be valued better than the others. In this situation, by shaping out the case of multiple optimal choices, this roughness of alternatives makes the decision difficult. Tie-breaking criteria might be needed to get a deliberate choice (i.e. not to decide randomly). Emotions can play such a role, especially when their arousal is due to the indeterminacy of the choice problem at stake.

Moreover, if we take into account the concept of *frame*, and make the structure of choice more complex and manifolded, additional links through which emotions can affect choice emerge like discussed, *inter alia,* in Chang (2007), Cassotti *et al*. (2012), Yang *et al*. (2013) and Lecheler *et al*. (2015).

Firstly, emotional responses can moderate (or reinforce), framing effects in given decision contexts. Thus, choosers with low levels of anxiety appear less susceptible to frames and optimistic individuals tend to underestimate risk. In other words, emotions work as *frame modulators.* Secondly, when different competing frames co-exist, emotions can determine, with respect different decision domains, their relative impact on choice behavior. For instance, distress can have a more important role in determining negative frames relevance for life and death decisions than for financial investment, or sympathy more likely will reinforce positive frames for immigration policies than for ozone depletion ones. In this last case, emotions are *frame mediators.* Finally, emotions as situational, adaptive reactions to unexpected choice contexts can create new psychological frames aimed to preserve chooser's self-esteem or his own self-definition. Thus, by helping people to re-frame choice problems and to embrace new positional goals, emotions can operate as *frame generators*.

Far from being exhaustive, above remarks offer us sufficient conceptual tools for relating emotions to choice super-structures and embedded choice behavior. However, before doing this, we have to introduce some definitions and notation. To this task is reserved the next Section.

3. Definitions and Notation

In this paragraph, we introduce definitions and notation[7] . Let $(X, \gtrsim)$ be a finite and non-empty poset (i.e. partially-ordered set). Suppose that any $(Z, \gtrsim) \subseteq (X, \gtrsim)$ is a closed set endowed by a supremum and an infimum element and that the set X has finite length with rk: $X \to I_+$ such that $rk(x) > rk(y)$ if $d(m, x) > d(m, y)$ and $rk(x) = rk(y) + 1$ if y covers x.

Define $\eta \in \mathrm{Y}$: $X \to Z$ as a diffeomorphism, that is, a non-order preserving map such that:

$$rk(\eta(x)) = \eta(rk(x)) \neq rk(x) \qquad (1)$$

for at least one $x \in X$.

Let $\theta \in \Omega$ be an equivalence relation, that is, a binary, reflexive, symmetric and transitive equivalence operator such that if for $x, z \in Z$, $rk(x) \neq rk(z)$ then

$$rk(x(\mathrm{mod}\theta)) \equiv rk(y(\mathrm{mod}\theta)) \qquad (2)$$

We are now equipped to define a *framing super-structure* as a couple formed by a diffeomorphism and an equivalence relation, that is

$$S: = (\mathrm{mod}\theta, \eta) \in \Omega \cup \theta_0 \times Y \cup \eta_0 = \Lambda \qquad (3)$$

and its induced poset as:

$$Z_{(\mathrm{mod}\theta,\, \eta)} \neq \emptyset = \{[x]_{(\mathrm{mod}\theta,\, \eta)}\ \forall x \in X\} \qquad (4)$$

Few additional elements complete our set-up. Denote $\hat{Z} = \{Z_i\}_{i = 1 \ldots N}$, with $Z_i \subseteq X$ for any i, a non-empty family of subsets of X. Let C be a set-valued social choice function defined as:

[7] The set-up here presented is a simplified version of the choice model suggested in Lanzi (2010), (2011). See those contributions for details and full references.

$$C = X \rightarrow \cup Z_i | \forall Z_i \in X \Rightarrow C(Z_i) \in Z_i \quad (5)$$

and define a maximal choice function as:

$$C_M(Z, \succsim): Z \rightarrow M(Z, \succsim) \quad (6)$$

with $M(Z, \succsim) = \{x | x \in Z \wedge \nexists y \in Z: y \succ x\}$[8].

