

## **The impact of narration, sentiment, and emotional modulation on economic of decision-making: a multidisciplinary study**

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**Abstract:** The article delves into the interplay between narration, sentiment, and decision-making processes, particularly within the realm of economic choices. Emphasizing the pivotal role of message content, the authors present a hypothesis depicting the profound impact of narration, characters, and sentiment in the communication process. These components wield significant influence over the emotional facets of decision-making, influencing the process or prompting alterations to initial decisions. Critically challenging established economic paradigms, the article underscores the indispensable emotional dimension inherent in communication. Drawing upon the scholarly contributions of eminent figures like Robert J. Shiller, the authors synthesize insights from psychology and neurobiology, unraveling the manipulative essence inherent in narration. In the theoretical section, the article also references Uri Hasson's theories and research on brain synchronization during the communication process. The practical segment of the article substantiates these claims through the presentation of findings from neuropsychological studies. The study confirms the hypothesis that narratives infused with high sentiment resulting from emotional interactions, following a cause-and-effect structure with a visible beginning, development, and end, lead to better synchronization and intensify neuronal responses. The structure, plot shaping, and sentiment in messages, influenced by word choice, shape narrative economy and impact cognitive costs in decision-making. The obtained results confirm that precisely tailored narration effectively reduces cognitive costs associated with the decision-making process. This validates the authors' hypothesis, opening up space for research replication and falsification of the results obtained.

**Keywords:** neuroscience, decision making, behavioral psychology, cognitive science, economic psychology

**JEL classification:** M3

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This article provides the basis for the research methodology conducted as part of research project number 2020/37/B/HS4/0261, which aimed to investigate the impact of communication and affect on inflation estimation. The study of the impact of communication on forecasting methods parallels the approach of the first neuromarketing study, which aimed to investigate the impact of specific communication on brain activity and, consequently, on consumer decision-making. Both projects provide insights into the complex nature of decision-making by the irrational human brain.

## **1 Introduction**

The article presents the influence of narration and sentiment resulting from the emotional dimension of communication on decision-making, including economic decision-making by the recipient of a communication. The article introduces a hypothesis on the importance of narration for the decision-making process, especially given the importance of the character used and the sentiment in the communication, which leads to the appearance of emotional affect as a factor accelerating the decision or changing the original decision. In the discourse along the lines of economics, cognitive psychology and cognitive science, what comes to the fore on the qualitative side is the value and quality of the message that forms the basis for entry into any thought process. The message itself matters, which casts doubt on the imperialism of the traditional approach in economics, as discussed in the article on narrative economics by Lukasz Baszczak (Baszczak, 2023). According to the researcher, insufficient insight into the complex structure of the decision-making process stems from economists' overly superficial and purely quantitative treatment of texts as narrative vehicles. The underestimation of the importance a message's impact has on perceptions of intricate economic problems may also be due to the scarcity of research focusing on detailed analysis of how specific narratives work. The narrative, the character used in it, as well as the intensity of the sentiment, i.e. appropriately chosen words, terms and phrases evoking emotions, in the communication have an impact on the formation of behaviour, preferences as well as the way of thinking and the final decision. Narratives in the above context can be defined as stories that contain a series of mininarrations with a cause-and-effect structure that revolve around the primary and secondary characters in them. The important point is that these stories evoke a range of emotions in the recipients of the communication, influencing their decisions and behaviour. Emotions are reduced to sentiment as one layer of the message. These narratives are not only thematically but also culturally diverse, conveying meanings but also providing a framework related to the perception of individuals as well as whole groups of people and societies.

