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# AGRICULTURAL COMPETITIVENESS: MARKET FORCES AND POLICY CHOICE

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*Political Economic Processes and Collective Decision Making*

**INTRODUCTION**

As economists have focused more attention on agricultural policy making, their analytical frameworks have slowly recognized the political power structure and the role of special interests (Rausser and Zusman, forthcoming). As Zusman emphasized in 'Public Policy for Agriculture' (this volume), 'the interests in political power of participants in the political economy are the principal determinants of economic policy'. At the core of these analytical frameworks we find two approaches to the game-theoretical modelling of collective decision making or bargaining. One, the axiomatic approach, suppresses all details of the decision-making process and predicts outcomes by identifying conditions that any outcome arrived at by rational decision makers should satisfy, *a priori*. These conditions are treated as axioms, from which the outcome is deduced using set-theoretical arguments. In contrast, the strategic approach models constraints on the decision-making process itself and predicts outcomes by determining the equilibrium non-cooperative strategies of decision makers facing those constraints. Among the various axiomatic approaches, by far the most popular is Nash's solution for a two-person bargaining game (Nash, 1950; 1953) which is easily generalized to  $n$ -person games.

The remarkable simplicity of the Nash approach has facilitated its wide use in both theoretical and empirical work. In particular, its solution can be computed as the point in the bargaining set that maximizes the product of the players' utility gains from cooperation. For many political-economic problems, the strengths of the basic Nash approach, and of the axiomatic approach in general, are undeniable. It is important, however, to be aware of the limitations of the Nash bargaining approach as a tool for studying political-economic and collective decision-making processes. The purpose of this paper is to explore these limitations and to introduce an alternative bargaining model (Rausser and Simon, 1991) that is applicable to a wide range of political-economic problems, especially prescriptive analyses of the underlying collective choice rules (the constitutional space) and institutions that structure the policy-making process.

In the next section we pose the following specific question: under what circumstances is it appropriate to invoke the Policy Preference Function (PPF)

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framework as a proxy for a more complex, bargaining model of the political economic process? There is a precise mathematical way to pose this question. For every bargaining model there is a 'solution map' which assigns to each feasible set (that is, each set of feasible bargaining outcomes) the element of this set that solves the model.<sup>1</sup> Similarly, for each political preference function, there is an analogous maximization map, which assigns to each feasibility set the element of this set that maximizes the given preference function. In order for the PPF framework to be a valid reduced-form representation of a bargaining model, there must exist a particular PPF (that is, one that is specified independently of the bargaining problems to which it is applied) whose maximization map coincides with the solution map for the original bargaining model. In other words, this requirement is that over a wide range of distinct bargaining problems (that is, distinct feasible sets), the same PPF yields maxima that correspond exactly to the solutions of the underlying bargaining model when applied to those problems.

We begin by noting that a necessary condition for the above correspondence to hold, and hence for the PPF approach to be valid, is that the solution map must satisfy the so-called 'independence of irrelevant alternatives' (IIA) axiom introduced by Nash (1950). This axiom states the following. Suppose that a certain alternative is the solution to a given bargaining problem. Now delete from the original feasible set one or more alternatives *other than* either the original solution or the disagreement point. In this case, under the IIA axiom, the solutions to the reduced and to the original problems must coincide.<sup>2</sup>

Having discussed the central axiom in political economy models, the paper introduces the Rausser–Simon multilateral bargaining model (Rausser and Simon, 1991). This model yields solutions that do not satisfy the IIA axiom. Selected applications are cited and one application to agricultural policy formation in transition economies is discussed in detail.