Finally, let us call the triple $(X, \succsim, S)$ an *embedded* choice structure, that is the traditional structure of choice on which a super-structure operates.

By using $(X, \succsim, S)$, we shall explain emotionally-sensitive choice behavior. More precisely, by operating as modulators, mediators or generators of framing super-structures, emotional states will affect super-structures' *intensity* and *relevance* and how the chooser will perceive the decision problem at stake. Interestingly, in doing this, we shall confirm the relevance of well-known phenomena of behavioral studies on framing effects: *preference reversal*, *preference (over)confidence* and *internal re-framing*[9] .

4. Emotions and Choice Re-framing

Take the choice structure $(X, \succsim)$ and suppose that it has unique maximal element m ($i.e.$ $C_M(X, \succsim) = \{m \in X\}$). Then, consider the following three cases.

4.1 Emotions as frame modulators

Suppose that the choice structure is embedded in $S' \in \Lambda$. given by:

$$S' = (\text{mod}\theta', \eta') \in \Lambda \quad (7)$$

such that

$$m(\text{mod}\theta', \eta') \equiv z(\text{mod}\theta', \eta') \quad (8)$$

and

$$rk(\eta'(y)) = rk(\eta'(z)) \quad (9)$$

with $y, z \in X / m$.

As it is immediate to show, if (9) holds we have that $C_M(Z_{(\text{mod}\theta', \eta')}, \succsim) = \{y, z\}$.

Imagine now that $S^{'}$ generates in the chooser a given emotional reaction which forces him to re-frame the decision problem at stake. Let us denote with $e \in E$ this emergent emotion and deal with two possibilities: a *frame-reinforcing* emotion and *frame-moderating* one.

In the first case, re-framing activities may lead to the following change in the binding framing super-structure:

$$\hat{S}|_e = (\text{mod}\hat{\theta}, \hat{\eta}) \quad (10)$$

such that

$$m(\text{mod}\hat{\theta}) \equiv \inf(X) \quad (11)$$

and

[8] On choice functions see Arrow, Sen and Suzumura (2011).

[9] On these topics see, among others, Jullien (2016), Thunstrom *et al*. (2015), Druckman and McDernott (2008), Ryan (2005), Wang (1996), Tversky *et al*. (1990).

$$rk(\hat{\eta}(y)) > rk(\hat{\eta}(z)) \qquad (12)$$

for some $y, z \in Z_{(\mathrm{mod}\wedge\theta,\wedge\eta)}/m$ with $d(m,z)=1$. Intuitively, when (10) holds it is true that $C_M(Z_{(\mathrm{mod}\wedge\theta,\wedge\eta)}, \gtrsim) = \{y\}$, that is, the intensity of the framing super-structure (or, put it differently, its ability to change choice behavior) increases.

In the second case, take the emotionally-modified framing super-structure that follows:

$$\tilde{S}|_e = (\mathrm{mod}\tilde{\theta}, \tilde{\eta}) \qquad (13)$$

such that

$$m(\mathrm{mod}\tilde{\theta}) \equiv z(\mathrm{mod}\tilde{\theta}) \qquad (14)$$

and

$$rk(\tilde{\eta}(y)) < rk(\tilde{\eta}(z)) \qquad (15)$$

for some $y, z \in Z_{(\mathrm{mod}\,\tilde{\theta},\tilde{\eta})}/m$. $Z_{(\mathrm{mod}\,\tilde{\theta},\tilde{\eta})}$ As it can be stressed, if (13) operates it holds that $C_M(Z_{(\mathrm{mod}\,\tilde{\theta},\tilde{\eta})}, \gtrsim) = \{z, m\}$, that is, framing super-structure's effects on choice behavior almost disappear. For instance, as suggested in Miller *et al*. (2004), empathy, or anger, may modulate framing effects on policy opinions and affect voting behaviour.