The paper attempts to verify the hypothesis of the influence of the message on the decision-making process, thus on the cognitive costs of economic decision-making. The protagonist of the narrative and the sentiment contained in the communication can accelerate the decision or lead to a change in a previously made decision. In order to prove the truth of this hypothesis, the first part of the article will present references to researchers working in the field of narrative economics. Noteworthy in this context is the position of researcher Robert J. Shiller, who advocates the introduction of narrative economics into economic theory and macroeconomic factors as one of the main elements profiling the choices, decisions and behaviour of individuals (Shiller, 2019). In the book *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism*, Shiller and Akerlof prove that there are narratives as emotionally charged messages that reach individuals and massively shape their behaviour as well as macroeconomic trends (Akerlof, Shiller, 2009). Another issue addressed in the article, which is part of narrative economics, will relate to sentiment as an important determinant in economic decision-making, based on Hochschild's (1983) theory or Kahneman and Tversky's (1979) *Theory of Perspective*. A further step towards presenting the multi-perspective impact of a narrative understood in terms of a profiled emotion-drenched message read in a subjective way will be provided by a neuroscience approach, which, based on Uri Hasson's (2016) theory of brain synchrony during the communication process, will provide a deeper insight into the manipulative essence of a story with a main character in the background as a carrier of meaning with a strong manipulative impact on its recipient. On the other hand, the practical part of the article will describe the findings of a neuropsychological study conducted with the help of EEG, which aimed to demonstrate the different impact of two messages on the recipients' decisions, where one of the messages displayed a storytelling structure with a clearly outlined narrative protagonist, which provided the basis for identification, better

communicative synchronisation. The other message had a factual structure, without the use of protagonists, and contained dry data, figures and geographical information. Both messages were about the place marketing industry. The conclusions of the described study prove Shiller and Akerlof's approach of narrative economics as well as going further towards the possibility of lowering the cognitive costs of decision-making through a profiled form of narrative communication thus proving the hypothesis posed at the beginning of the article.

## **2 The Economics of Narrative: Theories, Mechanisms and Implications**

### **2.1 The economics of narrative**

In a theory dedicated to the economics of narrative, Shiller uses terminology familiar from virology (Shiller, 2019). According to the researcher, stories can cause investment bubbles, shape expectations or demand en masse, and influence inflation rates. Akerlof and Schiller define narratives as stories that people tell themselves and others (Akerlof, Shiller, 2009). The structure of a story has the characteristic of an emotionally arousing message. Therefore, it is impossible to convey a neutral message. As a rule, its overtone will be emotional and the decoding of the message between the sender and the receiver will occur in an individualised and even subjective way, depending on experience, thinking and perception of reality. The stories take the form of a temporally following sequence of causally related events.

According to the researchers, narrative is a scheme for interpreting lived experiences and plays a number of roles in decision-making and the forming of preferences. Johnson, Bilovich and Tuckett (2022) have demonstrated in their research that narratives are not necessarily true, objective explanations of the world, and that the chosen narrative need not necessarily describe the world most accurately. Researchers argue that stories should be compared to a basic mental representation ('structured higher-order representation') that underpins the processes that enable decision-making. In the field of cognitive science and brain science, it is postulated that narrative should be defined as a set of individual stages that lead the individual to subjective insight. This begins with the narrative selection stage, where the subject selects the narrative that best explains the raw data encountered in the external world. This narrative is then used to imagine scenarios of the future. The scenarios themselves depend on the choices made. When it comes to choices, the perception of the subject and the emotions felt as a result are the most significant. These reactions serve to evaluate the scenarios and motivate the actual choice. In other words, a decision is made to permanently take a specific action. Narratives are thus the mental substrate of the decision-making process and permeate the decision-making process (Johnson, Bilovich, Tuckett, 2022). They can be defined as summative representations of information that are relevant causally, temporally, normatively or because of the analogy of the situation. Narratives support four related processes that occur in decision-making and action in the following order: exploration, simulation, affective evaluation and communication (Johnson, Bilovich, Tuckett, 2022). Due to the subjective nature of story transmission, decisions based on decoded narratives are made irrationally rather than rationally, as also demonstrated by Dan Ariely (Ariely, 2008). Ariely thus rejects the *homo oeconomicus* theory, which assumes that individuals are fully rational. The belief in an individual's rational insight comes from the belief that people have full information about the market around them and the opportunities from which they can choose. According to the traditional approach in economics, individuals function in such a way as to maximise profit and act solely in their own interests, without regard to the needs of others. The key word here is human rationality, which is questioned by behavioural economists (Kahneman, 2007). The behavioural approach in economics draws attention to the important fact that rationality presupposes the disregard of actual, widely understood choice criteria. These choice criteria depend on individuals, on internal and external conditions, on perspective and reference point. In real-life purchasing situations, the number of incentives that affect the individual is so large that rationality