## IIA: THE CENTRAL AXIOM IN POLITICAL ECONOMY MODELS

Among the various solution concepts offered within the axiomatic approach to bargaining theory, by far the most popular is the solution proposed by Nash (1950) for a two-person bargaining game. Nash showed that there is only one solution to such a game that (1) lies on the Pareto frontier (the Pareto-optimality axiom), (2) lies on the 45-degree line if the feasibility set is symmetrical about this line (the symmetry axiom), (3) is invariant to positive linear transformations of the players' utilities (the scale invariance axiom), and (4) is unaffected by removal of 'irrelevant' alternatives (the IIA axiom). This solution is easily generalized to  $n$ -person games, and its remarkable simplicity has facilitated its wide use in both theoretical and empirical work. In particular, the solution can be computed as the point in the feasibility set that maximizes a function equal to the product of the players' utility gains from cooperation, measured relative to the exogenous disagreement point.

Thus Nash's model satisfies precisely the condition identified above as determining when it is appropriate to substitute a PPF framework for a bargaining model: in fact, Nash's central result is to construct a function whose

associated maximization map coincides with the solution map implied by his four axioms. Of course, this function is not very interesting as a PPF, because it weights the policy maker's and all interests' utilities equally, leaving no room for differences in interests' relative influence on policy decisions. A variant of Nash's model that does allow for such differences is obtained by dropping the symmetry axiom and replacing the Pareto-optimality axiom with a requirement that *all* players gain strictly from cooperation if *any* player does (the strong individual rationality axiom). The resulting set of axioms implies a family of solution maps, each of which again coincides with the maximization map of a function equal to the product of the players' utility gains, except that these utility gains are now weighted by a set of non-zero exponents that sum to unity.<sup>3</sup>

As examples of well-known bargaining models that can indeed be represented in reduced form by simple maximization problems, both Nash's model and its non-symmetric variant appear to provide strong support for the validity of the PPF approach.<sup>4</sup> It is important to be aware, however, that such support relies crucially on the validity of the axioms on which these models are founded. Questions can be, and have been, raised about the validity of several of these axioms. The validity of the IIA axiom is of particular importance to any attempt to justify the PPF approach, however, because it can be shown to be a completely general necessary condition for the validity of that approach. For the maximization map associated with *any* conceivable PPF to coincide with the solution map of any bargaining model, it must be the case that the solution map satisfies IIA.

Rather than proving this result formally, we illustrate it with the following story.<sup>5</sup> Consider a government agency charged with determining consumer prices for staple food items. The agency does not have complete discretion over prices; it is bound by law to limit yearly price increases to no more than 5 per cent above inflation. Under the first scenario, the agency decides that this year a price increase of 2 per cent above inflation best meets its overall policy objectives. Under the second scenario, all else is equal, but the legal upper bound on price increases is 3 per cent rather than 5 per cent. Will the agency's decision be different? Quite obviously, if the agency considers 2 per cent to be a better figure than 0.5 per cent, 2.1 per cent, or any other figure under 5 per cent, then it must also consider it to be a better figure than any other figure under 3 per cent. The IIA axiom seems utterly reasonable in this context. Similarly, if in a *collective* decision-making context all participants agree that out of a set  $S$  of feasible alternatives a certain alternative is 'best', it seems that they should only find it easier to agree on the same alternative out of a subset  $T$  of  $S$ . After all, there are fewer comparisons to be made. In fact, this is precisely the justification Nash himself offered for the IIA axiom.

What, however, if the participants do not share any standard or set of collective preferences by which to compare the alternatives? Consider, for example, the following story about wage negotiations. Under the first scenario, the labour union comes out initially with a demand for a 19 per cent wage increase and the employer offers 4 per cent. Protracted negotiations follow, which result in a stalemate: the employer's absolute final offer is 9 per cent, but the union refuses to accept anything less than 11 per cent. Only after a two-

week strike do the two sides finally agree on a 9.9 per cent wage increase. Under the second scenario, all else is equal, but the government, in an attempt to fight inflation, has imposed general wage controls. In no industry are wages allowed to increase by more than 10 per cent. Obviously, this will affect the labour union's initial demand. But will it also affect the final agreement? It seems plausible that in this context the IIA axiom will be violated. The imposition of wage controls in the second scenario is likely to weaken the union's bargaining position relative to that of the employer, resulting in a lower agreed wage increase.

