POWER AND INEFFICIENT INSTITUTIONS

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ABSTRACT. This paper is concerned with the persistence of inefficient institutions. Why are they not replaced by more efficient ones? What and/or who prevents such change? We provide an answer to these questions based on two key ideas. The principal idea is that institutional change on an issue may adversely affect the bargaining power of some agents on different issues. The second is that certain kinds of frictions (or transaction costs) are present, which do not allow for this deteriorating bargaining power to be compensated for. A key insight obtained from our analysis is that, the greater is the degree of inequality in the players' bargaining powers the more likely it is that inefficient institutions will persist.

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"Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction." Douglass North, *Institutions, Institutional Change and Economic Performance, 1990.*

"The ... stumbling blocks to beneficial institutional change in many poor countries may have more to do with distributive conflicts and asymmetries in bargaining power." Pranab Bardhan, *Distributive Conflicts, Collective Action, and Institutional Economics, 2001.*

1. Introduction

Institutions matter. Today this insight lies (again) at the heart of mainstream economic thinking and research. That wasn't the case about two to three decades ago when competitive equilibrium theory dominated the profession, before the developments in, and applications of, subjects such as game theory, information economics and contract theory. Furthermore, it is an insight that today informs the policies and programmes of international organizations (such as the World Bank) who are promoting economic development in the poorer parts of the world. For a discussion and analysis of the importance of institutions for economic, political and social development, see the World Bank's World Development Reports *The State in a Changing World* (1997) and *Building Institutions for Markets* (2002). For a more formal and academic discussion see Bardhan (2001) and Hoff and Stiglitz (2001).[1]

One key issue concerns the persistence of inefficient institutions. Why are inefficient institutions not replaced by more efficient ones? What and/or who prevents such change? In this paper we provide one answer to these questions, an answer which uncovers a close and deep connection between *inequality* in bargaining power and the persistence of inefficient institutions.

According to Milgrom and Roberts (1992), there are four basic approaches to explaining institutional organization: Marx explains organization as a reflection of underlying power relationships and class interest; the Harvard Industrial Organization approach can be summarized as explaining organization as an attempt to manipulate prices; the transactions cost approach associated with the work of Coase and Williamson sees organization as minimizing transactions costs; finally, the modern efficiency approach sees organization as the efficient choice

[1]Both articles are in a volume entitled *Frontiers of Development Economics,* edited by Gerald Meier and Joseph Stiglitz. It contains articles by some of the pioneers and current leading scholars in development economics. They take stock of the current state of development economics, and discuss the main issues and problems of development. A central theme is the importance of institutions and institutional change.

for parties that can bargain effectively. The latter is based on an application of the Coase Theorem, which — for appropriate environments — applies value maximization. Milgrom and Roberts point out explicitly that it would be wrong to apply the Coase Theorem to issues such as land tenure or slavery, since too many (all?) of its assumptions are violated in these cases.

The Coase Theorem, the reader may recall, states that if parties bargain to an efficient agreement (which requires effective bargaining, implementation, and enforcement) and if their preferences display no wealth effects (that is, are quasi-linear in money) then the value creating activities are allocated according to efficiency criteria only, and other factors such as bargaining power or asset ownership affect only how benefits and costs are shared. In other words, under frictionless conditions the parties choose efficient institutions. Why then do inefficient institutions persist? One of the many restrictive conditions of the Coase theorem must be violated. Most often the culprit is identified in some form of transactions cost, chiefly asymmetric information.

This point has been noted by several authors — see, for example, the classic treatise by Douglas North, North (1990), where he develops the thesis that inefficient institutions persist due to the presence of various kinds of frictions (or transactions costs) such as those created by informational asymmetries. Not surprisingly, the explanation that we develop in this paper is also based upon the presence of certain kinds of frictions. Specifically, we consider situations in which parties are unable to make binding commitments, or, to put it differently, are unable to write enforceable (long-term) contracts. In addition, winners of an efficiency-enhancing institutional change are wealth-constrained and unable to borrow the potentially large amounts of money required to compensate the losers of such a change upfront.

Our explanation builds on two key ideas. The principal idea is that institutional change on one issue may adversely affect the bargaining power of some agents on a different issue. The second is the one just described, namely the presence of the frictions stated above, which do not allow for this deteriorating bargaining power to be compensated for. We study these issues in the simple but abstract setting of a two-stage game of perfect and complete information. The model has two players (individuals or organizations) who have the option to negotiate over an efficiency-enhancing institutional change. However, they know that if such a change is implemented then the players' respective bargaining powers over a different (second) issue will be altered; which, in turn, will affect their ex-ante incentives to conduct the institutional change in the first place.[2] Our analysis begins by characterizing conditions such that the efficiency-enhancing institutional change does not take place if and only if these conditions hold. We then analyze these conditions to tease out some specific results and insights about the persistence (or otherwise) of inefficient institutions. A key insight that we obtain is that, a small degree of inequality in the players' bargaining powers is conducive for efficient institutional change, but not a large degree of such inequality; in that latter case, inefficient institutions are likely to persist. Several other results and insights are derived such as the insight that, the larger are the efficiency gains associated with the institutional change the more likely it is that such change takes place.

