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Focal points in tacit bargaining problems: Experimental evidence

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ABSTRACT

We use a new experimental design to test Schelling's hypotheses about the nature and effectiveness of focal points in tacit bargaining problems. In our design, as in many real-world bargaining problems, each player's strategies are framed as proposals about what part of a stock of valuable objects she is to take, and there are payoff-irrelevant cues which define relations between players and objects. In line with Schelling's hypotheses, we find that such cues serve as powerful focal points. Their presence increases efficiency even in games where there is no efficient and equal division, and induces systematically unequal payoff distributions.

1. Introduction

> Suppose a *German*, a *Frenchman*, and a *Spaniard* to come into a room, where there are placed upon the table three bottles of wine, *Rheinish*, *Burgundy* and *Port*; and suppose they should fall a quarrelling about the division of them; a person, who was chosen for umpire, would naturally, to shew his impartiality, give everyone the product of his own country: And this from a principle, which, in some measure, is the source of those laws of nature, that ascribe property to occupation, prescription and accession. Hume (1739–1740, pp. 509–510).

Thomas Schelling's *Strategy of Conflict* is universally recognised as the foundation of the theory of focal points. Many of Schelling's best-known examples of focal points are Nash equilibria in symmetric matching games. In a *matching game*, each of (usually) two players independently chooses one label (for example, 'heads' or 'tails') from the same set of options, and each receives a positive payoff if and only if both choose the same label. The game is *symmetric* if players' payoffs, conditional on their choosing the same label, are independent of which label is chosen. It is now well established that players of such games are often able to achieve high degrees of coordination by using salient properties of the labels (e.g. Schelling, 1960, pp. 54–58; Mehta et al., 1994a, 1994b; Bacharach and Bernasconi, 1997; Crawford et al., 2008; Bardsley

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et al., 2010). An equilibrium that is selected by players in response to the salience of its label is the *focal point* of the relevant game.

However, as Schelling (1960, pp. 53–54) makes clear, one of the main intended applications of his theory is to bargaining problems in which communication is incomplete or impossible—in his terminology, problems of *tacit bargaining*. Although his particular interest is in tacit bargaining between opposing military strategists seeking to avoid or limit warfare, he envisages important economic applications for the theory—for example, the problem faced by competing firms that have common interests in collusive practices but are legally debarred from negotiating these explicitly. He proposes the hypothesis that the outcomes of games that model tacit bargaining can be affected by features that provide no information about payoffs, but merely attach apparently arbitrary labels to players, strategies or strategy profiles in what (as viewed by conventional game theory) is already a fully-specified game. In Schelling's theory, such labels – which we will call *payoff-irrelevant cues* – may prime mental associations with players' experiences outside the game, and players' perceptions of focal points may be influenced by their attitudes to those experiences. Crucially, however, players are assumed to have common knowledge of the *actual* payoffs of the game and to recognise that the cues that identify a particular solution as focal provide no additional information about those payoffs.

Why might one expect this hypothesis to be true? Schelling's answer, as we understand it, is that real-world problems of tacit bargaining can be modelled as games in which players have a common interest in coordinating on *any* of a set of alternative Nash equilibria. Payoff-irrelevant cues provide an equilibrium selection device. Even though the players' interests are not completely aligned, both recognise that if they are to coordinate, they must use whatever cues are available: 'beggars cannot be choosers when fortune gives the signals' (p. 300). This may result in an outcome that 'quite arbitrarily condemns one of the players to a smaller gain than the other for reasons that may seem purely accidental or incidental. But we have to suppose that a rational player can discipline himself to accept the lesser share if the clue points that way' (p. 286).

This intuition has been expressed more formally in a family of more recent theories of focal points. In different ways, these theories incorporate players' perceptions of labels into the formal structure of a game and show that because of the uniqueness of the labelling of a particular profile of players' actions, that profile is a payoff-dominant Nash equilibrium in the re-specified (or 'framed') game (Bacharach, 1993, 2006; Sugden, 1995; Casajus, 2001; Janssen, 2001, 2006). This analysis can explain the use of focal points not only in symmetric matching games, but in mixed-motive games in general.

Given its potential relevance for economics, Schelling's hypothesis about tacit bargaining has been subjected to surprisingly few direct experimental tests.[1] However, there has been some investigation of asymmetric matching games—that is, matching games in which the payoffs have a Battle of the Sexes structure. Such games might be interpreted as highly simplified models of some aspects of tacit bargaining. These studies have had mixed results. Cooper et al. (1993) and Güth et al. (1998) find that designating one of the players in Battle of the Sexes as the first mover, even when the first mover's decision is not observed by the second mover (and hence interaction is strategically equivalent to a simultaneous move game), increases the chances that coordination is achieved on that player's preferred pure-strategy Nash equilibrium. Holm (2000) finds that when it is common knowledge that a Battle of the Sexes game is being played between a male and a female player, there is a tendency for coordination on the preferred equilibrium of the male player.[2] In contrast, Crawford et al. (2008) find that salient labels that work as focal points in symmetric matching games can fail to induce coordination when payoffs are asymmetric. In the words of the title of their paper: 'The power of focal points is limited: even minute payoff asymmetry may yield large coordination failures'. They explain this observation by proposing a model of behaviour in matching games, based on the *level-k* theory of Stahl and Wilson (1995) and Nagel (1995).[3] If Crawford et al.'s headline conclusion were true in general – if payoff-irrelevant cues had power only in the complete absence of conflicts of interest – the theory of focal points would have little to contribute to the understanding of tacit bargaining.

To try to reach firmer conclusions about the role of focal points in tacit bargaining, we investigate games with three features that are often found in real-world bargaining situations, but that are not present in matching games. First, there is a surplus that has to be divided between the two players, and the alternative strategies for each player are framed as proposals about what part or share of that surplus the proposer is to take. Second, potential focal points are identified by what we call *relational* cues—that is, by salient but payoff-irrelevant relations between particular players and particular parts or shares of the surplus. Third, in order for the players' proposals to constitute an agreement, it is not necessary that they are exactly complementary; provided the players' claims on the surplus do not overlap, each player receives what he claimed. The first two features are matters of framing or labelling, but the third differentiates the payoff matrices of our games from those of matching games.

[1] Some preliminary results, broadly supportive of Schelling's hypothesis, are reported by Mehta et al. (1992). Their design uses a kind of what we will call 'relational cue', different from the one we use here.

[2] This may be an effect of labelling, as Holm conjectures. Alternatively, it could be the result of real differences between the payoffs of male and female players (for example, because of differences in attitudes to risk or inequality), or of players' beliefs about such differences.

[3] In Crawford et al.'s model, players at 'level 0' – the lowest level of a hierarchy of increasingly sophisticated modes of reasoning – favour 'label-salient' strategies in common-interest games, but favour 'payoff-salient' strategies in other games. The idea of explaining focal points in terms of a hierarchy of levels of reasoning, with salience understood as a property of choice at the lowest level, was first proposed by Lewis (1969, pp. 24–36); it is developed further by Mehta et al. (1994a) and Crawford et al. (in press).