The lesson to be drawn from these stories is that the validity of the IIA axiom is self-evident in the manner intended by Nash only in contexts in which there is no real bargaining 'problem' in the first place. The problem either reduces to a simple search over the feasible set for the alternative agreed by all to be best, because agents share a preference relation, or it reduces to a single-person decision problem, because the ultimate decision is delegated to one agent.

Of course, the fact that the IIA axiom's validity is not self-evident in some contexts does not imply at all that in these contexts the axiom is invalid. All that is implied is that one cannot simply posit IIA as a primitive of a bargaining model of such contexts. It is, however, quite possible for IIA to emerge as a *consequence* of the primitives of, say, some strategic model of bargaining. Accordingly, we now turn to a consideration of strategic bargaining theory. Indeed, several bargaining models have been developed that, if adopted by employers and unions in wage-bargaining contexts, for example, *would* yield a solution map that satisfies the IIA axiom. In fact, the solution maps of these procedures satisfy all four of Nash's axioms, and therefore implement the Nash bargaining solution non-cooperatively. This suggests that such procedures could be appealed to as an alternative defence of the Nash bargaining solution, the IIA axiom and, by extension, the PPF approach. The strength of such a defence, however, will depend entirely upon the plausibility of those procedures as representations of real-world bargaining.

The so-called 'Nash demand game', for example, introduced by Nash (1953) precisely as an example of a non-cooperative implementation of his own solution concept, introduces uncertainty over the boundary of the feasibility set and then presents players with a *one-shot* gamble that their bid will be feasible in combination with their opponent's bid. It is hard to think of any real-world bargaining situation with the latter feature. Luce and Raiffa (1957) in fact criticize the Nash demand game as being a 'completely artificial mathematical "escape"' from the non-uniqueness of non-cooperative Nash equilibria in the game under full certainty. Luce and Raiffa's criticism applies with equal, if not more, force to a second procedure, introduced by Anbar and Kalai (1978). This procedure shares the one-shot character of the Nash demand game and, moreover, requires players to have a very specific prior on each other's strategies.

The third procedure was developed in Zeuthen (1930) precisely to analyse collective bargaining situations. It was later formalized and extended to more general two-person bargaining situations by Harsanyi (1956) and is now generally referred to as the Harsanyi-Zeuthen bargaining procedure. The proce-

ture is essentially just a rule stipulating which player should make a concession if the players make incompatible demands. Strangely, it requires players to compare each other's willingness to give in to the opponent's demand *completely* in order to determine who will give in *slightly*. Such schizophrenic behaviour on the part of bargainers is again hardly plausible.<sup>6</sup>

The fourth and last procedure is the famous two-person game analysed by Rubinstein (1982), in which the players make alternating offers over the division of a pie that shrinks over time. It was proved independently by Binmore (1987), MacLennan (1982) and Moulin (1982) that the non-cooperative equilibria of this game (there are two, depending on which player makes the first offer) converge to the Nash bargaining solution as the cost of delay between offers goes to zero.

The Rubinstein game looks considerably more promising than any of the foregoing procedures in terms of suggesting a significant class of collective decision-making contexts to which the Nash bargaining solution can be applied to yield a rough prediction of outcomes. We can infer, by extension, that in this class of decision-making contexts, the PPF assumption is roughly valid as well. The class can be broadened further by relaxing some of the Rubinstein model's restrictive assumptions. For example, Krishna and Serrano (1990) have shown that the Rubinstein game is not restricted to two-person bargaining contexts. They construct an  $n$ -person version of the Rubinstein game that implements the  $n$ -person Nash bargaining solution as costs of delay go to zero. Note also that bargainers need not literally expect bargaining to go on forever if they keep rejecting each other's offers. It is a well-known fact that discounting future pay-offs in a multi-round game at a fixed rate  $\delta$  is equivalent to assuming a fixed probability  $p = (1 - \delta)$  that the game will end after any given round, with zero pay-offs. This implies that the pie may also shrink between rounds because players (credibly) threaten complete breakdown of the negotiations with probability  $p$  whenever their current offer is rejected. Such threats certainly appear to be a feature of many real-world bargaining contexts. So are costs of delay between offers, whether or not imposed deliberately.