The remainder of the paper is organized as follows. In the next two subsections, we present two real-life examples in order to illustrate our main ideas, their consequences, and their applicability; and then in the third subsection we discuss the related literature. Section 2 presents our model and section 3 our results. Concluding remarks are offered in section 4.

1.1. **An Example in Development.** In the villages of several poor countries (such as India) there is a great inequality in land ownership with land concentrated in the hands of a relatively small number of landlords. The landlords in such villages not only provide employment to the villagers but are also their main source of credit.[3] An important consequence of this arrangement is that the few landlords are significantly richer than the landless villagers. Together with the fact that there are only a few landlords but many landless villagers, this bestows great bargaining power to the landlords in not only the labour but also the credit markets.

An important empirical observation is that, for a variety of reasons (including agency arguments) large farms tend to be less productive than small farms. As such, it is argued that land redistribution, leading to greater equality of land ownership, would enhance productivity and hence the aggregate surplus that is generated. And yet such land redistribution has not taken place. There are several reasons for that

[2]The players are wealth constrained so that only the payoffs from a given issue may be allocated, and they are unable to commit to a sharing rule for the second issue. In the language of the agenda bargaining literature (see, for example, Busch, 2002), the negotiations are independent (or sequential) and implementation of any agreements is also sequential (i.e., an agreement on the first issue is implemented when reached, after which negotiations on the second issue commence.)

[3]See, for example, Bardhan (1980), Braverman and Stiglitz (1982), or Basu (1998).

which have been put forward in the literature; see, for example, Banerjee (1999).

The theory developed in this paper provides an alternative explanation. To put it succinctly, land redistribution would significantly and adversely affect a landlord's bargaining power in the labour and credit markets; which, in turn, would adversely affect his overall welfare; and that is why landlords refuse to give up their large landholdings. The inability to make binding commitments (i.e., to write enforceable, long-term contracts) prevents the poor villagers from committing not to exploit their increased bargaining power following land redistribution. Furthermore, being wealth-constrained and unable to borrow to the extent required, they cannot compensate the landlords upfront either. Hence the persistence of this (inefficient) institution, where ownership of land is concentrated in the hands of a small number of people.

It should be noted that our explanation, which is illustrated in the above example in an intuitive and informal manner, is not based on any informational asymmetry. We note this point in particular, since it is commonplace in the economics literature to explain inefficient outcomes by appealing to some form of asymmetric information.

1.2. **An Example in Industrial Organization.** The mechanism outlined above also applies to more mundane issues, such as the apparent lack of R&D joint ventures and the resultant duplication of R&D effort, observed in the industrial organization literature. The situation here is that of two firms who compete in a product market. The firms may engage in R&D in order to improve their production technology (lower their unit costs.) R&D is lumpy (i.e., comes in discrete units) and there are dis-economies of R&D in the industry. Hence it would be efficient if there were joint R&D; yet under standard assumptions the market leader may not wish to engage in a joint R&D venture. As in the previous example, the two parties face two separate issues — here it is the R&D stage followed by the product market stage — and for legal reasons it may not be possible for them to agree on a product market sharing rule when they agree on the terms of the R&D joint venture. Also, the agreement on the R&D stage (in particular, if there is any agreement at all) will influence the situation in the subsequent product market, since joint R&D may imply that any initial technological advantages of one firm must be shared between the joint venture partners. Hence the initial leader may suffer a potential loss which cannot be compensated for, given the limitations on contracting (in particular, that no explicit market sharing rules may be contracted on, or, equivalently, no profit sharing agreements may be engaged in.)

In the Appendix we present a numerical example in which the initial low cost firm refuses to establish an efficiency-enhancing "research joint venture" in equilibrium. Again, the persistence of the inefficiency is not due to asymmetric information but to asymmetric bargaining power.

1.3. **Related Literature.** A key motivation of this paper is that institutions matter for economic, political and social development and performance. Hence a *raison d'etre* for studying institutional change in general, and the theme of the persistence of inefficient institutions in particular. As such the analysis and results in this paper, while specifically concerned with the latter theme, may also have some wider interest and import. Scholars, for example, in the growing field of *Political Economics*, who explore the impact of specific political institutions on economic policy and performance, may find the contribution here of some interest; for a recent survey of that field, see Persson and Tabellini (2000).

Similarly, in industrial organization, specifically the theory of the firm, the issues raised here may be able to explain various phenomena in a new light. In the spirit of the efficiency framework, organizational form is explained as efficient given the transactions cost and contracting constraints placed on the parties. Our work thus relates to issues raised in Tirole (1990) and Milgrom and Roberts (1992), and the large literature on asset ownership and the firm (see, for example, Hart, 1995). The novel aspect is the explicit consideration of the bargaining environment and the careful analysis of bargaining power. Doing so we demonstrate that an apparently suboptimal organizational form may persist because the Pareto dominating allocations cannot be achieved *in equilibrium* since the more efficient form would be disadvantageous to one of the parties.