4.2 Emotions as frame mediators

Consider two framing super-structures, $S_1 = (\mathrm{mod}\theta_1, \eta_1) \wedge S_2 = (\mathrm{mod}\theta_2, \eta_2) \in \Lambda$, as alternative frames for the decision problem we are handling with. When they operate, we have, respectively, $C_M(Z_1, \gtrsim) = \{y\}$ and $C_M(Z_2, \gtrsim) = \{z\}$ for some $y, z \in X/m$ and with $Z_i = Z_{(\mathrm{mod}\theta i,\, \eta i)}$ for $i = 1, 2$.

As above, let us match a response emotion ($e \in E$) to these super-structures for getting transformed framing super-structures of the kind:

$$S_1|_e = (\mathrm{mod}\theta_1, \eta_1) \qquad (16)$$

such that

$$y(\mathrm{mod}\theta_1) \equiv m(\mathrm{mod}\theta_1) \equiv m \qquad (17)$$

with

$$rk(\eta_1(y)) < rk(m) = rk(\eta_1(m)) \qquad (18)$$

and

$$S_2|_e = (\mathrm{mod}\theta_2, \eta_2) \qquad (19)$$

such that

$$z(\mathrm{mod}\theta_2) \equiv y(\mathrm{mod}\theta_2) \text{ for some } y \in Z_2 \qquad (20)$$

Straightforwardly, it can be shown that $C_M(Z_{(\mathrm{mod}\theta 1,\, \eta 1)}, \gtrsim) = \{m\}$ and $C_M(Z_{(\mathrm{mod}\theta 2,\, \eta 2)}, \gtrsim) = \{y, z\}$. Intuitively, the emotional response to competing framing super-structures makes S_1 ineffective. Only S_2 is able to affect choice behavior. For example, as Brader *et al*. (2008) point out for immigration policies, emotional responses can question frame valence. Therefore, playing with immigration-related emotional states can largely alter how immigration issues are perceived and valued by citizens and how much they will, or not, accept more welfare opportunities for immigrants.

4.3 Emotions as Frame Generators

Finally, we have the simplest case in which no relevant framing super-structures exist, but the emotional response to the choice problem by itself generates a psychological, or internal, framing super-structure. Therefore, for dealing with this case, it is enough to denote the absence of super-structures as $S_0 = (\theta_0, \eta_0)$ and to take, among others:

$$\check{S}|_e = (\theta_0, \check{\eta}) \tag{21}$$

such that

$$rk(\check{\eta}(y)) > rk(\check{\eta}(m)) \tag{22}$$

for $\forall y \in X/m$. Now, emotions work like traditional embeddedness structures as social norms, social settings, moral principles etc. . They generate a normative principle for action that directly modifies choice behavior.

5. Discussion and Examples

The above Section has shown that emotions and framing super-structures can be reciprocally intertwined.

Firstly, an emotional response can be caused by, or being cause of, a binding framing super-structure. Secondly, it can transform existing super-structures' intensity or valence and involve a sort of super-structures dynamics very similar to the one observed for framing effects. Finally, with respect to different choice domains, the same emotional reaction can affect differently super-structure's effectiveness in changing choice behavior. Consistently, it is possible that the same framing super-structure generates different emotional reactions in different individuals and induces different choices. By echoing Jullien (2016), we should state that "*all choice super-structures created equal might not be identical*" in behavioral terms if choosers are experiencing different emotional responses to them. In some extreme situations, this can induce preference reversals.

Furthermore, if framing super-structures' effects can be nullified by emotional reactions, then it will be difficult to suggest to decision makers new points of view, or to let them undertake counter-factual reasoning. Whereas this ends in reinforcing their belief that their own original preferences are the unique emotionally-feasible, preference (over)confidence and dogmatic choices are likely to emerge.

Last but not least, if emotional responses can forge internal frames in which choice problems are embedded, these new frames have to interact with existing external ones in determining choice dispositions. Indeed, this confirms the relevancy of the interaction between emotions and social norms as well as its complexity. Social norms can build external frames aimed to affect choice behavior and able to induce emotional responses which will change external frames' features and create new internal framing super-structures. The latter will compete with the form we in determining choice behavior. Maybe, as a result of conflicts between external and internal framing super-structures, second-order emotions will phase out, interact with existing super-structures and change them once more. When this happens, we are allowed to speak of *emotional cascades* internal to the individual self.