Nevertheless, despite the plausibility of many of the Rubinstein model's features, any appeal to the model to defend the PPF approach runs into serious problems. First of all, there is the disturbing paradox that players in the Rubinstein model act as if they maximize a collective utility function only when costs of delay and/or threats of complete breakdown simultaneously shrink to insignificance and continue to drive the bargaining process. In addition, an essential feature of the model is that players have either an infinite or an indeterminate horizon and this is hard to reconcile with political-economic contexts. In many, if not most, such contexts, the horizon is both finite and determinate: there is a clear deadline before which agreement must be reached. Even when there is no such deadline, costs of delay, far from driving the bargaining process, appear incidental to it at best. As for threats of complete breakdown, these are often simply not credible in political-economic contexts. In most situations where a candidate must be selected, for example, it is clear to all those involved in the selection process that somehow some candidate will eventually emerge as winner. Similarly, in the current legislative debates on economic and social policy reform in many countries, it is understood by all

sides that some reform plan will eventually be negotiated. Maintaining the status quo is simply not a realistic option in the existing political climate.

Both costs of delay and threats of complete breakdown *are* clearly important (perhaps even driving factors) in settings such as used-car markets, where buyers and sellers haggle over price and can always walk out on each other. They also clearly play a role in wage bargaining, although breakdown there is rarely permanent. The Rubinstein model may therefore justify using the Nash bargaining solution in those kinds of contexts. In political-economic contexts, however, neither the Rubinstein model nor any of the other strategic bargaining models discussed above appear to provide much support for the Nash bargaining solution, the IIA axiom or, by extension, the PPF assumption.

We conclude this section with a discussion of one more bargaining model, by Zusman (1976), which has frequently been invoked in the agricultural economics literature in support of the PPF approach. The model is based on Nash (1953), the second of Nash's classic papers on bargaining, in which he expands his original model to a two-stage bargaining game. In the first stage, players non-cooperatively determine the threats they will invoke if no agreement is reached in the second bargaining stage. This second stage coincides with Nash's original model, except that the exogenous disagreement point is now an endogenous 'threat point'. This formulation was generalized by Harsanyi (1963) to the  $n$ -person bargaining game and was used by Zusman to derive a 'governance function'. This governance function represents a political-economic system as a weighted sum of a single policy maker's and possibly multiple interest groups' utilities, where the weights reflect the interest groups' relative power over the policy maker. Although for any given feasibility set the solution to the Zusman model coincides with the maximum of this governance function, the weights of this function are not constant across feasibility sets.

## THE RAUSSER-SIMON MULTILATERAL BARGAINING MODEL

In this section, we introduce an alternative approach to the modelling of political economic problems, based on the framework developed in Rausser and Simon (1991). Henceforth we will refer to this approach as the MB model. The MB model represents politics as a process by which competing interest groups negotiate a compromise agreement that reflects their relative bargaining strengths. In contrast to the Rubinstein bargaining model, it is based on a finite-horizon notion of bargaining. In contrast to all four of the strategic bargaining models discussed in the preceding section, the MB model violates the IIA axiom.

We begin with a very brief description of the formal structure of the framework and then illustrate the formalism with an application. The reader is directed to the original paper for a more general treatment of the model and for technical details. There is a fixed, finite number of negotiating rounds. The description of the game includes a set of *admissible proposals* and a set of *admissible coalitions*. For example, the set of admissible proposals might consist of an interval  $[x, \bar{x}]$ , representing alternative settings of some policy variable. More generally, the admissible set could be a subset of  $n$ -dimensional



Euclidean space, representing a package of policy instruments that are being negotiated simultaneously. The set of admissible coalitions typically includes any sub-group of the players that together have the political power to implement a proposal. For example, in a strict majority rule regime any group containing a strict majority of the players would be admissible. Alternatively, if one or more players have de facto veto power over the negotiations, then any admissible coalition would have to include those players.

