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A review of research on group identity and hold-up problem

Rong Yu, Cenlin Zhang*

School of Economics and Management, Southwest Petroleum University, Chengdu, China
**Corresponding author*

Abstract: *The hold-up problem is a key concern in contemporary contract theory, and finding solutions to this problem can enhance transactional efficiency and facilitate the development of corporate careers. The emergence of identity economics offers fresh insights into understanding and predicting the decision-making behaviors of individuals or groups. This article begins by examining the relevant literature on the hold-up problem and group identity and subsequently reviews experimental and neuroscience studies that demonstrate the impact of group identity on behavioral decision-making. Drawing upon a comprehensive analysis and evaluation of the existing research, this article proposes novel research ideas or perspectives.*

Keywords: *Hold-up problem, Group identity, Experimental economics, Neuroeconomics*

1. Introduction

The hold-up problem is prevalent in various aspects of daily trading activities among firms and takes on complex and diverse forms. This problem severely impedes the establishment of long-term, stable, and close partnerships between firms. Early economic theory explored integration as a means of managing the hold-up problem. However, due to the complex and diverse situation, integration is not effective in addressing this problem. Experimental economists have shifted their focus towards individual heterogeneous preferences and beliefs. They argued that these preferences and beliefs are influenced by the specific social category to which individuals belong or their social identities. These factors, in turn, influence individual behavioral decisions. This exploration has led to the development of "identity economics," which provides a new approach to solving the hold-up problem. In recent years, advancements in neuroscience theory and modern technology have allowed for the opening of the "black box" in the human brain during economic management activities. This has enabled the direct exploration of the neural mechanisms underlying human behavioral decisions. These developments provide both methodological and technical tools for the study of the neural basis of social identities for behavioral decisions[1-4].

2. Experimental economic studies on the hold-up problem and social identity

2.1. Hold-up problem

Grossman and Hart (1986) present the classical GHM model, which weighs costs and benefits and extends the hold-up problem to a bilateral transaction scenario. In this scenario, one party makes a relationship-specific investment ex-ante, and the other party takes advantage of the investing party's gains post hoc due to the incompleteness of the contract. The ex-ante estimate fails to capture all of the investment earnings, resulting in ex-ante relationship-specific underinvestment. This leads to underinvestment that is less than the socially optimal level.

According to Williamson (1979, 1985), vertical integration can solve the hold-up problem if both parties involved possess equal investment skills and the dedicated investment quasi-rent generates significant occupancy. However, Grossman and Hart (1986, 1990) argued that incomplete contracts in asset-specific investment can lead to suboptimal outcomes, as purchasing residual control rights may result in losses for the second party. Klein (1996) suggests that contractual provisions can mitigate the emergence of hold-up problems. Fraja (1999) proposes that reciprocal investment of translocators, or investment continuity, effectively governs the hold-up problem, even in the presence of a bilateral direct externality. Nicita (2004) suggests the concept of cross-competitive influence through endogenous

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external option rights, arguing that these rights are another choice secondary to reputation and corporate culture[5-9].

2.2. Social identity and group identity

The social identity theory developed by Tajfel and Turner (1979) is the most influential in the study of group relations, and it takes "group " as the core concept to emphasize that social identity is an individual's perception of being subordinate to a particular social group, and that group membership has emotional and value implications for the individual and in turn, affects his or her behavior. Volz et al. (2009) states that individual identities and social identities largely result from favorable comparisons both within and across relevant outgroups. Social identity theory holds that an individual's identification with a group is fundamental to group behavior and it is primarily used to explain the ethnic centers of intergroup behavior, i.e., ingroup preference and outgroup discrimination. At the same time, economists break through the inherent social identities (e.g., nation, country, gender, etc.) to reframe the group identities, according to a certain experimental design, which is used to observe how individuals or groups make decisions under the influence of the reframed group identities, to investigate the mechanism of how social identities affect economic behavior. The principal line of thinking among the investigators was to stimulate the natural social identities and to induce (artificial) group identities, and the correspondence between the two experimental approaches, the priming technique and the minimalist group paradigm (MGP).

2.3. Experimental economic research on the hold-up problem and group identity

Ellingsen (2004) conducted a study on the impact of commitment and threat on the hold-up problem in trust game control experiments with and without communication. Eckel and Grossman (2005) explored the effects of group identity on behavior by creating varying degrees of group identity in public goods supply game experiments. Their findings indicate that identities established through identity-strengthening tasks lead to higher levels of cooperation. However, teams with greater intensity of group identity did not effectively overcome "hitchhiking" behavior in their teams based on identification alone. In a communication-free trust game experiment, Morita et al. (2013) identified group identity as a significant factor that influences incentives to invest in specific relationships. Interestingly, they found that group identity can mitigate the hold-up problem[10-12].