We are, however, concerned specifically with the issue of the persistence (or otherwise) of inefficient institutions. While several authors have written on this theme, it is arguably Douglass North who has been a pioneer in the study of institutions and institutional change; see, especially, North (1990). His work, while informal, addresses a whole host of issues related to this topic. The importance of the presence of various kinds of transaction costs for explaining the persistence of inefficient institutions is a main focus of his work. Our analysis also requires the presence of certain kinds of transaction costs such as the inability to make binding commitments. However, we focus attention upon the role and impact that *distributive conflicts* may have on institutional change. In particular, our main insight that there is a close relationship between inequality in bargaining power and the persistence of inefficient institutions is novel.

There are two recent papers which have also pointedly emphasized and discussed the importance of such distributive conflicts for the persistence of inefficient institutions.[4]

First is the paper by Bardhan (2001). In it he provides a discussion of various issues concerned with the persistence of inefficient institutions. In particular, Bardhan makes several points which, in effect, lay the ground for the model and analysis in this paper. Indeed, for further motivation of our model and analysis, we refer the reader to his article. He discusses and emphasizes the notion that a productivity-enhancing institutional change may create winners and losers, and that the former may be unable to compensate the latter; and thus the losers would resist the change that is potentially Pareto improving. This notion lies at the heart of our analysis; we formally develop it, and explore its range of validity and implications. Bardhan suggests that, "... the obstruction by vested interests can be formalized as a simple Nash bargaining model." This is, of course, exactly the approach that underlies our model.[5]

Second, there is the paper by Acemoglu (2002). In this article he argues that distributive and social conflicts are key factors determining the persistence (or otherwise) of inefficient institutions. In particular, he studies a model to explore the fundamental point that the inability to make binding commitments can be a decisive factor inhibiting efficiency-enhancing institutional change from taking place. He also provides an interesting discussion of several real-world examples to illustrate this point. Rather than describe those here, we refer the reader to his paper for that, and also for references to some other studies that make a similar point, albeit only implicitly and in various specific contexts. While the formal model studied in Acemoglu (2002) and the model studied in this paper are quite different, the underlying motivation is similar, as are some of the key ideas.

2. The Model

2.1. **An Overview.** We consider a situation with two "players" and two "issues". A player can be either a single individual or a coalition (or

[4]Both were brought to our attention after the first draft of this paper was completed.

[5]We should also like to mention that he (also) uses land redistribution as an illustrative example; his discussion is more detailed than our short summary, and provides additional motivation for our model and analysis.

group) of individuals. For example, in the context of a rural village in India, one player could be the single, wealthy landlord, while the other player comprises of the large number of poor and landless villagers. In this context, one issue could be land redistribution, while the second could be an issue concerning the conditions on which the poor are employed by the landlord or the conditions on which they are offered credit by him.

There is a status quo in place over both issues. This current state-of-affairs generates a per-period payoff to each player from each issue. In the language of bargaining theory, this payoff is a player's inside option.[6] A basic assumption is that this status quo is inefficient.

The two players first decide whether or not to commence negotiations over the first issue. If they choose not to do so, then the inefficient status quo remains in place; otherwise negotiations proceed. The decision (on whether or not to begin negotiations) is made independently and non-cooperatively. In particular, we assume that both players are sufficiently wealth-constrained such that no player has enough funds to be able to make an upfront payment to the other player in order to get the negotiations going. Furthermore, the players are unable to make binding commitments (via, for example, enforceable, long-term contracts) about their respective future actions that would induce them to come to the negotiating table.

If however the players do proceed to negotiate, then bargaining over the first issue begins. When and if agreement is reached and implemented over the first issue, the parties then commence bargaining over the second issue. That second set of negotiations takes place under a *newly* established status quo. Each player's inside option from the first issue is now determined by the (presumably efficient) agreement just struck over it. A fundamental assumption that underlies our model is that the inside option that each player obtains from the second issue is potentially influenced (altered) by the agreement struck over the first issue.

The motivation behind the above bargaining agenda with sequential negotiations and implementation is as follows. We have in mind situations in which an agreement over one issue (the second one) is relatively easy to renegotiate, while that is not the case with first issue. Once agreement over the first issue is reached and implemented, it is too costly to renegotiate that agreement; its implementation implies changes in the status quo that are difficult to alter. After an agreement

[6]For a general discussion and analysis of "inside options" — and how they differ, for example, from "outside options" — see Muthoo (1999).

over this first issue, the players may have an incentive to renegotiate any prior agreement over the second issue. Since parties are unable to write enforceable (long-term) contracts, such renegotiation would take place. This agenda makes sense for example in those situations in which the second issue concerns the terms of trade (prices and quantities) while the first issue concerns the ownership of, or property rights over, some assets (such as land and capital).

In this model there are two sources (or factors) from which a player derives "bargaining power"; these are his inside options over the two issues. It should be noted that a player's bargaining power in the status quo (which is his bargaining power before agreement over the first issue is reached) can differ from his bargaining power after agreement over the first issue is reached but before agreement over the second issue is reached. We denote the former a player's *ex ante* bargaining power, and the latter a player's *ex post* bargaining power.

