Chapter #10

EMOTIONAL REACTIONS TO ECONOMIC PREDICTIONS AND THEIR EFFECTS ON REASONING AND LOGICAL THINKING

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ABSTRACT
This chapter explores the possibility that emotions evoked by media views about the future of Portuguese economy could affect logical reasoning, particularly in problems related to financial issues, and how this effect may vary depending on the valence of emotion produced by the news. Positive or negative emotions were induced by presenting participants with paragraph excerpts of news media with financial or non-financial content (all positive or all negative). Afterwards, participants judged the logical validity of several syllogisms with neutral, negative financial or negative non-financial content and expressed their confidence in each judgment. Results indicate that negative emotions, evoked either by the priming or by the syllogisms content, lead to better performance but lower confidence. These results are in line with research showing that negative emotions promote deeper, analytical, reasoning and more cautious (less confident) judgments, while positive emotions trigger more superficial and heuristic-based judgments.

Keywords: reasoning, emotion, syllogism, decision-making, economic crisis.

1. INTRODUCTION

After the bailout loan in 2010, the Portuguese society was besieged by severe austerity (e.g., growing unemployment, salary reduction, increased taxation) due to so-called punitive interest rates often justified as the consequence of years of collective overspending. We posit that the effects of such economically and financially intimidating social environment are that more and more people become mentally preoccupied with making ends meet, which triggers increased needs of self-regulation and snowballing adverse effects on consumers' judgment, reasoning and decision making.

More recently, the Portuguese economy has shown signs of recovery from this economic crisis (e.g., decrease in unemployment rates and reduction of the austerity measures). However, experts and opinion makers are divided as to how solid and stable this recovery really is. This divide has been well captured by the media, with commentators presenting conflicting views concerning the country's economic future. There are those who convey the notion that the Portuguese economy is in the path of structural recovery, generating in consumers' positive emotions and hope in the future; whereas other opinion makers find the signs of recovery illusive (resulting mostly from the European conjuncture) and argue that the Portuguese economy is on the verge of another crisis, potentially generating negative laden emotions, stress and preoccupation among consumers.

The present study was intended to explore how the consumer's emotions, reasoning and decision behavior may be affected by these opposing views. Emotions were manipulated between-participants by priming participants with news from one of the two aforesaid media

views about the future of Portuguese economy. As expected, emotional valence was positive after priming with encouraging news, and negative after priming with deleterious news about the evolution of the economy (a similar contrast was found when participants were primed with other positive and negative media news, which content matter was unrelated to economical or financial issues). Participants then responded to several conditional reasoning problems (syllogisms). The problems' valence was either neutral or negative. Half of the problems with negative valence had financial contents and the other half had non-financial contents (see the Method section for examples).

2. BACKGROUND

Thoughts about financial demands (experimentally induced or naturally occurring) reduce cognitive performance among participants with financial difficulties (Mani, Mullainathan, Shafir & Zhao, 2013). Although Mani et al. (2013) argued that these findings could not be fully explained by emotional laden responses of stress or anxiety (but rather by the exhaustion of cognitive resources), previous research has shown that activation of emotions (both positive and negative) impairs performance in reasoning tasks. This has been found both for incidental affect (Melton, 1985; Oaksford, Morris, Grainger, & Williams, 1996; Palfai & Salovey, 1993) and for integral affect (Blanchette, 2006; Blanchette & Richards, 2004). Incidental affect refers to emotions that are evoked from a source not directly related to the reasoning task or its material (e.g., an unrelated priming task before the reasoning task). Integral affect, on the other hand, is generated by the reasoning task, more frequently by the emotional content of the reasoning problem (Blanchette & Richards, 2010).