becomes, in the eyes of behavioural economists, a myth, a simplification of reality (Kahneman, 2011). The relativity of the factors influencing the decision-making process is also emphasised by Schiller and Akerlof (2009), who point out that this relativism and irrationality arise from stories, which form the basis and the foundation for the initiation of higher thought processes, i.e. for making decisions, forming judgements about reality, formulating views and preferences. Stories spread virally, influencing their surroundings thanks to the emotional layer contained within them. The cause-and-effect process influences the flow of information, and the introduction of characters into the narrative implies a human factor that increases the motivation of the communicating parties to exchange information. Stories distort reality at the same time as mapping it from a given scale containing misrepresentation, error, subjective insight. This is also evidenced by Kahneman and Tversky's *Perspective Theory*, in which the researchers described the subjectivity of thinking resulting from, among other things, emotional load.

## **2.2 Emotions in decision-making processes**

Neuropsychology shows that individuals experience emotions in a subjective way that manifests itself in different decision-making and behavioural patterns. The affective perception is the first reaction, which then guides information processing and decision-making. Thanks to neuroscience, Neumann and Morgenstern's theories could be challenged. According to Neumann and Morgenstern (1976), the sum of satisfaction and the probability of its occurrence were to form the basis of rational decision-making under risk. They rejected the subjectivity of decisions.

A rational person, guided by maximising expected utility, will choose the basket with the highest expected utility. The theory recommends choosing the action with the highest expected utility and not necessarily the action with the highest expected value. This approach will be criticised with the findings of Kahneman and Tversky (2011), who, in line with *Theory of Perspective*, showed that market participants almost never behave in such a way as to increase long-term returns by applying all necessary information. Human cognition, according to the researchers, is profiled by cognitive distortions. People are overconfident, overly optimistic and overly attached to certain details that obscure the existence of other details. Individuals are short-sighted, failing to see long-term benefits, and are determined to make short-term gains based on felt emotions.

The feeling of emotion depends on the stimulus that acts on the cognitive system. Stories, by virtue of their structure, must rely on intense stimuli that can be easily understood, assimilated and processed. Narratives are based on simplifying, contrasting, presenting events in a parsimonious, schematic way while maintaining a cause-and-effect development of events. This story structure, together with the protagonist introduced into the story, reinforces the subjective, cognitively loaded human mind. The characters use language, words, phrases to communicate, which themselves generate emotions. The sentiment in the communication accompanying the development of the narrative used in the storyline results from the mapping of the language used by the interlocutors in the communicative conditioning of reality through the exchange of information about people, human fates, problems, pleasures, disasters and failures in the conversation.

The irrationality of the message is reinforced, in addition to the sentiment and structure of the story, by the neuromechanism discovered by Uri Hasson, which points to the ability of communicating brains to become better synchronised, i.e. to make a communicative connection that facilitates communicative alignment with the other person (Hasson, Frith, 2016). The more the narrative structure resembles a storytelling message relating to a human story, resulting in a better identification with the protagonist, the more effective the synchronisation of the communicating brains of *homo sapiens*.

### **2.3 Synchronisation in communication**

The communication process cannot take place without reaching an agreement between the sender and receiver of the message. Understanding takes place at the level of the linguistic code used, common culture, and the system of certain shared meanings, i.e. the semantic space. In addition, synchronisation between the sender of the message and the receiver also takes place in behavioural and neuronal space. Conformity at the behavioural level takes place through the process of mirror conformism involving mirroring the other person's behaviour.

The parties in the process of information exchange adapt their behaviour to each other, mirroring and sometimes complementing them. A similar synchronisation occurs at the level of neuronal synchronisation process at the level of two communicating brains, and therefore minds in cognitive terms (Hasson, Frith, 2016).

According to Uri Hasson (2016) the interactions of interlocutors in the process of communication presuppose the synchronisation of neuronal processes taking place in their brains. According to the researcher, interactions between individuals are dynamically interconnected and not merely consensual. Hasson's proposed broader optics for understanding what happens during the interactions of communicating individuals encompasses both processes in which individual actions occurring at the neuronal level in the brains of communicating individuals mirror each other (neuronal congruence) and situations in which one person's brain activity is related to (but does not mirror) the dynamics of the other person's brain.