2.2. **The Formal Set-Up.** There are two players, 1 and 2, and two issues, X and Y. The size of the per-period "cake" (or joint payoff) created as a result of an agreement over issue k ($k = X, Y$) is $m^k > 0$. Bargaining over issue k is thus equivalent (in utility terms) to bargaining over the partition of this per-period cake. The agenda is fixed and given: negotiations (if they occur) over the two issues are to be conducted separately and sequentially. Without loss of generality, assume that the first set of negotiations is over issue X. When and if agreement is reached over issue X (which is immediately implemented) the second set of negotiations over issue Y begins. Failure to reach agreement over issue X means that the players cannot and/or will not proceed to negotiate over issue Y. Each player has the option to refuse to bargain (i.e., each player can choose not to start the negotiations over issue X).

During the first set of negotiations, until agreement is reached over issue X, the players obtain their inside options. The per-period inside options from issue k ($k = X, Y$) obtained by players 1 and 2 respectively are z_1^k and z_2^k, where $z_1^k + z_2^k < m^k$. This implies that if the players fail to reach agreement over issue X, then player i's average (or per-period) payoff from this impasse is $d_i = z_i^X + z_i^Y$. The latter is also player i's average payoff from the status-quo.

If the players reach agreement over issue X giving players 1 and 2 respectively shares x and $m^X - x$ of the cake (where $x \in [0, m^X]$), then the agreement is immediately implemented. This means that from then onward the per-period payoffs to players 1 and 2 from issue X are x and $m^X - x$ respectively. Furthermore, and this is a key feature of our model, each player's inside option from issue Y may change. It is no longer necessary that player i continues to obtain the per-period payoff of z_i^Y from issue Y. This is because the particular agreement over issue X, as captured by x, may strategically affect the players' inside options over issue Y. We capture this potential change as follows: player i's per-period inside option from issue Y immediately after agreement x over issue X is struck is $f_i(x)$, where for any $x \in [0, m^X]$, $f_1(x) + f_2(x) < m^Y$. For the time being we make no (additional) assumptions about the nature of the functions f_1 and f_2.

We adopt the Nash bargaining solution to describe the outcome of each set of negotiations, where the manner in which we apply this bargaining solution is informed by non-cooperative bargaining theory (as discussed, for example, in Muthoo, 1999). This completes the description of our model with two "players" and two "issues". The model is a (two-stage) game with perfect information. It will be assumed that the game is one with complete information. The latter means, in particular, that all the parameters of the model are common knowledge between the players.

The core parameters of our model — which play an important role in our analysis on whether or not, in equilibrium, the inefficient institutions that underlie the status quo are replaced by efficient institutions — are as follows. First, there are the players' inside options associated with the inefficient status quo, namely, z_1^X, z_1^Y, z_2^X and z_2^Y. These determine the players' absolute and relative bargaining powers in the status quo. Second, there are the players' (endogenously determined) new inside options over issue Y following an agreement over issue X, the functions f_1 and f_2. These determine the players' absolute and relative bargaining powers after an agreement over issue X is reached. Third, there are the parameters that capture the magnitudes of the efficiency gains associated with the beneficial institutional changes, namely, m^X and m^Y.

By entertaining heterogeneity in the players' inside options, we are able to explore the impact that *inequality* in bargaining power has on the persistence (or otherwise) of inefficient institutions. It should be emphasized that this inequality in bargaining power can be *ex ante* (i.e., in the inefficient status quo) and/or *ex post* (i.e., after an agreement on issue X but before an agreement on issue Y). Perhaps not surprisingly, these two different kinds of inequality can have potentially differing impacts.

2.3. **A Preliminary Result.** Using "backward induction" in order to characterize subgame perfect equilibria, we begin by characterizing the outcome of the second set of negotiations conditional on an arbitrary outcome in the first. Thus, suppose that the players commence negotiations and an agreement is struck over issue X on an arbitrary partition $(x, m^X - x)$ of the cake. Now consider the second set of negotiations, over issue Y. If the players reach an agreement on some arbitrary partition $(y, m^Y - y)$, then the per-period payoffs thereafter to players 1 and 2 are $x + y$ and $m^X + m^Y - x - y$. But if the players fail to strike an agreement over issue Y, then the per-period payoffs to players 1 and 2 are $x + f_1(x)$ and $m^X - x + f_2(x)$. Applying the Nash bargaining solution, it follows that the players will reach agreement over issue Y, and the utility payoffs to players 1 and 2 can be written as follows:[7]

$$P_1(x) = x + \left[f_1(x) + \frac{1}{2}\big[m^Y - f_1(x) - f_2(x)\big] \right], \tag{1}$$

$$P_2(x) = [m^X - x] + \left[f_2(x) + \frac{1}{2}\big[m^Y - f_1(x) - f_2(x)\big] \right]. \tag{2}$$

While the first term in each of these expressions is a player's (currently arbitrary) per-period payoff from issue X, the term inside the big bracket is his per-period (Nash bargained) payoff from issue Y. The latter is the sum of the player's new inside option payoff from issue Y (following the implementation of the agreement on issue X) and one-half of the net surplus from issue Y (the amount of cake available above and beyond the sum of the new inside option payoffs).