In order to illustrate how our set-up can be used to study practical choice problem, we shall conclude this Section by provide a couple of narrative examples.

5.1 Family affairs and marital frictions

Joanie wants to go to a family party planned for the evening; John, her husband, does not. He is now came back home from office and he is thinking to join friends for playing soccer. Joanie

begins to act frustrated, so that John suggest to stay home and watch an amazing new movie together. Joanie reminds John that their not participating would be judged rude and not polite by family members and, sighing occasionally, resigns herself to reading. In the meanwhile, John is looking for his lucky soccer shirt (he has dozens, but irrationally loves only that one!) that Joanie brought to the dry cleaner a couple of days before. He asks if she has picked it back and she answers "no". John flies into a rage and a huge quarrel explodes. Joanie goes to bed; her husband settles back before television. The party is out of question!

Let us explain this very familiar sort of case through our set-up.

At the beginning of the story, John had four alternatives: (i) going to the family party like Joanie desires (x); (ii) watching television with his wife (y); (iii) watching television alone (z); (iv) going with friends to play soccer (w). His individual preference ordering among alternative is as follows:

$$w \succsim y \succsim z \succsim x$$

but his wife prefers to go to the family reunion like family norms suggest. If we represent how these norms can affect John's choice behavior through a framing super-structure, we have that:

$$S = (\mathrm{mod}\theta, \eta)$$

such that
$$y(\mathrm{mod}\theta) \equiv z(\mathrm{mod}\theta)$$
$$rk(\eta(w)) < rk(\eta(z)) < rk(\eta(x))$$

with $C_M(Z, \succsim) = \{x\}$.

John being angry about his wife's inadvertence might seem unreasonable and the intensity of the quarrel inappropriate. However, beyond psychological reasons of this emotional reaction, John's anger re-shapes S. Firstly, it makes John not caring for the family norms more intensively than normal. Secondly, it makes unpleasant for John to pass time with his wife. Finally, because of the quarrel, John would be in late to the soccer match and he would be blamed by friends. Formally,

$$S|_e = (\mathrm{mod}\theta^a, \eta^a)$$

such that
$$x(\mathrm{mod}\theta^a) \equiv y(\mathrm{mod}\theta^a)$$
$$rk(\eta^a(z)) > rk(\eta^a(w)) > rk(\eta^a(x))$$

with $C_M(Z^a, \succsim) = \{z\}$.

Independently by real causes of John's anger, his being furious about the shirt has the effect to get his wife's mind off the family reunion and to stop her irritating reminders. His best choice alternatives, i.e. going to play soccer, is compromised by the quarrel, but his refusal to go to the party is successful. The framing choice super-structure has been re-shaped by his emotion that has worked here as modulator of family norms relevance. Furthermore, because of his anger, John experiences preference reversal with respect to his starting preference ordering.

5.2 Death and social norms

Mary died yesterday. Since the 60ies, she has been a nice and gentle hippy and a member of a rich and conservative family. As usual in these cases, Mary was often blamed by her family and, along all her life, she has been always judged the "bad and mad" one. Her unique son, Bob, is a middle-age folk musician who has left the family ground, traveled the world and embraced a tribal religion according to which funerals must be like parties: without tears or sadness, and with a lot of joy, dancing and music.

Bob has to decide how to organize her mother's funeral, even if she has left no instructions about what to do after her death, apart from that she wanted to be buried. Thus, he faces four possible alternatives: (i) a traditional ceremony open to all family members (x); (ii) a traditional funeral in private form (only sons and Mary's best friends) (w); (iii) a party with friends (y), and (iv) no funeral at all (z).

Given Bob's beliefs, his individual preferences are as follows:

$$y \succsim z \succsim w \succsim x$$

but well-established social norms push the decision toward a traditional and public ceremony. Their effects on the choice problem can be represented by using a framing super-structure, $S_1 = (\mathrm{mod}\theta_1, \eta_1)$, such that:

$$y(\mathrm{mod}\theta_1) = z(\mathrm{mod}\theta_1)$$

$$rk(\eta_1(x)) > rk(\eta_1(w)) > rk(\eta_1(y))$$

with $C_M(Z_1, \succsim) = \{x\}$.