3. Neuroeconomics studies on the group identity and economic behavior

3.1. EEG (electroencephalogram)

When the pyramidal cell population of the cerebral cortex becomes synchronously active, a large number of postsynaptic potentials are generated. These potentials are transformed into EEG signals due to the superimposed signal that passes through the skull and scalp (Mitzdorf, 1985). EEG involves the placement of electrodes on the scalp to capture this spontaneous, rhythmic, and comprehensive biopotential information from the brain. The amplified and recorded EEG signals provide a picture of the production of these signals. EEG has several advantages, including high temporal resolution, noninvasiveness, and convenience. It can accurately reflect the firing activity of neuronal clusters in the submillisecond time scale.

3.2. Source Location

The use of EEG in analyzing and applying brain activity is limited by its low spatial resolution and inability to provide high-resolution structural images. To address this issue, a viable solution is to reconstruct the distribution pattern of the source of signal generation within the brain using the measured EEG signal. However, accurate localization of brain sources requires addressing two problems: the forward problem and the inverse problems. The forward problem involves simulating how the electrical signal generated in the brain is conducted to the scalp and recorded. The solution to this problem is highly dependent on the choice of head model in brain modeling, specifically the head geometry and tissue conductivity. The most commonly used head model is the boundary element model (BEM) (He,1987), which involves segmenting tissue demarcation points with different conductivity ratios. The inverse problem is to deduce the source of estimated intracerebral neural activity, or source localization, from the scalp-recorded potential signal. The most commonly used methods for this are the equivalent current

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dipole (ECD) model (Schneider, 1972) and distributed source model (DSM) (Hämäläinen & Ilmoniemi, 1994). Compared to the EDM, the DSM does not require an a priori assumption of the number of sources of EEG activity, making it more suitable for complex cognitive and decision-making processes[13-16].

3.3. Functional brain network

Recent advancements in brain science have demonstrated that the execution of numerous higher cognitive functions in the brain is not solely attributed to a particular region, but rather the coordinated collaboration of multiple brain intervals. These brain regions are interconnected through various forms of connectivity, such as structural connectivity, functional connectivity, and effective connectivity, forming a complex and extensive brain network. Where functional connectivity (FC) refers to the degree of statistical dependence or correlation between two EEG signals (Friston, 2011). Identification of these brain networks through appropriate techniques and methodologies is advantageous in uncovering the intricate connections and interactions between brain regions that underlie cognitive decisions. For example, using the principle method of graph theory, different brain regions are defined as nodes, and the connections between brain regions are defined as edges, and the functional brain network can be established.

3.4. Neuroeconomic studies of identity influences behavioral decision-making

There have been several studies conducted to investigate brain neural response activity in behavioral games that involve group identities. These studies aim to unravel the mechanisms by which identity influences economic decision-making, specifically the thinking behind differences in intergroup attitudes and alterations in attention allocation. Wu et al. (2011) focused on components such as MFN and P300 of event-related potentials (ERP) in the Ultimatum game. They discovered that unfair offers from friends induced more negative EEG responses than those from strangers, and unfair offers from friends induced more positive EEG responses than unfair offers. Wang et al. (2014) experimented with how ethnic identity affects people's efficiency in allocating equal tradeoffs and associated EEG responses using EEG. They found that subjects tended to have a more favorable allocation to the same ethnicity.

Studies on source localization and functional brain networks have primarily focused on identifying the neural mechanisms and large-scale networks that underlie the influence of group identity on behavioral decisions. Telzer (2015) conducted research that revealed enhanced activation in several brain regions, including the ventral striatum, anterior cingulate cortex, dorsolateral prefrontal cortex, ventrolateral prefrontal cortex, insula, putamen, wedge, and temporoparietal junction, when participants made prosocial donations to others. Morese et al. (2016) analyzed a dictator game involving third-party punishments and found that brain regions associated with understanding other people were activated. Yang et al. (2020) investigated an intergroup dictator game and discovered that, after establishing an in-group association, individuals contributed more money to intragroup members in order to defeat competitors. Using functional near-infrared (fNIRS) measurements of neural activity and within-group synchrony, they found that the within-group junction decreased right dorsolateral prefrontal activity and increased functional connectivity between the right dorsolateral prefrontal and right temporoparietal junctions[17-20].

4. Conclusion

In contract theory, the hold-up problem has been extensively studied by scholars both domestically and internationally. The problem arises due to asset specificity, quasi-rents, and incomplete contracts, and various governance approaches have been proposed, including transaction cost, property rights, legal intervention, and mechanism design. Experimental economics has introduced the concept of group identity to mitigate the hold-up problem, but further research is needed to validate these findings with larger sample sizes and under different conditions. Neuroscience technology can provide insight into the neural mechanisms underlying economic decision-making behavior, but current studies on group identity only examine simple EEG signal eigenvalues and lack consideration for the low spatial resolution and multidimensionality of EEG signals. There is a lack of neurological research investigating the hold-up problem from the perspective of group identity, which presents an opportunity for researchers to explore this area further.

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