In the first round of negotiations, each player submits a proposal from the set of admissible proposals and selects a target coalition from the set of admissible coalitions. One of these proposals is then chosen at random by 'nature', according to an exogenously specified vector of access probabilities, and put to the selected coalition for a vote.<sup>7</sup> If all members of the coalition accept the tabled proposal then the game ends. If one or more parties rejects it, then play proceeds to the next round. This process continues until the last round. If players cannot reach an agreement in the last round, an exogenously specified default alternative is implemented. The main result of Rausser and Simon (1991) is to identify conditions under which the equilibrium of the bargaining game is essentially independent of the precise number of negotiating rounds, provided that this number is sufficiently large. Moreover, in equilibrium each party tables the same proposal, so that the outcome of the model is independent of nature's choice of proposer.<sup>8</sup>

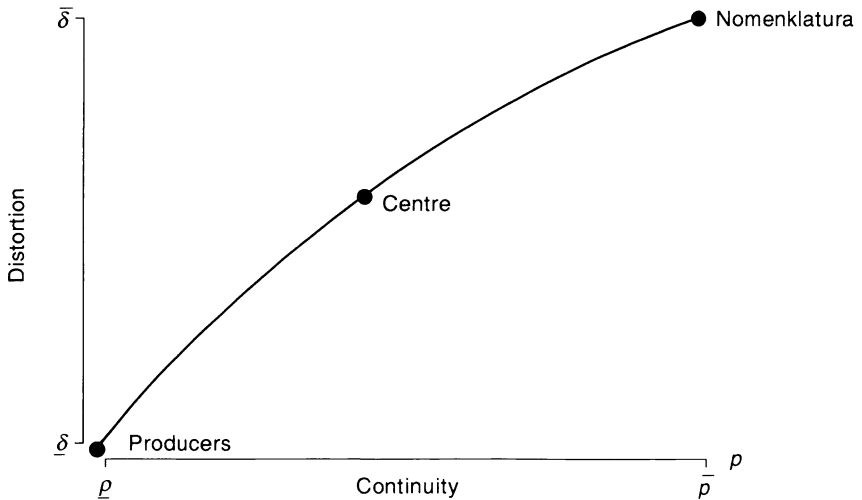
The MB model has been applied to a number of political economic problems. These applications exploit a key advantage of the framework as a tool for prescriptive policy analysis. Since various 'constitutional variables' (the rules for making rules) must be specified as part of the description of the problem, comparative statics techniques can be applied to obtain insights into the relative merits of alternative constitutional designs. In particular, the modeller must declare who has access and what constitutes an admissible coalition. Thus one can compare, say, the implications of simple majority rule versus a two-thirds majority.

Adams, Rausser and Simon (1993) use the MB model to analyse the negotiations between agricultural water users, urban water agencies and environmental groups over the issue of reforming the water allocation system in California. Rausser and Simon (1992) apply the MB framework to study the relationship between three constructs: the structure of a political alliance, the context in which negotiations take place, and the performance of the alliance. Rausser and Simon (1994) use it to investigate the linkages between agricultural and environmental policy. Finally, Lyons *et al.* (1994a) consider the political economy of agrarian reform in transition economies, taking the Bulgarian experience as a case study. The transition application is further developed in Lyons *et al.* (1994b). In this paper we will excerpt some of the main points of Lyons *et al.* (1994a) (henceforth referred to as LRS).

Before describing the LRS model itself, we need to provide some background. Many of the countries of Eastern and Central Europe are burdened by a fundamental tension between disruption and continuity. This tension arises from the dual roles played by the so-called nomenklatura (the ruling elite under the former Communist regimes) in the transition to a market economy. Both roles stem from the nomenklatura's privileged status in the old order.