However, research in this domain is not without controversies. Besides the aforesaid evidence of emotional content leading to low performance on logical reasoning, some studies also show that integral emotions that are personally relevant to the participant produce better performance in reasoning tasks (specifically judgment of logical validity in syllogisms – Blanchette & Campbell, 2012; Blanchette, Richards, Melnyk & Lavda, 2007). Other studies show, more generally, marked difference in styles of cognitive processing between positive and negative emotions. While positive emotions tend to promote a more superficial and unfocused processing style, negative emotions tend to promote more focused and systematic processing of information (Bless, Bohner, Schwarz & Strack, 1990; Worth & Mackie, 1987). In contrast, recent research by Sidi, Ackerman and Erez (2018) suggests that positive affect enhances participants' confidence and increases participants' cognitive performance (see also Isen, 2008).

The current study aims at contributing to this debate by testing the effect of financial pessimism (versus financial optimism) on participants' emotions and on participants' reasoning performance (as well as confidence). Financial optimism versus pessimism was primed between participants using encouraging versus deleterious news about the Portuguese economy. In order to control for valence effects and evaluate to what extent the financial domain played a distinctive role two more conditions were added which primed participants with pessimistic and optimistic news about other non-financial social issues. Logical reasoning was measured using syllogisms. The valence and content matter of these syllogisms was manipulated. Syllogisms were either neutral or emotionally negative. Emotionally negative syllogisms had financial or non-financial contents. Such manipulation allowed us to test the differential effect reported by Blanchette et al. (e.g., Blanchette & Campbell, 2012) of integral versus incidental emotions on logical reasoning. According to these previous findings, financially preoccupied participants (i.e., primed with the pessimistic view of the Portuguese economy) should show better performance in syllogisms with financial content (as these problems would be more relevant for Portuguese participants who have experienced the recent economic crisis).

3. METHOD

3.1. Participants

A total of 118 participants (66 women), with ages ranging between 18 and 52 years old (M = 25.6; SD = 7.88) participated in the study. Data was collected in Portugal via an online questionnaire.

3.2. Material

Table 1.
Examples of the 4 configurations of problems with neutral, non-financial and financial contents.

Credibility	Content	Valid Non-conflict	Not valid Conflict
Credible	Neutral	All flowers need water. All roses are flowers. Therefore, all roses need water.	All fruits have vitamins Oranges have vitamins. Therefore, oranges are fruits.
	Negative Non-Financial	All cancer treatments are painful. Chemotherapy is a cancer treatment. Therefore, chemotherapy is a painful treatment.	All contagious diseases are serious. AIDS is a serious disease. Therefore, AIDS is a contagious disease.
	Financial	All minimum wage workers have financial difficulties. Call-center workers are payed the minimum wage. Therefore, call-center workers have financial difficulties.	All financial products have bank fees. Credit cards have fees. Therefore, credit cards are financial products.
		Valid **Conflict**	**Not valid** **Non-conflict**
Not credible	Neutral	All animals have eyes. Viruses are animals. Therefore, viruses have eyes.	All birds have wings. Dogs have wings. Therefore, dogs are birds.
	Negative Non-Financial	All criminals cause suffering to their victims. Psychotherapists are criminals. Therefore, psychotherapists cause suffering to their victims.	All infectious diseases cause many deaths. Gastritis cause many deaths. Therefore, gastritis is an infectious disease.
	Financial	All government companies charge fees. NGOs are government companies. Therefore, NGOs charge fees.	All motor vehicles are taxed. Bicycles pay taxes. Therefore, bicycles are motor vehicles.

Twelve syllogisms were created with different contents: four with neutral content, four with negative non-financial content (e.g., content mater involving diseases) and four with negative financial content (e.g., content mater involving debts and interest rates). The syllogisms' validity and credibility was manipulated orthogonally. As a result, there were four possible configurations for each type of content. Syllogisms in which credibility and validity did not match (credible but not logically valid or not credible but logically valid) were considered conflict problems (as they present a conflict between the logical deduction and the credibility of the conclusion) and the remaining were considered non-conflict problems (as the logical validity and credibility of the conclusion converge in the same answer; see Table 1).