In this way, there is a process of complementarity in the case of brains in communication. Uri Hasson (2016) points to the mirror neurons discovered by Giacomo Rizzolatti as the basis of communication. Mirror neurons were discovered by Rizzolatti (2008) as an area involved in learning new skills through imitation, understanding other people's actions, simulating other people's behaviour. simulating the intentions, thoughts and even emotions of others, and finally as an area involved in language acquisition. The mechanism anchored in the human brain enables synchronisation, which is an important factor in the construction of social interactions.

Interactions with other members shape human behaviour in the world, and conformity is a pervasive feature of such interactions. Synchronisation facilitates cultural learning, cultural maintenance and group cohesion.

An example of synchronicity may be the automatic imitation of postures, manners and facial expressions during face-to-face interactions. Hasson (2016) argues that an important form of abstract conformity, arguably uniquely human, is that created by culture. In some cases, synchronisation may occur at a low basic level and the compliance response may be considered a simple reflection of the low level response. In some more complex cases, synchronisation may occur in areas that are based on action. In higher-order areas, reactions between two brains may be similar only if meanings and intentions are shared between brains in a particular context.

Such synchronisation can be considered as intention-based matching. This intention-based mechanism usually depends on abstract inferences that take into account the context. Such matching can no longer be considered as strictly tailored to the motor system.

According to Hasson, dynamic coordination between human brains often includes complementary behaviours, not just mapping (mirroring) or parallelism.

In the context of assessing the attractiveness of the message itself to the brain processing the message, Uri Hasson's concept seems to have the potential to enrich the discourse. For a message to be attractive, it must be characterised by an emotional layer, which the more expressive and elaborate it is, the more attractive it is to process and remember. Also a specific narrative structure based on leading human characters creates a narrative that is easily and clearly decodable.

Complementing the previous discourse, Hasson's view of complex neural dynamics played out at the level of the brain in communication, e.g. reflected at the level of motor skills, tone of voice, speed of speech, but also word choice, with complementary synchronisation mechanisms, but also neuronal and sometimes complementary neuronal, and sometimes even mental complementarity, broaden the specification of the characteristics of the message that comes to the fore in terms of attractiveness. Research using modern neuroimaging techniques have shown that a properly designed message is able to lead to a change of mind in people initially determined to choose another option, as evidenced by an EEG study on tourism destination decision-making.

## **2.4 Description of the conducted research**

The study was conducted in 2022 and the tests lasted from October 2022 to December 2022. The study was conducted on a group of senior students at a Polish university. The study was designed in three stages.

The first stage was to solve psychological tests to investigate the personality profile of the study participants. This was important from the point of view of personality, measured on a scale of the level of neuroticism, a trait affecting, among other things, the sensitivity with which the recipient of a message processes a stimulus.

The personality test also made it possible to rule out burdened personalities.

The next stage was an interview, consisting of a short conversation exploring the participants' preferences for a possible tourist destination. Respondents had a choice of two cities, one in Poland and the other in the United States. Cities of comparable size had the important difference that they were located on two different continents. Respondents had never been to either city.

The final stage of the study was a neuropsychological test using an electroencephalograph to verify the verbal declaration given in the second part of the study with the neuronal mechanisms taking place in real time while viewing the advertising spots for one and the other city. Importantly, at the end of the neuropsychological study, respondents were asked to verify their previous choice as to their desire to visit the chosen location.

For the purposes of this article, which examines the hypothesis regarding the impact of message sentiment and the impact of message structure on reducing the cognitive costs of decision-making, only the part of the study devoted to the change in the decision previously made by participants under the influence of a more cognitively appealing place marketing message will be discussed.

The table 1 shows the characteristics of the study group.

Half of the group were women and the other half men. The age of the subjects, due to the specificity of the study (brain changes occurring over a lifetime), was narrowed down so that all subjects were aged between 30 and 40 years (the age span was 10 years).

