The Meeting Place Problem: Salience and Search.*†

Simon Grant
Economics Program, RSSS,
Australian National University

John Quiggin
Department of Economics,
James Cook University

First version: November 1994
This version: May 1996

Abstract

The notion of salience was developed by Schelling in the context of the meeting-place problem of locating a partner in the absence of a pre-agreed meeting place. In this paper, we argue that a realistic specification of the meeting place problem involves allowing a strategy of active search over a range of possible meeting places. We solve this extended problem, allowing for extensions such as repeated play, search costs and asymmetric payoffs. The result is a considerably richer, but more complex, notion of salience.

Keywords: salience, search
JEL Classi cation: C78, D83
[forthcoming *Journal of Economic Behavior and Organization*]

*The authors wish to thank Steve Dowrick, Stephen King, Colin Rose, Murray Smith and participants of the Thirteenth Australian Economic Theory Workshop for their helpful comments and suggestions. Naturally, any errors or omissions are the sole responsibility of the authors.

†Proofs should be sent to Simon Grant, Economics Program, RSSS, Australian National University, ACT 0200, Australia.

1 Introduction

You have arranged to meet in Washington DC on a certain day, a friend who is a holder of a recent PhD in Economics. Unfortunately, you have neglected to specify a meeting place or a time. What should you do? Your friend will undoubtedly recognise this problem as a classic example of a co-ordination problem, first examined in detail by Schelling (1960), and may be expected to pursue the solution proposed by Schelling — pick the most salient point in Washington and wait there at noon. If you follow the same strategy, and you make the same judgement as to the most salient point, that is, if the point is *focal* for the two of you, then you will meet. Unfortunately, Washington offers a number of salient points. The Washington monument is most salient in the literal sense, but the White House, the Capitol and the Lincoln Memorial are obvious alternatives. For sufficiently obsessive economists, even the Brookings Institute or one of its competitors might stake a claim. Hence, there exists the possibility that you will fail to co-ordinate. Fortunately, there is a way to do better. If you know that your friend will pursue the salient point strategy and the set of salient points is sufficiently small, you can guarantee a meeting simply by visiting each of the salient points in turn.

The above discussion highlights the importance in a game theoretic analysis of the specification of the strategy sets for each player as this specifies how each *conceives* of their own and their opponents' range of possible actions. In this case by considering the possibility of adopting the additional action of active search guarantees the desired meeting, given the belief that the friend is choosing one from a number of salient points at which to wait. Unfortunately, there is a possibility that the same thoughts will occur to your friend. Once this happens, given the training of both players, progression to a full common knowledge solution is inevitable.[1] The equilibrium in which each player believes the other is randomly choosing between engaging in active search and picking a salient point at which to wait is the one that seems most in accord with the strategic uncertainty of this situation. Although the (symmetric) extension of the each player's strategy set has not removed the possibility of failing to meet in the associated mixed strategy equilibrium, it is relatively easy to show that the expected likelihood of meeting is increased.

There is, in fact, a real-life problem that most people have encountered (unlike the artificial one set out at the beginning of this paper). Having lost contact with your partner in a large public place, how should you go about finding them? An added feature of this particular meeting problem is that the "game" may last many periods with the benefit

[1] However, you will probably disagree as to how precisely common knowledge is achieved.

of meeting (weakly) decreasing in the length of time with which it is achieved. At least, in the authors' experience, the strategy usually adopted consists of alternate periods of waiting at salient points and of rapidly searching as many such points as possible. When the meeting is achieved, it is usually found that several points have been visited by both parties in the course of the search.

In the following section we present a stylized model of the meeting place problem (a 'pure-coordination' game) where the choice of salient point is determined from the model's informational structure rather than any pre-game communication or so-called 'cheap talk'.[2] The alternative salient points may be viewed, in the terminology of Sugden (1995), as alternative ways of 'labelling' the available actions.