It follows that during the negotiations conducted over issue X the per-period equilibrium payoffs to players 1 and 2 from reaching agreement on an arbitrary partition $(x, m^X - x)$ are $P_1(x)$ and $P_2(x)$. Clearly, an agreement x on issue X not only determines a player's payoff from issue X, but also has a strategic effect on the player's Nash bargained payoff from issue Y, by affecting the players' inside options on issue Y. It should be noted that if the players fail to reach an agreement on issue X, then the per-period payoffs to players 1 and 2 are $z_1^X + z_1^Y$ and $z_2^X + z_2^Y$ respectively. Notice that the sum $P_1(x) + P_2(x) = m^X + m^Y$, which, by assumption, strictly exceeds the sum of the per-period inside option payoffs from disagreement over issue X.

[7]The manner in which the Nash bargaining solution should be applied in a bargaining situation with inside options is discussed in Chapter 6 in Muthoo (1999). There it is shown that the inside options should be used to define the threat (or disagreement) point in the Nash Bargaining Solution.

3. Equilibrium Inefficient Institutions

We begin by deriving a proposition that characterizes conditions such that in equilibrium at least one player refuses to bargain if and only if the parameters satisfy these conditions. Thus, when these conditions hold, the inefficient status quo remains in place; but not otherwise. We then analyze these conditions in order to derive some more specific results and insights about the persistence (or otherwise) of inefficient institutions.

3.1. **Characterization.** Notice that for issue X, in isolation, player preferences are monotonic in x: more x means more cake for player 1 and less cake for player 2. What about the equilibrium utility payoffs $P_1(x)$ and $P_2(x)$? Assuming, for expositional simplicity, that f_i $(i = 1, 2)$ is differentiable, it follows that monotonicity of $P_1(x)$ in x requires that for any $x \in [0, m^X]$,

$$1 + f_1'(x) - \frac{1}{2}[f_1'(x) + f_2'(x)] > 0.$$

The interpretation of this inequality is that the utility gains from an increase in x (the 1) cannot be dominated by a potential loss in equilibrium payoff on issue Y that is caused by the change in the inside option payoffs. Similarly for player 2, monotonicity of $P_2(x)$ in x requires that for any $x \in [0, m^X]$,

$$-1 + f_2'(x) - \frac{1}{2}[f_1'(x) + f_2'(x)] < 0.$$

Hence, both players' equilibrium utility payoffs are *monotonic* if and only if

$$1 > \frac{1}{2}[f_2'(x) - f_1'(x)] \quad \text{for any } x \in [0, m^X]. \tag{3}$$

Under the monotonicity assumption (i.e., when inequality 3 holds), negotiations will not commence in equilibrium if and only if at least one player's per-period payoff from the status quo exceeds the maximal possible payoff he could get from the bargain; that is, either $P_1(m^X) < z_1^X + z_1^Y$ or $P_2(0) < z_2^X + z_2^Y$. Using (1) and (2), and re-arranging terms, we obtain

$$m^X + \frac{1}{2}[m^Y + f_1(m^X) - f_2(m^X)] < z_1^X + z_1^Y, \tag{4}$$

$$m^X + \frac{1}{2}[m^Y - f_1(0) + f_2(0)] < z_2^X + z_2^Y. \tag{5}$$

Define for each $x \in [0, m^X]$, $\Delta(x) = [f_2(x) - f_1(x)]/2$. The value of $\Delta(x)$ is a measure of the degree of inequality in the players' *ex post* bargaining powers; in particular the advantage of player 2 over player 1 in the bargain on Y.[8] Together with the definition of total disagreement payoffs for player i, $d_i = z_i^X + z_i^Y$ $(i = 1, 2)$, we can then rewrite the above as

$$m^X + \frac{1}{2}m^Y - d_1 < \Delta(1), \tag{6}$$

$$m^X + \frac{1}{2}m^Y - d_2 < -\Delta(0). \tag{7}$$

Inequalities 6 and 7 have an easy interpretation. The right-hand side is a player's loss in bargaining power over the subsequent issue, evaluated at that player's maximally possible payoff. The left-hand sides are the maximal payoff gains possible if there were no second stage status quo payoffs. If, then, a player's loss in second stage bargaining power exceeds his maximal gain in a game without such bargaining power differences, the player will refuse to negotiate. To summarize, we have established the following (characterization) result:

Proposition 1. *Assume that the functions f_1 and f_2 satisfy inequality 3. Then, in equilibrium, at least one of the players will refuse to bargain (and the inefficient status quo remains in place) if and only if either inequality 6 or inequality 7 is satisfied.*

Thus, under the monotonicity assumption, if neither inequality 6 nor inequality 7 holds then the players will strike an agreement over issue X (and then over issue Y). But if either one of these two inequalities holds, then at least one player will refuse to bargain, and the inefficient status quo remains in place.