While the nomenklatura have the potential to provide the agricultural sector with indispensable human capital, they also have the potential to extract rents from the sector, thus undermining its competitiveness. Both the productivity of nomenklatura capital and their capacity to extract rents are diminished to the extent that the reform disrupts the established agrarian order. Thus, in order to succeed, the agrarian reform process must sail between Scylla and Charybdis. Too much disruption degrades economic productivity, possibly to the extent of threatening the viability of the reform movement itself. Too much continuity skews the distribution of political power in favour of the nomenklatura, which may undermine the competitiveness of the nascent free market institutions.

Figure 1 graphically depicts the transition dilemma. The horizontal axis measures the degree of correlation,  $\rho$ , between the pre- and post-transition social orders. When  $\rho$  is set to one, the old order is perfectly preserved and the nomenklatura play a significant role in the transition process. As  $\rho$  tends to zero, the old order is increasingly fragmented, and the nomenklatura's economic and political role in the transition is reduced. The notion of correlation here is a measure of the degree of social disruption across both space and time. Thus a policy with  $\rho$  near zero represents a big-bang strategy, while a policy with  $\rho$  tending towards one represents a gradualist strategy. The vertical axis in the figure measures the degree of price distortion,  $\delta$ , in the post-transition economy resulting from rent seeking by the nomenklatura. Rent-seeking activities by the nomenklatura are less likely to occur under highly disruptive transitions because, in these cases, the nomenklatura have less political leverage with which to impose distortionary policies on society. For this reason, the disruption–distortion locus is upward-sloping. Its particular shape depends both on the way in which disruption affects the nomenklatura's political power and how that power is mapped into economic policy.



**FIGURE 1** *The disruption–distortion locus*

The LRS paper analyses the nature of this trade-off between disruption and distortion to gain insights about how societies choose transition strategies. To analyse the trade-off, a two-period Stackelberg model is constructed, involving three interest groups. Producers care about their economic surplus. The nomenklatura care about the rent they extract from the economy. The third interest group, labelled the 'centre', cares about social welfare, which is defined as total economic surplus less nomenklatura rent. Figure 1 indicates the preferred locations of these parties along the disruption–distortion locus: producers and the nomenklatura have directly inimical preferences, while the centre prefers an interior solution.

All economic activity in the model takes place in the second period in a single market. The focus of second-period policy is the choice of  $\delta$  (the deviation between consumer and producer prices in the market). The rent from this distortion goes to the nomenklatura, reducing consumer and producer surplus, and creating deadweight loss. The level of distortion is chosen through a political process by which the three interest groups lobby the government for their preferred level of distortion. The policy process in this period is formulated in the manner of the Zusman (1976) model:  $\delta$  is chosen by maximizing a Zusman governance function, which weights the objectives of the three interest groups according to their political power in the post-transition system. (Note that this political process exhibits IIA.) The influence each group is able to bring to bear on this policy decision is determined by the outcome of the transition. Highly disruptive transitions shift power away from the nomenklatura and towards producers and the centre, leading to lower levels of distortion in period 2. However, highly disruptive transitions also reduce the productivity of the economy in period 2, reducing total economic surplus.

In the first stage of the model described in the preceding section, the three interest groups (the nomenklatura, the centre and the producers) negotiate with each other to determine the character of the transition. The outcome of their negotiations is a choice of  $\rho$ , representing the extent of disruption. The selection of  $\rho$  determines the distribution of political power in the post-reform governance structure, which in turn determines the level of distortion in the post-reform economy. Thus the political parties are in fact negotiating to select a point on the disruption–distortion locus. This negotiation process is formulated as an MB game.