This approach enables us to assign an expected value for picking a salient point and contrast it with the situation where one or both of the players conceives of the alternative of engaging in active search. As foreshadowed above, including the strategy of active search increases the likelihood of meeting in the mixed strategy equilibrium. Section **??** extends the model to the situation where repeated plays may be available to effect a meeting. In accord with natural intuition, we show that the probability of playing active search (at least initially) and the value of the (stationary) mixed strategy equilibrium to both players increase with the likelihood that another play in the next period will be available (or equivalently with the patience of both players). We present a 'battle of the sexes' extension of the basic model in section **??** where although meeting is still desirable, the two players may have conflicting preferences as to which salient point they wish to meet at. Further discussion and applications of the asymmetric case are considered in section **??**. In particular we highlight Schelling's point that 'pre-game play' by a player may introduce asymmetries to increase the salience of a desired outcome thereby favouring an apparently weaker player.

2 The Pure Co-ordination Game

We first analyze a pure coordination problem with two salient points. Players I and II are drawn from a population of two types. For type 1, occurring with probability p, point 1 is the more salient, and conversely, point 2 is more salient for type 2. The distribution of types, given by the parameter p, is unknown to both players, however. Instead, each player begins with a prior distribution of p such that each type is equally probable and uses their own type as a signal for p. Hence, if they follow the salient point strategy, they will choose the point more salient for themselves in the belief that this point is the one most likely to be focal. That is, in our formal model below, the Bayesian updated value of p for a player of type 1 (respectively, type 2) will be greater than (respectively, less

[2]For a treatment of 'cheap' talk in coordination games see Farrell (1988).

than) one-half. So a player's best guess as to what is more salient for the other player is what is more salient for herself.

In the terminology of Sugden (1995), we can interpret the two types as corresponding to two possible ways the players can *label* the two salient points: more or less salient to them. These two ways of labelling the points may well depend upon psychological and cultural factors and so reflect what is *intrinsically* salient to the individuals. Importantly, they *precede* reasoning. Our focus, as it is in Sugden, is the question: given the players' types and their information or beliefs about how those types are determined or related, what choices are rational for them to make?

For concreteness, we will assume that the prior distribution on p is uniform on $[0,1]$.[3] The conditional joint probability distribution of the two individuals' types can be represented in the following matrix where the (i,j) element is the probability that individual I is of type i and individual II is of type j **for a given** p:

	1	2
1	p^2	$p(1-p)$
2	$(1-p)p$	$(1-p)^2$

The complete payoff matrix for a player is

	Active	S_1	S_2
Active	0	1	1
S_1	1	1	0
S_2	1	0	1

However, given that a player will never follow the strategy of waiting at the salient point less favored for themselves, the game may be reduced to one of two strategies, active (search) and (waiting at) salient (point). Notice that the unconditional joint distribution is

	1	2
1	1/3	1/6
2	1/6	1/3

Hence $\Pr[II=1|I=1] = \Pr[II=2|I=2] = 2/3$. Given that player j is engaging in an active search strategy, the payoff to player i of choosing the point more salient to him is 1 (while of course engaging in active search as well pays off 0). Alternatively, given that player j is choosing the point more salient to her, i can expect a payoff of 1 from actively searching. If both choose their most salient point, then the expected payoff is 2/3 – the conditional probability that they view the same salient point as the relatively more salient (or, equivalently, the probability that a player's own more salient point is focal). The expected payoffs for the two players in the reduced form game are thus[4]

[3] **We might defend this assumption by appealing to a 'principle of insu cient reason.'**

[4] For each strategy combination, the entry in the bottom left hand corner is the payoff to player I (the "row" player) and the entry in the top right hand corner is the payoff to player II (the "column" player).

	Active	**Salient**
Active	0, 0	1, 1
Salient	1, 1	$\frac{2}{3}$, $\frac{2}{3}$

This game is similar in general form to what Binmore (1992, p339) has called 'the Australian battle of the sexes'. It has two asymmetric Nash equilibria in pure strategies and a Pareto-inferior (Bayes-Nash) equilibrium in mixed strategies where each engages (or believes that the other engages) in active search with probability 1/4. Given the informational structure of our model and without further reason to discriminate between the individuals and their choice of actions, we shall treat the mixed strategy equilibrium outcome as the equilibrium (expected) outcome most reasonable to predict or anticipate for both the outside analyst and the players themselves at the time when they are reasoning about how they should play. This choice is consistent with a justification advanced by Binmore for considering mixed strategy equilibria in problems of this kind. Possibilities for generating asymmetry and thereby making possible of one of the pure strategy equilibria are discussed in the next section.