This premise was important in terms of the emotional and cognitive maturity of the brains, which can be considered mature brains from the point of view of the neuronal processes occurring in human brains up to around the age of 30.

**Table 1.** Characteristics of the examined group – socio-demographic features.

variable	specification	number	%
sex	woman	10	50
	man	10	50
age group	30 – 35	7	35
	36 – 40	13	65
education	secondary or vocational education	8	40
	higher	12	60
residence	town of over 100,000	20	100
marital status	single	7	35
	married	8	40
	divorced	3	15
	in an informal relationship	2	10

Source: own study based on the conducted surveys (2022)

After undergoing psychological tests to profile the respondents' personalities, the respondents were faced with a choice of two places they would like to see.

The table below shows the results of the interviews with the respondents.

**Table 2.** Results of interviews

category	number	motivation to visit the city
Respondents who showed a desire to visit city in Poland	5	quiet peaceful place, kayaks, river, green city, revitalization, smart city
Respondents who showed a desire to visit city in the USA	15	my dream is to see the United States; I have never been there; a city known from movies; attractive tourist destination; something new

Source: own study based on the conducted surveys (2022)

At the end of the survey, after viewing two materials that differed in narrative structure and sentiment, respondents were asked to revise their choices before viewing the advertising spots.

The table below shows the results of the interview at the end of the survey, together with the reasons for the choices made.

**Table 3.** Results of the interviews after watching the advertisements for both cities

category	number	motivation to visit the city after watching the film
Respondents who showed a desire to visit city in Poland	13	charming narrow streets; valuable historical landmarks; intriguing places to explore; vibrant and lively colorful lanes; people relaxing in cozy pubs – it's a perfect spot for spending a weekend with family and friends
Respondents who showed a desire to visit city in the USA	7	modern buildings; elegant spacious streets, huge traffic; monumental architecture, vast urban space; modern city

Source: own study based on the conducted surveys (2022)

Of the group of respondents, the destination decisions were changed by those who had originally decided to visit the United States. Only 7 people stayed with their original decision. The rest of the group strongly in favour of the States changed their minds. This was most likely influenced by the viewed communication characterised by a more attractive narrative structure, a defined storytelling plot, defined clear story characters, high sentiment and better potential for neural synchronisation.

The results of the study by means of EEG confirm the subjects' interest in the viewed advertising spots of the two locations. Based on the observation of brainwaves, it was possible to determine the different processing pattern by the cerebral hemispheres for the two marketing messages, which differed in terms of the development of the narrative about the two cities in Poland and America. The results are presented in Table 4.

**Table 4.** Average results of amplitude of waves ( $\beta$ ) in the frontal lobe (polish city and city in the USA)

side	waves	N	Average (PL)	N	Average (USA)
right (R)	B1	20	19.7	20	19,5
	B2	19	21.2	20	19,3
left (L)	B1	20	21.3	20	19,1
	B2	19	20.0	18	20,4

Source: own study based on the conducted research (2022)

The above results suggest that stimuli presented in a film about a city in Poland evoked higher beta 2 wave amplitudes on the right side of the frontal lobe and higher beta 1 wave amplitudes on the left side. Beta 2 waves are associated with intensive cognitive processing, as well as excitement or arousal, while beta 1 waves are associated with concentration and attention directed outwards to find the causal narrative development (Byrne, Bonfiglio, Rigby, Edelstyn, 2022). The consistent presence of these



waves in all subjects indicates a strong neural response to the material about the Polish city, a state of focus and tracking of the presented content, a state of strong attention and intellectual effort, and a state of strong focus and engagement of attentional processes. Right cerebral hemisphere activity and beta waves in the right cerebral hemisphere may be associated with different responses when viewing an advertisement involving humans (Byrne, Bonfiglio, Rigby, Edelstyn, 2022).