Notice that we don't really need monotonicity — all it does is to ensure that player 1's equilibrium utility payoff $P_1(x)$ is maximized at $x = m^X$ and player 2's equilibrium utility payoff $P_1(x)$ is maximized at $x = 0$. So, in the absence of monotonicity, define $\overline{x}$ and $\underline{x}$ respectively to be the supremum and infimum of $\{x \in [0, m^X] : P_1(x)\}$ and $\{x \in [0, m^X] : P_2(x)\}$ — which exist since the functions P_1 and P_2 are bounded. At least one player will refuse to bargain if and only if either $P_1(\overline{x}) < z_1^X + z_1^Y$ or $P_2(\underline{x}) < z_2^X + z_2^Y$; that is, if and only if one of the

[8] Recall from above that the NBS on Y allocates $\left[m^Y + f_1(x) - f_2(x)\right]/2 = m^Y/2 - \Delta(x)$ to player 1, and $\left[m^Y - f_1(x) + f_2(x)\right]/2 = m^Y/2 + \Delta(x)$ to player 2.

following inequalities holds:

$$\overline{x} + \frac{1}{2}m^Y - d_1 \;<\; \Delta(\overline{x}), \tag{8}$$

$$\left(m^X - \underline{x}\right) + \frac{1}{2}m^Y - d_2 \;<\; -\Delta(\underline{x}). \tag{9}$$

Hence, we have the following more general characterization result:[9]

Proposition 2. *In equilibrium, at least one of the players will refuse to bargain (and the inefficient status quo remains in place) if and only if either inequality 8 or inequality 9 is satisfied.*

When will the conditions in these propositions be satisfied? We now turn to an exploration of this question in order to determine which environments lead to these results. There are, fundamentally, three avenues which could contribute: the role of bargaining power itself, both *ex ante* and *ex post*; the size of the efficiency gains ($m^X + m^Y - d_1 - d_2$); as well as the change in bargaining power introduced through the linkage of the second issue's status quo payoff with the agreement struck on the first issue.

3.2. **Equal Bargaining Powers.** Consider, first, the benchmark case of perfect equality in both *ex ante* and *ex post* bargaining powers. That is, the case in which (i) for $k = X, Y$, $z_1^k = z_2^k$, and (ii) for any $x \in [0, m^X]$, $f_1(x) = f_2(x)$. The latter implies that $\Delta(x) = 0$ for all $x \in [0, m^X]$. For these parameter values inequality 3 holds and thus Proposition 1 is applicable. Letting the identical inside option over issue k be denoted by z^k, and the identical new inside option on issue Y be denoted by the function f, it is easy to verify that both Inequalities 6 and 7 then collapse to

$$m^X + \frac{1}{2}m^Y - z^X - z^Y < 0$$

which cannot hold (since, by assumption, $m^k > 2z^k$ for $k = X, Y$). Hence, we have established the following result:

Corollary 1. *If the players have equal* ex ante *bargaining powers and equal* ex post *bargaining powers, then, in equilibrium, agreement is reached over both issues, and the inefficient status quo is replaced by an efficient outcome.*

[9]Indeed, the above derivation did not use continuity of f_i either, and so also covers the case where the bargaining power on the second issue may jump or flip at certain critical values of the first — something which may happen if the first issue involves voting rules or majority requirements, as in many constitutional bargains.

Perhaps not surprisingly, in an environment in which players are symmetrically placed — that is, have equal bargaining power in the inefficient status quo and would continue to have equal bargaining power after reaching agreement over issue X but before reaching agreement over issue Y — each of them has an incentive to get rid of the inefficient status quo and benefit from the efficiency-enhancing institutional change. Notice that this conclusion holds even if the players' *ex post* inside options are adversely (or positively) affected by the agreement on X, provided that they are affected in an identical manner — preserving the relative bargaining powers of the players. Also note that the size of the possible efficiency gains does not matter here. Furthermore, the presence of the transaction costs are immaterial. Despite the limits on contracting and the wealth constraint, the inefficient institution is replaced.

An important implication of Corollary 1 is that inequality in the players' bargaining powers is necessary for the persistence of inefficient institutions, an insight that we now explore in more depth.

3.3. **Unequal Bargaining Powers.** We begin the analysis of the general case of unequal bargaining powers by first studying the special case in which the players' *ex ante* bargaining powers are unequal, but their *ex post* bargaining powers are equal. That is, the case in which for any $x \in [0, m^X]$, $f_1(x) = f_2(x) = f(x)$. This special case is the (approximately) relevant case for many real-life situations (such as the land redistribution situation) in which (i) there is a relatively large degree of inequality in the players' *ex ante* bargaining powers, and (ii) the institutional change implied by an agreement over issue X eliminates (or significantly reduces) the inequality in bargaining power over issue Y. As such this special case may be of some interest in its own right, besides being instructive. In fact, as we shall show, the main qualitative results and insights obtained in this special case carry over to the general case of unequal *ex ante* and unequal *ex post* bargaining powers.