Although stylized, this game form does allow us to address the interesting welfare question of whether the availability of the active search strategy reduces or increases welfare. It is clear from inspection of the payoff matrix above that welfare is increased if active search is available only to one player. Indeed active search is a dominant strategy for that player and by engaging in active search a meeting is guaranteed. Active search available to both players also increases welfare. To see this, suppose both players initially play pure Salient. A move to any mixed strategy (including the Bayes-Nash equilibrium mixed strategy) by Player I must increase welfare, since the active strategy is always successful. But by definition, the equilibrium mixed strategy for player II must be equally as good as the pure Salient strategy given that player I is (or is believed by player II to be) following the Bayes-Nash equilibrium mixed strategy. Algebraically the expected payoff to the Bayes-Nash equilibrium mixed strategy where each player engages in active search with probability 1/4 is 3/4. Hence the difference between these equilibrium payoff and both players choosing to wait at their more salient point is 1/12.

3 Repeated plays and common knowledge.

Suppose we now allow the possibility of a series of plays, with the payoff for both players decreasing in the number of plays required before meeting is achieved. As soon as a round occurs in which both players choose Salient, they will either meet (if they have the same type) or fail to meet (if they have different types). After a failure to meet, it is common knowledge that the two players are of different types. From this point on, neither has any a priori reason for believing either of the salient points is a more likely candidate on which the two will coordinate a meeting if they both decide to wait at a salient point. Of course, the two pure strategy combinations where both go to the same salient point remain Nash equilibrium actions for any round of the game. We contend, however, that the 'salient' equilibrium belief for each of the two players (given their information) is that an individual playing salient is *equally* likely to choose either salient point. Thus the probability of meeting in a given play, given the belief that the other is playing salient, is reduced to 1/2. Although the notion of common knowledge is somewhat problematic in relation to the question of salience, it would appear that a similar analysis would apply when both players' types are common knowledge at the beginning of the game. If the types are the same the salient point strategy is optimal. If they are different, the analysis presented above implies the chance of meeting in that round if both are playing salient is 1/2.[5]

To analyze formally the repeated play extension, suppose that the value of meeting in the nth round is δ^{n-1} with δ in $(0, 1)$. We can interpret δ as either the (common) discount factor of the two players (that is, their degree of 'patience') or the probability that there will be another round of play if a meeting is not achieved in the current round. We can characterize the (stationary or Markov Perfect) mixed strategy equilibrium by two continuation payoff matrices for the pure action combinations in any round of play. We shall refer to rounds as being in one of two states. A round is in state P if the players' types are private information. Alternatively, the round is in state C if the types are common knowledge and known to be different. Let V_P (respectively, V_C) denote the *expected equilibrium* continuation payoff of the a round in state P (respectively, C).

In round 1, the each player's type is known only to his or herself and so it is a round in state P with continuation payoffs given by:

	Active	**Salient**
Active	δV_P, δV_P	1, 1
Salient	1, 1	$\frac{2}{3} + \frac{1}{3}\delta V_C$, $\frac{2}{3} + \frac{1}{3}\delta V_C$

If an asymmetric strategy combination is played a meeting is achieved and the game ceases. If both play active search, then both know that the other was also engaged in active search so neither learns anything more about the other's type. Hence play for the next round will remain in state P. The expected equilibrium continuation payoff for both engaging in active search in a state P round is thus δV_P. If both play Salient, the probability that they meet (because they are of the same type) is 2/3. If they fail to

[5] Note that, unlike Crawford and Haller (1990), players in our model do not 'learn' to cooperate with repeated rounds of play. In particular we do not allow players to use past plays as 'precedents' with which they can achieve coordination.

meet then as we discussed in the paragraph above it is common knowledge that they are of different types so the probability of meeting in any subsequent round given they both play salient is reduced to 1/2. Play in the next round (and all subsequent rounds) will be state C. The expected payoff to both playing salient in a round in state P is thus $2/3 + 1/3V_C$. The continuation payoff matrix of a round in state C is given by:

	Active	**Salient**
Active	δV_C, δV_C	1, 1
Salient	1, 1	$\frac{1}{2} + \frac{1}{2}\delta V_C$, $\frac{1}{2} + \frac{1}{2}\delta V_C$

If we let a_P (respectively, a_C) denote the stationary mixed strategy equilibrium probability that a player engages in active search in a state P (respectively, state C) round, then a_P, a_C, V_P and V_C are determined by the following four equations.

$$a_C \delta V_C + (1 - a_C) = V_C \tag{1}$$

$$a_C + (1 - a_C)\left(\frac{1}{2} + \frac{1}{2}\delta V_C\right) = V_C \tag{2}$$

$$a_P \delta V_P + (1 - a_P) = V_P \tag{3}$$

$$a_P + (1 - a_P)\left(\frac{2}{3} + \frac{1}{3}\delta V_C\right) = V_P \tag{4}$$

Given V_C, the continuation expected value of playing in a state C round, the first pair of equations defines the probability of engaging in active search by one player that would make the other player indifferent between playing active search or playing Salient in a state C round. Similarly, given V_P and V_C, the second pair of equations defines the probability of engaging in active search by one player that would make the other player indifferent between playing active search or playing Salient in a state P round. This system yields the *unique* solution:

$$a_P = \begin{cases} \frac{1}{4} & \delta = 0 \\ \frac{2-(4-\delta)^{1/2}}{\delta} & \delta \in (0,1] \end{cases}, \; a_C = \frac{1}{3}, \; V_P = \frac{1 - a_P}{1 - \delta a_P}, \; V_C = \frac{2}{3 - \delta} \tag{5}$$

It is immediately obvious from (**??**) that the continuation expected value of playing in a round of type C is increasing in δ, the discount factor of both players, although the equilibrium probability of playing active search in a round of type C remains unchanged at 1/3. Straightforward, but tedious, algebraic manipulation leads to:

$$\frac{da_P}{d\delta} = \frac{a_P^2}{2(2 - \delta a_P)}, \; \frac{dV_P}{d\delta} = \frac{a_P\left[2 + (3 - \delta)a_P\right]}{2(1 - \delta a_P)^2 (2 - \delta a_P)}$$

Hence we have the intuitive comparative static results that both the (equilibrium) probability of playing active search in a state P round and the continuation expected value of playing in a state P round are increasing in δ.

Now suppose that the active search strategy incurs costs. Small symmetrical costs simply reduce welfare and the optimal frequency with which the active search strategy is chosen. If, however, costs are asymmetric, in particular positive for player II and zero for player I, then the asymmetric equilibrium in which player I adopts active search and player II adopts a salient point becomes itself a *focal* equilibrium (that is, salient to both players) and is Pareto-superior to the Bayes-Nash mixed strategy equilibrium and the other asymmetric equilibrium. If all of this is common knowledge, it seems that the players should be able to co-ordinate on this equilbrium without explicit communication. Note that this conclusion does not seem to follow simply from the Nash equilibrium condition or any obvious refinement. Rather, at least in cases where mixed-strategy equilibria are Pareto-dominated (so that players will not deliberately randomize even if they can) salience undermines the main argument for considering mixed-strategy equilibria.

In the next section we turn to the case where the returns from the outcomes are no longer perfectly aligned, that is, the game is no longer one of pure co-ordination.

4 Asymmetric Payoffs

In our asymmetric payoff version the set-up is the same as for section **??** except now the payoff to a player of meeting at the point less salient to him or her is $1 - \epsilon$. This is a simple parametrization that provides a convenient asymmetric extension of the original pure coordination game of section **??**. We can again reduce the first round to two actions – active search and playing salient – since given players are using their own type as a signal for p there is even more reason to choose the point more salient to herself when playing salient.

Although conceptually there is no difficulty in proceeding as we did in section **??** and allowing potentially infinite repeats of play until a meeting is achieved, for ease of exposition and simplicity of algebraic derivation, we shall assume that only a second round of play is available if a meeting is not achieved in the first round.