3.3. Design

The study had a 4 x 3 x 2 x 2 experimental design, with Emotional priming (financial positive, N = 26; financial negative, N = 37; non-financial positive, N = 28; non-financial negative, N = 28) as a between-participants factor and syllogism contents (neutral, non-financial, financial), syllogism credibility (credible, not credible), syllogism validity (valid, not valid) as within-participants factor.

3.4. Procedure

Participants were invited to participate in two separate studies. In the first study, they were asked to respond to a pre-test of items to be included in a questionnaire concerning people's perception of the present state of the national economy (the emotional priming task). In the second study, they were requested to respond to a series of conditional reasoning problems or syllogisms (the reasoning task).

The priming task was inspired in priming manipulations developed by Salancik (1974; Salancik & Conway, 1975), and consisted in presenting participants with six paragraphs (presented in pairs with each paragraph accompanied by a related image to reinforce the emotional response). All paragraphs were real excerpts from the news media. For each pair of paragraphs, participants were asked to choose the one they considered more relevant and striking. For each participant, the six paragraphs were either all about the Portuguese economic context or about content unrelated to economic or financial issues (e.g., sports). Additionally, for each participant the six paragraphs were all positive or all negative in valence, thus creating four conditions (financial positive or negative and non-financial positive or negative). After evaluating the six pairs of paragraphs, participants responded to a manipulation check in which they indicated, for each of 19 emotions (obtained and expanded from Gross & Levenson, 1995), how intensely they felt them during the presentation of the news (pairs of paragraphs) in a scale from 1 ("did not feel at all") to 7 ("felt totally").

Following the priming task, participants were debriefed, thanked for their participation in the first study and directed to the second study. The second study was introduced as a pre-testing of reasoning problems in the form of syllogisms to be used in a future study. Participants were asked to respond, for each syllogism, if its conclusion derived logically from the premises and how confident they were in their response - in a scale from 1 ("not confident at all") to 7 ("completely confident"). Participants were informed that in all syllogisms they should accept the premises as true and focus only on evaluating the logical validity of the conclusions (this warning was repeated before the presentation of each syllogism). After responding to the 12 syllogisms, participants were debriefed and asked how many studies had they performed, what was each study's goal and if they thought there was any relation between studies. These questions were used to verify the credibility of the two independent studies cover story.

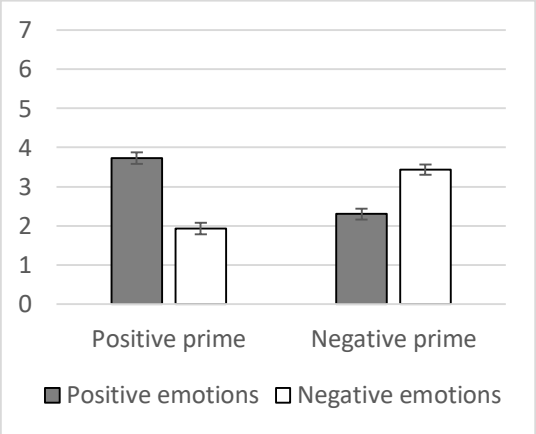
4. RESULTS

4.1. Manipulation check

Ratings of the emotions felt during the evaluation of the news were included in an exploratory factor analysis. Two main factors emerged, explaining 53% of the total variance. The first was a negative valence factor composed of 13 emotions (alert, anxious, unmotivated, disgusted, irritated, insecure, annoyed, nervous, apprehensive, outraged, tense, sad and angry) that explained 40% of variability with loadings varying between .421 and .864; the second was a positive valence factor composed of 4 emotions (confident, entertained, hopeful, satisfied) that explained 14% of variability with loadings varying between .464 and .663.