The right hemisphere is often involved in impulsive processing, when the researcher can feel the excitement, the dynamism of the material being viewed. In addition, the right hemisphere plays a key role in recognising faces and analysing facial expressions. When watching a commercial about people, activity in the right hemisphere and beta waves in this hemisphere may suggest focusing on the faces of the people depicted and analysing their facial expressions. The right hemisphere is often associated with social processing, such as interpreting other people's gazes, gestures or intentions and their faces (Benowitz, Bear, Rosenthal, Mesulam, Zaidel, Sperry, 1983). Activity in the right hemisphere and beta waves in this hemisphere when watching an advertisement about people may indicate a focus on social aspects, interpretation of behaviour or identification with the people depicted. These observations contribute to our understanding of the neural processing and engagement of respondents during exposure to promotional material about a city in Poland. Higher amplitudes of specific brain waves suggest greater interest and emotional response to the content, indicating a potentially positive impact on their perception and decision-making processes. The above summary of the results from the second part of the study coincides with the data presented in the table. The information remembered by respondents after exposure to both materials coincides with their brain work. The first spot about a city in Poland showed people interacting, laughing, hanging out in restaurants, while exploring a cosy, vibrant green city. The second material about a city in the United States included information about buildings, streets, representative places of the city, all shown from an eagle's perspective, from a distance, with location data.

### **3 Conclusion**

The conclusions of the research conducted on the attractiveness of the message and the impact of narrative on lowering the psychological costs of decision-making allow us to confirm the hypothesis that a narrative based on high sentiment resulting from emotional interaction between people, a narrative based on cause and effect with a visible beginning, development and end will lead to better synchronisation in the area of the message being processed and thus to a more intense neuronal response to the narrative message based on the interaction between people, on the proximity of the frame, on the dynamics of changing scenes resulting from one another.

The structure of the message, the way the plot is shaped and the sentiment in the message resulting from the choice of words and expressions shape the narrative economy and influence the cognitive costs of decision-making. With neuroscience and tools to study neural mechanisms in real time, it is possible to gain a more accurate understanding of aspects of how communication influences human decision-making and behaviour. Therefore, the research topic addressed in the article has not been sufficiently exhausted and further research in this area is recommended. This time on a different communication and a larger research group.

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## **Utjecaj naracije, osjećaja i emocionalne modulacije na ekonomiju donošenja odluka: multidisciplinarna studija**

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**Sažetak:** Ovaj znanstveni članak uranja u prostor igre između naracije, osjećaja i postupka donošenja odluka, a posebice na području ekonomskih izbora. Naglašavajući središnju ulogu sadržaja poruke, autori iznose hipotezu koja opisuje dubok utjecaj naracije, likova i osjećaja u procesu komunikacije. Ove sastavnice imaju značajan utjecaj na emocionalne aspekte donošenja odluka, utječući na postupak ili potičući promjene početnih odluka. Kritički osporavajući utanačene ekonomske paradigme, članak naglašava manjak neizostavne emocionalne dimenzije svojstvene komunikaciji. Oslanjajući se na znanstvene doprinose eminentnih ličnosti poput Roberta J. Shillera, autori iznose sintezu uvida iz psihologije i neurobiologije, razotkrivajući manipulativnu bit svojstvenu pripovijedanju. U teoretskom dijelu, članak se također poziva na teorije i istraživanja Urija Hassona o sinkronizaciji mozga tijekom procesa komunikacije. Praktični dio članka potkrepljuje te tvrdnje kroz prikaz nalaza neuropsiholoških istraživanja. Istraživanje potvrđuje hipotezu da narativi prožeti visokim osjećajima koji proizlaze iz emocionalnih interakcija, prateći uzročno-posljedičnu strukturu s vidljivim početkom, razvojem i završetkom, dovode do bolje sinkronizacije i pojačavaju neuronske reakcije. Struktura, oblikovanje zapleta i osjećaji u porukama, pod utjecajem izbora riječi, oblikuju narativnu ekonomiju i utječu na kognitivne troškove pri donošenju odluka. Dobiveni rezultati potvrđuju da precizno prilagođena naracija učinkovito smanjuje kognitivne troškove povezane s procesom donošenja odluka. Time se potvrđuje hipoteza autora, otvarajući prostor za umnožavanje istraživanja i lažiranje dobivenih rezultata.

**Ključne riječi:** neuroznanost, donošenje odluka, bihevioralna psihologija, kognitivna znanost, ekonomska psihologija

**JEL klasifikacija:** M3