As in the pure coordination game, in the first round the players' types are private information. In the second round the players' types remain private information if both played active search in the first round of play and common knowledge (and known to be different) if a meeting was not achieved after both played salient in the first round. We shall refer to the former (respectively, the latter) as a state $2P$ (respectively, $2C$) round with its (equilibrium) expected payoff denoted by V_{2P} (V_{2C}).[6]

Hence if both players play active search in the first round they will each receive in equilibrium the expected payoff δV_{2P}. If one plays active search and the other plays salient then a meeting is guaranteed. But note that the while the payoff to the one playing salient

[6] We can also view a state $2P$ round as a one-round asymmetric game.

is 1, for the active searcher the probability of meeting at his or her more preferred point is only $\frac{2}{3}$ leading to an expected payoff of $1 - \frac{1}{3}\epsilon$. Finally if both play salient in the first round, the probability of meeting is $\frac{2}{3}$ and the probability of proceeding to a state $2C$ round is $\frac{1}{3}$. Thus the expected payoff of both playing salient is $\frac{2}{3} + \frac{1}{3}\delta V_{2C}$ for each. The payoff matrix for the first round is thus

	Active	**Salient**
Active	δV_{2P} δV_{2P}	1 $1 - \frac{1}{3}\epsilon$
Salient	$1 - \frac{1}{3}\epsilon$ 1	$\frac{2}{3} + \frac{1}{3}\delta V_{2C}$ $\frac{2}{3} - \frac{1}{3}\delta V_{2C}$

In terms of the parameters and the equilibrium continuation payoffs V_{2P} and V_{2C} , a_1, the (symmetric mixed strategy) equilibrium probability of engaging in active search is

$$a_1 = \frac{1 - \epsilon - \delta V_{2C}}{4 - \epsilon - \delta\left(V_{2C} + V_{2P}\right)} \tag{6}$$

The payoff matrix for a state $2P$ round is the same as that for the first round with V_{2P} and V_{2C} set to zero as there are no further rounds. Thus, a_{2P}, the (symmetric mixed strategy) probability of engaging in active search in a state $2P$ round can be expressed as

$$a_{2P} = \frac{1 - \epsilon}{4 - \epsilon} \tag{7}$$

which yields an expected payoff for a state $2P$ round of

$$V_{2P} = \frac{3 - \epsilon}{4 - \epsilon} \tag{8}$$

As one would expect, from (**??**) we can show that the (equilibrium) probability of engaging in active search and the associated expected payoff in a state $2P$ are both decreasing in ϵ, the degree of (potential) divergence in player's preferences.

An examination of the payoff matrix for a state $2P$ round (a one-round [sub]game) reveals the advantage of a player not possessing (or conceiving of) the active search strategy when it is known that that strategy is available to her opponent.[7] In this situation regardless of types, the (iterative dominant) strategy equilibrium outcome secures 1 for this 'constrained' player and only $1 - \epsilon/3$ for the player who actively searches. Either being unimaginative (or viewed as such by one's opponent) is a bonus in this situation, a point on which we elaborate in section **??**. Moreover, we have that

$$1 - \epsilon/3 - V_{2P} = \frac{(3 - \epsilon)(1 - \epsilon)}{3(4 - \epsilon)} > 0$$

[7] In the purely symmetric situation of the introduction, awareness that the other player may pursue active search is virually equivalent to consideration of the same strategy for oneself. However, asymmetry may arise from physical incapacity to search, social custom or bounded rationality. Some examples are discussed below.

Hence *both* players are better off when active search is available only to one player. This is not that surprising since with only one player actively searching, a meeting is guaranteed. So even with the potential divergence of the players' objectives the benefit from guaranteeing a meeting more than offsets the increased likelihood that the searcher will meet at their less preferred salient point.

The other possible second round state is a state $2C$ round that arises after a failure to meet having played salient in the first round. As it is now common knowledge that the two players are of different types, the payoff submatrix for the strategies combinations $((S_i, S_j))_{i,j=1,2}$ is now a "battle of the sexes game".[8] That is, the divergence in players' preferences is now actual rather than potential. From this point on, neither individual has any a priori reason for believing that either of the salient points is a more likely candidate on which the two will coordinate a meeting if they both decide to wait at a salient point. Of course, the two pure strategy combinations where both go to the same salient point remain Nash equilibrium actions for this round of the game. We contend, however, that the 'salient' equilibrium is the ('symmetric') mixed strategy equilibrium where each engages in active search with probability a_{2C}; and conditional on deciding to wait at a salient point, picks the point more salient to herself with probability s. In this situation the choice of s cannot be determined independently of the choice of a_{2C}, thus we cannot collapse the two salient actions into one as was done in the private information states above. The payoff matrix for a state $2C$ round with the row player of type 1 and the column player of type 2 is thus:

	A	S_1	S_2
A	0, 0	1, $1-\epsilon$	$1-\epsilon$, 1
S_1	1, $1-\epsilon$	1, $1-\epsilon$	0, 0
S_2	$1-\epsilon$, 1	0, 0	$1-\epsilon$, 1

The mixed strategy equilibrium action and expected payoff for this round is given by:-

$$a_{2C} = \frac{1-\epsilon}{(1-\epsilon)^2 + (1-\epsilon) + 1}, \qquad s = \frac{1}{(1-\epsilon)^2 + 1}, \qquad V_{2C} = \frac{(1-\epsilon)^2 + (1-\epsilon)}{(1-\epsilon)^2 + (1-\epsilon) + 1} \quad (9)$$

¿From (**??**) and (**??**) we can compute

$$1 + \epsilon - V_{2P} = \frac{(1-\epsilon)^2 (1+2\epsilon)}{2(2+2\epsilon-\epsilon^2)}, \quad 1 - \epsilon - V_{2C} = \frac{(1-\epsilon)^3}{(3+\epsilon^2)}$$

that is, the symmetric mixed strategy equilibrium payoff in a state $2P$ (respectively, $2C$) round is less than the payoff of meeting at the player's more (respectively, less) preferred

[8] For a coordination game where the payoffs are qualitatively like the "battle of the sexes" and where there is pre-game 'cheap talk' the reader is referred to Farrell (1987).

salient point. Substituting these expressions into (**??**) and (**??**) we obtain:

$$a_1 = \frac{(4-\epsilon)(1-\epsilon)(3-2\delta-3\epsilon+\delta\epsilon+\epsilon^2)}{48-17\delta-72\epsilon+26\delta\epsilon+43\epsilon^2-13\delta\epsilon^2-11\epsilon^3} \tag{10}$$

and thus V, the expected equilibrium payoff of the two-round asymmetric game is

$$V = \frac{132-48\delta-213\epsilon+77\delta\epsilon+129\epsilon^2-39\delta\epsilon^2-33\epsilon^3+6\delta\epsilon^3+3\epsilon^4}{3(48-17\delta-72\epsilon+26\delta\epsilon+43\epsilon^2-13\delta\epsilon^2-11\epsilon^3+2\delta\epsilon^3+\epsilon^4)} \tag{11}$$

As is the case for a_{2P} and V_{2P}, a_1 and V are decreasing in ϵ. Increasing (potential) divergence in payoffs makes active search a less desirable action to take, since by searching one meets at the other's more preferred point. a_1 is also decreasing in δ, but as one would expect V is increasing in δ, as the more patient the players are, the more valuable a second round meeting becomes.

5 Further Applications

Following Schelling (1960) the analysis presented above may be applied to a range of bargaining problems. Consider for example, a situation proposed by Schelling in which two parties must agree to an exact partition of an area of land (say the Continental United States) without communicating.[9] In the case considered by Schelling, each party has a single chance to write down a proposal. If the two proposals constitute a partition, this is the agreement, otherwise both parties get nothing. Suppose however, that either party may make proposals over a continuous finite interval. If for some finite period of time during the interval, the two proposals represent a partition, this is the agreement. Otherwise, both parties get nothing. If the parties are solely concerned with reaching agreement on some partition, and they are indifferent as to which partition is chosen, the analysis of section **??** applies. The one-shot game arises when the bargaining period is just long enough for a player choosing active search to offer all the salient partitions. The main modification is that there is some possibility of agreement even if both players play active.