Responses from emotions in each factor were averaged by participants and included in a 2 X 2 X 2 ANOVA with Emotion Valence (positive, negative) as a within-participants factor, Priming Valence (positive, negative) and Content (financial, non-financial) as between-participants factors. A significant main effect of Emotion Valence showed that mean intensity of positive emotions (M = 3.01, SE = .10) was significantly higher than mean intensity of negative emotions (M = 2.68, SE = .10). The only significant interaction was between Emotion Valence and Priming Valence $F(2, 228) = 104.54$, $p < .001$, $\eta_p^2 = .48$, showing the expected pattern of more presence of negative than positive emotions after negative valence priming when compared to positive valence priming (see Figure 1). This indicates that the priming manipulation elicited the desired emotions in participants.

Figure 1.
Intensity of positive and negative emotions by emotions primed.

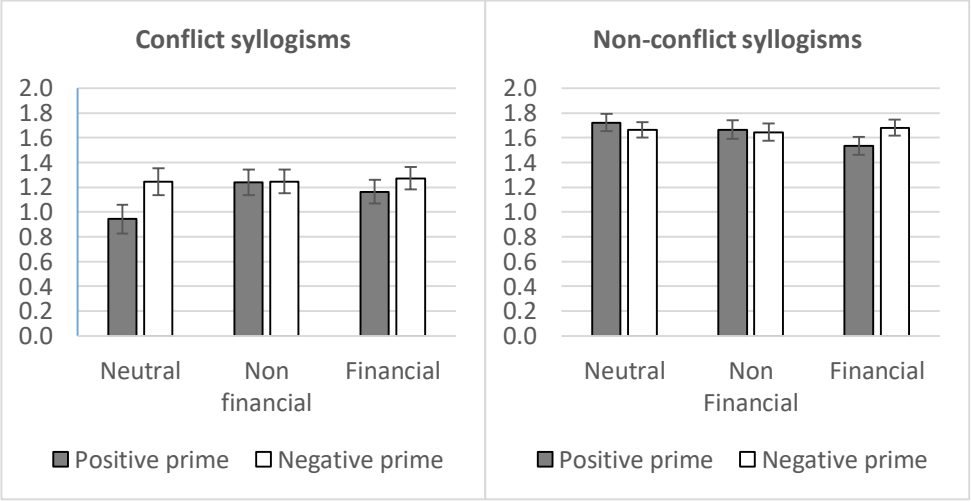


4.2. Accuracy in syllogisms

Number of correct responses to syllogisms by participant were analyzed in a 2 X 2 X 3 X 2 ANOVA with Priming Valence (positive, negative) and Priming Content (financial, non-financial) as between-participants factors, and Syllogism Content (neutral, non-financial, financial) and Syllogism Type (conflict, non-conflict) as within-participants factors.

There was a significant main effect for Syllogism Type, $F(1, 115) = 77.64$, $p < .001$, $\eta_p^2 = .40$, indicating, as expected, more correct judgements for non-conflict problems than for conflict problems. There was an interaction between Syllogism Content and Syllogism Type, $F(2, 230) = 4.07$, $p = .018$, $\eta_p^2 = .03$, indicating that conflict problems with neutral content led to lower accuracy (M = 1,09, SE = 0.08) than both non-financial (M = 1,24, SE = 0.07) and financial content problems (M = 1,22, SE = 0.07), $F(1, 115) = 5.22$, $p = .024$, $\eta_p^2 = .04$, while in non-conflict problems accuracy for neutral content (M = 1,69, SE = 0.05) was not significantly different from accuracy for both non-financial (M = 1,66, SE = 0.05) and financial content problems (M = 1,61, SE = 0.05), $F(1, 115) = 1.81$, $p = .181$, $\eta_p^2 = .01$. A second order interaction between Syllogism Content, Syllogism Type and Priming Valence, $F(2, 230) = 3.58$, $p = .029$, $\eta_p^2 = .03$, indicate that the pattern of lower accuracy for conflict neutral problems is observed only after positive valence priming and not after negative valence priming. This is confirmed by a significant difference in accuracy between problems with neutral content (M = 0.94, SE = 0.12) and problems with both financial (M = 1.16, SE = .10) and non-financial content (M = 1.24, SE = .10), $F(1, 115) = 8.74$, $p = .004$, $\eta_p^2 = .07$, after positive priming but not after negative priming, $F<1$ (see Figure 2).