Like all finite-horizon dynamic models, the MB model is solved by backward induction. The solution may be obtained by applying a simple computational algorithm. For convenience, it is presumed that the default alternative is a breakdown in the economic system, a possibility so catastrophic that it is less preferable to each party than any negotiated level of  $\rho$ . Since in the last round of the game the alternative to agreement is the default alternative, a consensus can be obtained in this round in support of *any* level of  $\rho$ . It follows that in equilibrium the final-round proposal by any party will globally maximize that party's pay-off along the disruption–distortion locus. Whichever proposal is selected by nature in the final round will be accepted by all parties.<sup>9</sup>

Now consider the decision problem facing players in the penultimate round of negotiations. In equilibrium, each party will accept any tabled proposal that satisfies the party's participation constraint, that is, any proposal that yields a

pay-off level at least as great as the party's *reservation utility*, which is its expected utility conditional on disagreement in the current round.<sup>10</sup> It follows that the penultimate round proposal of any party's equilibrium strategy must be the  $\rho$ -value which maximizes that party's pay-off, subject to the condition that the other parties' participation constraints are both satisfied. Proceeding backwards up the game tree with this algorithm, we can compute the proposals that each party must submit in each round of negotiations. In equilibrium, whichever proposal is selected by 'nature' in the first round will be unanimously accepted. Thus, in equilibrium, play never proceeds beyond the first round.

One of the main objectives in LRS is to investigate the relationship between economic variables and the nomenklatura's acquisition of political power, and how this relationship affects the 'quality' of the transition. The paper challenges the conventional political economic wisdom that decoupling politics from economics will necessarily improve economic performance. Among the more interesting results of the analysis, conditions are identified under which the quality of the transition is actually enhanced by coupling the nomenklatura's acquisition of political power to the magnitude of the rents that they extract. Specifically, this result considers the effect of an exogenous change in political-economic culture, resulting in an increase in the extent to which the nomenklatura can utilize the rents they acquire to enhance their political power. *A priori*, it would appear that such a shift could have only detrimental consequences, and that these consequences will be more severe, the larger is the rent-seeking capacity of the nomenklatura. It turns out, however, that this intuition is not well-founded. The LRS analysis demonstrates that, if initially the nomenklatura are sufficiently powerful relative to the producers, the effect of this cultural change is to increase the general quality of transition, even though the equilibrium level of continuity declines.

The basic intuition for this result can be provided quite simply. The outcome of the bargaining process reflects the balance of power between the three interest groups. As indicated in Figure 1, the level of continuity which is optimal from a social welfare perspective lies between the level preferred by the producers and the level preferred by the nomenklatura. If the political power wielded by these two extreme groups is appropriately balanced, the optimal level of distortion can be attained as the political-economic equilibrium for the system. If the balance is tilted in favour of the producers, the equilibrium will be characterized by excessive disruption, that is, social welfare will be increasing in  $\rho$ , at the equilibrium level of  $\rho$ . Conversely, if the balance is tilted towards the nomenklatura, then social welfare will be decreasing in  $\rho$  at this level. Consider the latter case, in which the nomenklatura has too much power, so that the equilibrium level of  $\rho$  is excessive. It would appear that the centre ought to be able to redress the imbalance in power by acting strategically: by pretending to prefer less  $\rho$ , and negotiating accordingly, could not the centre tilt the bargaining outcome to the left? The answer is that this negotiating strategy would not be credible: to accomplish such a realignment, the centre would have to misrepresent its preferences in the final round of the bargaining game, by proposing a sub-optimal  $\rho$ -value. However, if this late stage in the game were ever to be reached, and if the centre were to

be selected by nature to table a proposal, then the centre would be in a position to enforce the optimal level of  $\rho$ . Thus, once the time came for the centre to misrepresent its preferences, it would no longer have any incentive to do so. In short, strategic misrepresentation of preferences is not a sub-game perfect strategy.