During the second night after Mary's death, Bob has a horrible nightmare in which he sees all injustices Mary suffered because of his family, especially in the last years before her passing away. Mark awakes full of mercy for his beloved mummy and decides to disperse the ashes on the beach even if this act will be blamed and punished by his family. Nevertheless, his emotions are too strong: he only wants let his mother to join the universe of love, as she always told him. This new emotional state (e) has two main effects: on the one hand, it strongly reduces in Bob's mind the relevance of binding social norms; on the other hand, it gives new meaning to the fact that Mary never told him how to organize her funeral. Therefore, we have now two competing super-structures of the kind:

$$S_1|_e = (\mathrm{mod}\bar{\theta}_1, \bar{\eta}_1)$$

such that

$$x(\mathrm{mod}\bar{\theta}_1) = w(\mathrm{mod}\bar{\theta}_1)$$

$$y(\mathrm{mod}\bar{\theta}_1) = z(\mathrm{mod}\bar{\theta}_1)$$

$$rk(\bar{\eta}_1(y)) > rk(\bar{\eta}_1(x))$$

and $$S_2|_e = (\mathrm{mod}\theta_2, \eta_2)$$

such that

$$y(\mathrm{mod}\theta_2) = x(\mathrm{mod}\theta_2) = w(\mathrm{mod}\theta_2)$$

$$rk(\eta_2(z)) > rk(\eta_2(y)).$$

As it can be easily checked, it is true now that:

$$\{z\} = C_M(\bar{Z}_1, \succsim) \cap C_M(Z_2, \succsim).$$

Intuitively, in this example emotional embeddedness has re-shaped the existing framing super-structure effects on decision and created a new psychological frame able to compete with the old one in suggesting solutions. Behind Bob's preferences, social norms and family duties, z is selected and nobody, except Mary and Bob, will understand why.

6. Concluding Remarks

In the present paper, we have dealt with relations between emotional responses to choice problems and framing super-structures. In our reasoning, we have taken a given emotional reaction and applied it to a framing super-structure. I am aware of the fact that this is only the simplest possible case. For instance, several possible emotions can co-exist and compete in determining choice behavior, or intricate linkages among emotional responses, socially or culturally-imposed behavioral rules and second-order emotions may occur. Indeed, these issues deserve future research efforts by scholars involved in behavioral studies.

However, in my opinion, in the understanding of how emotions drive behavior, it is more urgent to insert emotionally-sensitive choices in game theory models. The reason of this is twofold.

On the one hand, emotions are relational entities and interaction rituals have strong emotional components. In their encounters, individuals generate emotional energy and strive for defending their self-esteem. Any encounter has underlying emotional currents that can alter interaction participants' perception of themselves or of the choice situation at stake (Collins, 2004).

On the other hand during social interaction the individual self and identity are put under discussion and this give raise to emotional arousal. There will be positive emotions when one's view of the self is confirmed by others, negative ones when it is discredited (Turner and Stets, 2006). Therefore, during strategic games not only individuals will purse payoff maximization, but they will also emotional strategies for achieving self-congruence and self-consistency. Even more importantly, during strategic games individual emotions will interact with other players' ones. In several cases, this multi-lateral exchange of emotional states will be able to bias the final emotive reaction of many decision makers. Like financial markets show, there multi-agent emotional cascades, supported by reciprocal suggestion and influence, may contribute to herding behavior.

Finally, emotional-dependency of choice can rationalize the difference between instrumentally -rational actions (i.e. actions that are optimal strategies given some ends known *ex ante*) and creative behavior (that is, the ability to identify creative solutions in situations in which the classic means-ends schema does not hold). Emotional reactions to choice situations in which means and ends are modified by the process of choice itself, can free creativity and individuals capabilities to detect extraordinary innovative lines of action.

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