Figure 2.
Proportions of corrects judgments of conflict and non-conflict syllogisms with different contents under positive and negative priming.

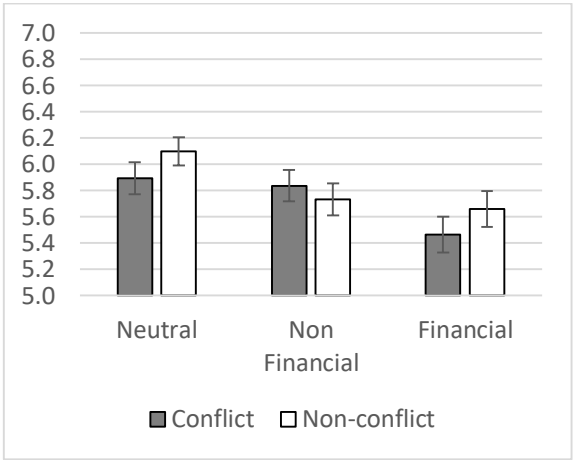


4.3. Confidence in responses to syllogisms

Response confidence in syllogism judgments correlates positively (albeit not strongly) with judgment performance for all types of contents (with correlation coefficients ranging between .19 and .34, $ps < .034$). The same 2 X 2 X 3 X 2 ANOVA used for accuracy in responding to the syllogisms was performed with participants' confidence on their responses as a dependent variable. There was a significant main effect of Syllogism Content, $F(2, 230) = 18.27$, $p < .001$, $\eta_p^2 = .14$, indicating that response confidence for problems with neutral content (M = 5.99, SE = .11) was higher than response confidence for both financial and non-financial contents, $F(1, 115) = 28.15$, $p < .001$, $\eta_p^2 = .20$, while response confidence for problems with non-financial content (M = 5.78, SE = .11) was higher than response confidence for problems with financial content (M = 5.56, SE = .13), $F(1, 115) = 9.22$,

p = .003, η_p^2 = .07. There was also an interaction between Syllogism Content x Syllogism Type, $F(2, 230) = 3.45$, p = .033, η_p^2 = .03. Response confidence for conflict problems (M = 5.89, SE = .12) and non-conflict problems (M = 6.10, SE = .11) with neutral content were significantly different, $F(1, 115) = 5.78$, p = .018, η_p^2 = .05; while the difference in response confidence in problems with financial content between conflict syllogisms (M = 5.46, SE = .14) and non-conflict syllogisms (M = 5.66, SE = .14) were marginally significant, $F(1, 115) = 3.72$, p = .056, η_p^2 = .03. However, response confidence in problems with non-financial content showed no significant difference between conflict (M = 5.83, SE = .12) and non-conflict versions (M = 5.73, SE= .12), $F(1, 115) = 1.30$, p = .257, η_p^2 = .01 (Figure 2).

Figure 3.
Confidence means for conflict and non-conflict syllogisms with different contents.