3.3.1. *Equal* ex post*, But Unequal* ex ante *Bargaining Powers.* For any $x \in [0, m^X]$, let $f_1(x) = f_2(x) = f(x)$, which implies that $\Delta(x) = 0$. Recall that we defined, for each $i = 1, 2$,

$$d_i = z_i^X + z_i^Y,$$

which can be interpreted as a measure of player i's "aggregate" *ex ante* bargaining power. Inequality in the players' aggregate *ex ante* bargaining powers can be plausibly measured by, or interpreted as, the "distance" between d_1 and d_2 — defined, for example, by the absolute value of the difference between d_1 and d_2.

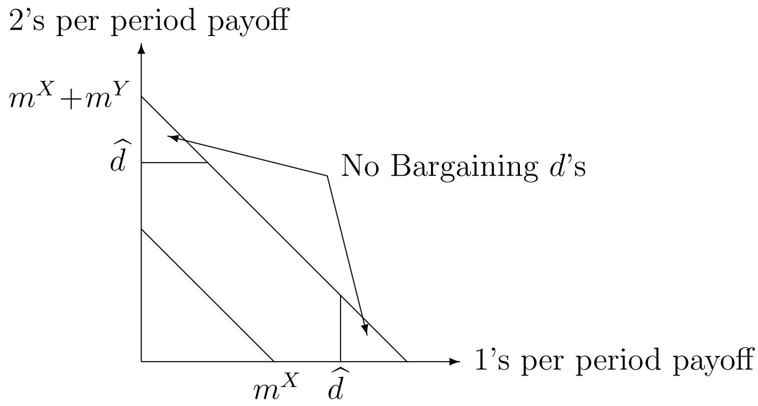

Figure 1. Illustration of Corollary 2

In this special case under consideration, inequality 3 holds, and thus Proposition 1 is applicable. Its easy to verify that inequality 6 and 7 respectively become:

$$m^X + \frac{1}{2}m^Y - d_1 < 0, \tag{10}$$

$$m^X + \frac{1}{2}m^Y - d_2 < 0. \tag{11}$$

Since the sum of the left-hand sides of these two inequalities exceeds zero (by assumption,) both of them cannot hold. This implies that in equilibrium at most one player would refuse to bargain. Denoting, for notational convenience, $\widehat{d} = m^X + m^Y/2$, we have established that if, for some $i = 1, 2$, $d_i > \widehat{d}$, then player i would refuse to bargain; and moreover, $d_j < m^Y/2$ $(j \neq i)$ — since (by assumption) $d_1 + d_2 < m^X + m^Y$. This analysis implies that for any pair $d = (d_1, d_2)$ in the indicated regions of Figure 1, there will be no negotiations in equilibrium (and the inefficient status quo remains in place). In summary, we have established the following result:

Corollary 2. *Assume that the players have equal* ex post *bargaining powers, but have unequal* ex ante *bargaining powers. Then, in equilibrium, negotiations don't commence and the inefficient status quo remains in place if and only if the degree of inequality in the players' aggregate* ex ante *bargaining powers is sufficiently large.*

The intuition behind this result comes from noting that when there is a sufficiently large degree of inequality in the players' aggregate *ex ante* bargaining powers, an agreement on issue X would destroy the *ex* *ante* bargaining power advantage of one player (given the hypothesis of Corollary 2 of equal *ex post* bargaining powers), and thus that player has an incentive to refuse to bargain.

It should be noted that Corollary 2 shows that what matters for the question at stake are the players' "aggregate" *ex ante* bargaining powers (as defined by d_1 and d_2). A player's *ex ante* bargaining powers over individual issues matter only to the extent that they determine his aggregate *ex ante* bargaining power. For example, if player 1 has most of the *ex ante* bargaining power over issue X (i.e., $z_1^X >> z_2^X$), while the opposite is the case over issue Y (i.e., $z_1^Y << z_2^Y$), then whether or not the efficient outcome obtains depends on the relative magnitudes of their aggregate *ex ante* bargaining powers. If d_1 and d_2 are close to each other (which may happen in this example), then it follows from Corollary 2 that the players would negotiate, and the inefficient status quo would be replaced by an efficient outcome.

However, in some situations (such as in the land redistribution situation), a player who has most of the bargaining power over one issue may well have most of the bargaining power on the other issue as well. In that situation, the degree of inequality in the players' aggregate *ex ante* bargaining powers will be large, and may well be large enough to induce the inefficient outcome.

A key message of Corollary 2 is as follows: a small degree of inequality in the players' aggregate *ex ante* bargaining powers is conducive for efficient institutional change, but not a large degree of such inequality; in that case, inefficient institutions are likely to persist.

What role, if any, do the other parameters have? First, notice that the players' equal (by hypothesis) *ex post* bargaining powers have no role to play on whether or not, in equilibrium, negotiations would commence. This is formally implied by the fact that the function f does not appear in inequalities 10 and 11. The intuition for this result comes from the observation that the players' incentives on whether or not to negotiate are influenced by the relative magnitudes of their respective *ex post* bargaining powers. If they are equal, then, irrespective of the absolute magnitude of this common *ex post* bargaining power, it has no role on incentives to bargain.