Now consider the effect of increasing the positive relationship between nomenklatura rents and their political power. In this case, the centre's preferences will genuinely be realigned in the direction of the producers, and the credibility issue will not arise. An increase in the extent to which money can buy power will result in an increase in the slope of the disruption–distortion locus: as  $\rho$  increases, the nomenklatura will obtain more rents; as they do so, their political power will increase, providing them with greater leverage with which to increase their rents still further; in short, a given increase in  $\rho$  will lead to a greater increase in  $\delta$ . In response to this increase in 'the price' of  $\rho$ , the centre's preferred location along the disruption–distortion locus will shift to the left, becoming more closely aligned with the preferences of the producers. The balance of bargaining power will shift, the solution to the MB problem will shift to the left, and welfare will increase.

## CONCLUSION

In this paper we have drawn attention to some of the assumptions that are implicitly made when the PPF approach is applied to model a political–economic process. We have pointed out that, in order to invoke the PPF framework as a proxy for an explicit bargaining model, there must be an exact correspondence between the solution map of the bargaining model and the maximization map of the PPF in question. We first noted that a necessary condition for such a correspondence to exist is that the solution map of the bargaining model must satisfy the IIA axiom. We then examined several prominent bargaining models, both axiomatic and strategic, that indeed satisfy this axiom.

The axiomatic models posit IIA as a primitive; it is, therefore, appropriate to apply these models to specific contexts only if the validity of the axiom is self-evident in these contexts. We argued that such contexts involve bargaining that is either consensual or mediated by an arbiter. The strategic models we discussed, on the other hand, yield IIA as a consequence of their primitives, and it is perfectly possible that these primitives are quite adequate stylizations of political–economic contexts that involve 'real' bargaining. We argued, however, that these primitives fail to capture the essence of most actual political economic negotiations. The Rausser–Simon framework serves as a useful bargaining model for such political–economic negotiations.

## NOTES

<sup>1</sup>More precisely, the map assigns solutions to combinations of a feasible set and a so-called 'disagreement point' in that set which represents the bargainers' respective pay-offs if they fail to

cooperate. It is common practice in bargaining theory, however, to assume that the bargainers have von Neumann–Morgenstern utility functions, which represent their preferences uniquely only up to a positive linear transformation, and to assume also that the solution is independent of the particular utility representations used. By applying suitable positive linear transformations to the bargainers' utility functions, the disagreement point of each feasibility set can then be normalized to the origin in utility space. Given this normalization, it is then no longer necessary explicitly to distinguish the disagreement point of each feasible set in the domain of what we call the 'solution map'.

<sup>2</sup>Nash's axiom should not be confused with the condition by the same name used by Arrow (1951; 1963) in the derivation of his famous impossibility result. See Ray (1973) for a demonstration that the two are logically and indeed conceptually unrelated.

<sup>3</sup>See Peters (1992) for a proof of this result.

<sup>4</sup>Another model which appears to provide support for the PPF approach is Zusman (1976). It is discussed at the end of this section.

<sup>5</sup>A formal proof requires adding a trivial step to the proof of Theorem 2.2 in Peters and Wakker (1991).

<sup>6</sup>See Bishop (1964) for a more detailed critique of the Harsanyi–Zeuthen procedure.

<sup>7</sup>Players' access probabilities reflect the distribution of power among them: the higher is a player's relative political power, the greater will be that player's access probability.

<sup>8</sup>More precisely, the Rausser–Simon model consists of a sequence of finite round bargaining games, with the number of rounds increasing without bound as the sequence progresses. For each of these games, there is a unique equilibrium outcome. Under certain conditions, this sequence of equilibria will converge as the number of rounds increases. A *solution* to the bargaining model is the limit of the sequence of equilibria for the finite games. It is interpreted as the equilibrium of a negotiating process with a large but unspecified number of negotiating rounds.

<sup>9</sup>We assume that a party must vote in favour of a proposal whenever it is indifferent between accepting or rejecting it.

<sup>10</sup>To compute this reservation utility, take the weighted sum of the utilities the party receives from each of the proposals submitted in the final round, where the weights are the players' access probabilities.

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