4.4. Mediation analysis

To further explore the impact of the positive and negative valence priming manipulations on accuracy and confidence in responding to the syllogisms, we first computed the difference between positive and negative relevant emotions (as identified in the factor analysis) to create an affect score for each participant (positive values indicate a mean positive affect whereas negative values indicate a mean negative affect). We then computed overall accuracy and confidence scores aggregating the syllogisms with different contents. Two mediation analysis were then conducted. The first one tested the hypothesis that the impact of the priming valence on accuracy in responding to syllogisms is mediated by the emotions. In other words, if negative priming (compared to positive priming) would lead to an increase in mean negative affect (i.e., more negative emotions and/or less positive emotions), leading to worst performance in logic syllogisms. Indeed, besides a direct effect of priming valence on accuracy 95% CI = [.0145; .3372] a bootstrapping analysis (5000 resamples) using the PROCESS macro (Hayes, 2012), shows that mean affect scores mediated the effect of priming valence (i.e., positive or negative priming) on accuracy, 95% CI = [-0.2417; -0.0041]. The second mediational analysis tested if the impact of priming valence on confidence was mediated by emotions (i.e., participants' affect score). Using the same statistical procedure, we found a direct effect of priming valence on confidence ratings, 95% CI = [0.1924; 1.3941] and also an indirect effect, showing that mean affect mediated the effect of priming valence on confidence, 95% CI = [-09804; -0.0162].[1]

5. DISCUSSION

The results from our study suggest an effect of emotion valence on logical reasoning performance. There is a consistent difference in performance between neutral problems responded under a positive priming condition and the remaining ones. Interestingly, this is the only instance in which there are no negative emotions evoked. In all other instances there are negative emotions evoked by either the negative priming, the negative content of non-financial and financial syllogisms, or both. Negative priming (financial or non-financial) and/or responding to negative valence problems (regardless of the financial or non-financial content of these problems) seem to be enough to enhance decision behavior in logic deductive tasks such as syllogisms that present a conflict between logic validity and credibility.

To further explore the impact of the positive and negative priming manipulations on accuracy and confidence, we conducted two mediation analysis, which showed that the effect of the valence of the priming on participants' accuracy and confidence in responding to conflict syllogisms was mediated by participants' emotions. In other words, generally negative and deleterious news versus positive and encouraging media news (regardless of the financial or non-financial content matter of the news) induced net negative emotional states, which then lead to improved accuracy and confidence in responding to logical deductive tasks (syllogisms).

These results are in line with the argument that negative affect leads to more analytical processing whereas positive affect leads to more heuristic processing (Worth & Mackie, 1987). In order to account for the differential effects of negative and positive affect on cognitive processing, Schwarz and Clore (2007) proposed the affect-as-information theory, which suggests that affect serves an adaptive signaling function that directs cognitive processing (Schwarz, 1990, 2010). More specifically, positive affect signals a safe and benign environment and consequently leads individuals to rely on more shallow top-down processing (e.g., heuristics); whereas negative affect signals threat or the presence of a problem and consequently more systematic processing (e.g., Huntsinger, Isbell, & Clore, 2014).

The effect of subjectively appropriate integral emotions found in Blanchette et al. (2007) and in Blanchette and Campbell (2012) was not replicated. The enhanced performance in judgment of syllogisms with financial content was the same after priming with financial and priming with non-financial content. We are not the first to fail to replicate this result. Eliades, Mansell and Blanchette (2013) have also failed to find the effect (although the reasoning task used was a base-rates neglect task instead of syllogisms). In our case, the way we operationalized integral emotions was through priming financial preoccupation and responding to financial content syllogisms, whereas Blanchette and Campbell (2012) tested performance of army veterans on combat-related emotional syllogisms. There probably was in their problems a stronger link to personal (integral) experience. More research is certainly needed to further explore the differential effect of integral and incidental emotions.

Interestingly, syllogisms content seems to have had somewhat opposite effects on judgment performance and confidence in the case of conflict problems. When compared to neutral content, negative (financial and non-financial) content improved performance but lead to a decrease in confidence (particularly in the case of financial content). Such pattern of results suggests that financial related negative content enhanced attention and recruited participants' cognitive resources to more carefully deliberate and respond to logical reasoning problems. However, such content simultaneously increased subjective uncertainty and hesitation translated into lower confidence levels on participants' own answers. This result is also in line with the affect-as-information theory, which proposes that positive affect

increases confidence and thus promotes reliance on short-cut strategies (see Efklides, 2016, for a review).