Next consider the case where players have differing preferences over partitions, which may or may not be common knowledge. Schelling has observed in this context that one player may obtain an advantage by pre-bargaining actions that increase the salience of her preferred meeting point (or partition). For example, in the case of two parachutists co-ordinating on a meeting place, the one who jumps first may point to the preferred location immediately before jumping. The analysis developed here suggests a generalisation of this. A player may be able to pre-commit to playing Salient in general, without any specification of the particular game or set of salient points under consideration. When such a game

[9] A very similar example involving lists of cities is discussed by Kreps (1990).

arises, she can choose her most preferred Salient strategy in the knowledge that the other player must choose Active. In the parachute case, for example, one parachutist may conspicuously pack heavy equipment, thereby forgoing the Active strategy. As this example indicates, the asymmetries in the situation may favor the apparently weaker player.

A military version of the partition game arises when two armies confront each other, both wishing to gain territory but also wishing to avoid an all-out battle. The salient strategy is that of picking a defensible position and resisting all attacks on that position. The active strategy is that of manoeuvre and probing attack, testing how much ground the enemy is willing to yield. If both players choose the active strategy or if they choose salient strategies that are incompatible in the sense that the claimed territories are incompatible, an all-out battle will erupt.[10] On the other hand, if compatible salient strategies are chosen, or if one player chooses the active strategy and the other chooses any salient strategy, battle will be avoided. It is apparent that, ceteris paribus, an ability to precommit to playing Salient will be advantageous. If only one party can precommit to Salient, she can choose from a number of possible Salient outcomes the one which is most favorable to her. For the other party, playing Active will now be the preferred strategy. In certain circumstances, it seems reasonable to suppose that the militarily weaker party will have the ability to precommit to Salient, since he will normally be retreating and can therefore choose where and when to take a stand. Note that, for plausible values of the payoffs, both parties will be better off than in the situation where neither can precommit.[11]

Parent-child relationships (in which communication is notoriously difficult) provide a related example. In general childen want more autonomy than their parents think is desirable. Since all disputes over autonomy will eventually be resolved in favour of the child, the parent is in the position of the weaker general. However, the advantage of weakness is the ability to precommit to Salient. Standard professional advice is that the parent should commit to a fixed set of rules at each interaction (though these rules will be relaxed over time). Since these rules can never be perfectly communicated, the child should adopt the Active strategy of exploring ambiguities. The resolution arrived at is likely to depend on the availability of appropriate salient points, such as the rules that the parent experienced as a child, and the rules applying the members of the childs' peer group. Bad outcomes occur if both parties play Salient; that is, back demands for incompatible rules with the application of sanctions, or if both parties play Active; that

[10] As in the general partition game, it is less clear what happens if the salient strategies do not clash but leave some territory unclaimed

[11] Farrell and Saloner (1988) also note that the ability of one party to make a unilateral and irrevocable choice is a common mechanism employed to achieve coordination. They also analyse the situation where both pre-play communication and unilateral preemptive actions are available.

is, if parents fail to commit to any set of rules.

The notion that the parties cannot communicate may seem artificial. However, in many bargaining situations it may be possible for the bargainers to commit themselves to a final agreement even though they cannot make credible statements in advance about their willingness to accept particular agreements. (See for instance, Farrell and Gibbon [1989].)

6 Conclusion

The principal conclusion arising from our analysis of the meeting place problem is that specification of the strategy space is all-important. Although this point is trite, it has frequently been overlooked. For example, game-theoretic analysis of interactions between firms has focused almost exclusively on interactions specified in terms of quantities (Cournot) or prices (Bertrand). Considerable attention has been given to refinements of equilibrium notions in situations where such interactions are repeated. Prices and quantities are obviously salient variables for economists who have spent years analysing supply-and-demand diagrams. However, it is less clear that they are relevant for business managers, who are frequently more concerned with variables such as markups (Grant and Quiggin, 1994), market share and employment levels. Even if businessmen did think like economists, it seems more natural to conceive of the strategy space in terms of supply schedules (Klemperer and Meyer, 1989). Although our analysis suggests that simplistic application of the notion of salience may yield an inadequate representation of co-ordination problems, it does not diminish the importance of salience in developing solution concepts. Indeed, consideration of the complexities that arise when there are multiple salient points gives emphasis to our current limited understanding of the notion of salience. We do not, however, advocate an immediate attempt to formalise the idea.[12] Rather, a strategy of active exploration seems appropriate at present.

[12] We refer the reader, however, to Sugden (1995) for an innovative and promising approach towards developing a formal theory of focal points.

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