As aforementioned, Sidi et al. (2018) found that positive affect enhanced participants' confidence (as well as success in cognitive processing). In contrast, in our results positive priming (compared to negative priming) lead to lower performance and lower confidence. However, there are potentially relevant differences between the two studies. First, Sidi et al. (2018) only used positive emotional priming and neutral priming conditions; second, they used general knowledge questions as the cognitive task rather than a logical reasoning task. Further research could explore more systematically the extent with which these differences may explain the disparity in results.

Finally, the increase in deliberation and decrease in subjective confidence found in our study might signal the beginning of a response to a context pointing to the risk of future economic difficulties. Had this context been maintained and the mental (and physical) weariness brought about by long-term deliberation efforts and preoccupation it could have increased levels of stress and deteriorated performance (Lund et al., 2010). In fact, this is in line with Mani et al. (2013) interpretation of their own results according to which, cognitive impairment can be the product of long-term financial preoccupations. In the short term, however, priming negative scenarios of economic difficulties seems to evoke negative emotions that improve logical decision-making.

6. FUTURE RESEARCH DIRECTIONS

An interesting venue for future research would be to show increased and decreased reasoning performance under emotional stress from financial issues over a time lapse. Priming participants with scenarios of economic difficulties could trigger a coping mechanism to a stress related response (e.g., Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986), leading participants to engage in additional cognitive effort, thus improving logical reasoning in the short run. However, overtime, the depletion of cognitive resources could lead to a decrease in performance.

In responding to syllogisms, as the ones used here, participants are thoroughly warned to ignore the believability of the syllogism content and focus on its logical validity. This is deemed a necessary condition to guarantee that when participants fail to respect the syllogism logic, they are actually failing to inhibit the intuitively appealing (but wrong) believable answer and not just misunderstanding the task. As a result, participants never fail to detect the conflict because they are explicitly told about it. This is unfortunate because one of the key aspects of rational behavior is the ability to detect the conflict between alternative responses in reasoning problems (e.g., Stanovich, 2009). Indeed, conflict detection triggers the need to engage in more reasoning before responding. If participants fail to detect the conflict, they will not engage in effortful deliberate reasoning (even if they have the ability and cognitive resources to do so). This was something that, by design, the current study could not address. However, there are other reasoning tasks that do not involve the need of such explicit warnings. These reasoning tasks (e.g., base-rates neglect task) could be used in future research to assess not only participants' ability to inhibit intuitive responses but also their ability to detect the conflict that calls for such inhibition effort in the first place. In sum, a relevant follow-up for the present study would be to verify if negative priming valence (i.e., financial or non-financial pessimism) could improve reasoning performance even in tasks where conflict detection is a necessary first step to respond rationally or if it only improves reasoning performance once the conflict (in reasoning tasks) is pointed out to the participants as it happened in the current study.

7. CONCLUSION

Our manipulations of a positive or negative perspective of the country's economic future did not improve reasoning problems with financial contents specifically, but financial content in reasoning tasks promoted focus and systematic processing akin to a processing style derived from negative moods. Negative emotions, either evoked by the priming task or by the problem content, lead to better performance and worse confidence, in line with affect-as-information theory (e.g., Schwarz & Clore, 2007) but in contrast with other research (e.g., Sidi et al., 2018). Our findings add to the extant literature concerning the ongoing debate on the relation between emotions and reasoning. By studying the effects of media news valence and content, we bring this discussion to more applied settings extending its implications to how people's socio-economic environment might affect their judgment accuracy and how these effects are at least partially mediated by emotions.

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[1] In the mediation analyses, the direct effects of priming valence on accuracy/confidence are positive because positive priming was coded "1" and negative priming was coded "2". Hence, increase from "1" to "2" is associated with an increase in performance / confidence. The indirect effects are negative because net affect was computed as "mean rating of positive emotions – mean rating of negative emotions". Hence, a decrease in net affect is associated with an increase in performance / confidence.