Finally, note the fairly intuitive but important result — which is immediate from the above analysis — that, the larger are the efficiency gains associated with institutional change the more likely it is that such change will take place. In other words, even with a large *ex ante* bargaining power advantage for one party, which does get lost in negotiations, if there is enough of a payoff to redistribute, the party will come to the table. This suggests, for example, that in order to promote efficiency-enhancing institutional change ways should be found to enhance the associated gains from such change.

3.3.2. *Unequal* ex post *and Unequal* ex ante *Bargaining Powers.* Here we impose no restrictions on the parameters. As such we apply the characterization result stated in Proposition 2 and investigate 8 and 9, restated here for convenience.

$$\overline{x} + \frac{1}{2}m^Y - d_1 \;<\; \Delta(\overline{x}),$$
$$(m^X - \underline{x}) + \frac{1}{2}m^Y - d_2 \;<\; -\Delta(\underline{x}).$$

It follows immediately from these inequalities that if $\Delta(\overline{x})$ is sufficiently large then player 1 would refuse to bargain, and if $\Delta(\underline{x})$ is sufficiently small then player 2 would refuse to bargain. This is not surprising. If under the best possible scenario for player 1 (namely, when $x = \overline{x}$) his *ex post* bargaining power is significantly smaller than that of player 2 (i.e., $\Delta(\overline{x})$ sufficiently large), then he would have no incentive to bargain. Symmetrically for player 2. An implication of these observations is that if, for all $x \in [0, m^X]$, the absolute value of $\Delta(x)$ is sufficiently large, then at least one of the above inequalities would hold, and thus at least one of the players would refuse to bargain. We state this result in the following corollary:

Corollary 3. *Fix the players' (potentially unequal)* ex ante *bargaining powers. If the degree of inequality in the players'* ex post *bargaining powers is sufficiently large, then, in equilibrium, negotiations don't commence and the inefficient status quo remains in place.*

On the other hand, if the degree of inequality in the players' *ex post* bargaining powers is sufficiently small, then Corollary 2 applies. Again note that the size of efficiency gains plays a role in this, and the larger the gains the more likely is change. In the above this can be seen by the fact that the left hand side of the inequalities is decreasing in the *ex ante* disagreement payoffs of the players.

As a final check on the role of changing bargaining power versus asymmetric bargaining power, consider the monotonic case with equal *ex ante* power (hence $d_1 = d_2 \equiv d$) but unequal *ex post* power. Inequalities 6 and 7 then become

$$m^X + \frac{1}{2}m^Y - d \;<\; \Delta(1),$$
$$m^X + \frac{1}{2}m^Y - d \;<\; -\Delta(0).$$

Since $\Delta(\cdot)$ is bounded in absolute value by $m^Y/2$ while d is bounded above by $(m^X + m^Y)/2$ by assumption, the LHS of these inequalities is greater than $m^X/2$. It follows that the status quo will likely be changed in this situation if the initial issue is large relative to the second issue. If, however, the initial issue is small compared to the second issue, and the bargaining power in the second issue moves significantly against a player, then that player will not want to negotiate.

A central message of our analysis can be put as follows (which extends the message derived from Corollary 2): a small degree of inequality in the players' bargaining powers — both *ex ante* and *ex post* — is conducive for efficient institutional change, but not a large degree of such inequality; if the degree of inequality of either their *ex ante* or their *ex post* bargaining powers is sufficiently large, then inefficient institutions are likely to persist. Furthermore, the larger are the gains in efficiency compared to the differences in bargaining powers, the more likely is institutional change.

4. Concluding Remarks

There is a close and deep connection between *inequality* in bargaining power and the persistence of inefficient institutions.[10] In particular, we unearthed a positive relationship between the degree of such inequality and the likelihood of the persistence of inefficient institutions. Our analysis drew out the distinction between *ex ante* and *ex post* bargaining powers. This is important and fundamental. An inefficient institution may persist, for example, precisely because some agents possess enormous bargaining power in the status quo which they would loose after an efficiency-enhancing institutional change is implemented. Such agents therefore have a vested interest in maintaining the inefficient institutions that underlie the inefficient status quo. As we discussed above, the persistence of the inefficient property rights over landholdings in rural India is a case in point.

In fact, our model, results and insights are potentially applicable to help explain the persistence (or elimination, as the case may be) of inefficient institutions in the context of a great variety of economic, political and social situations.

To take just one other example, consider the conflict between Israel and the Palestinians. There is a status quo in place, which is inefficient

[10]Of course, as we discussed and as is captured in our model, this connection is possible by the presence of various kinds of frictions (or transaction costs); for otherwise Coase's Theorem applies, and efficiency would be compatible with unequal bargaining powers.

(due in part to the costs and consequences of terrorism and military engagements), and in which there is a great degree of inequality in bargaining power; Israel possesses most of it. The conflict is over many issues. However, some of these issues such as the right of return (of Palestinian refugees to Israel), the future of Jerusalem, and property rights over certain lands, are such that once agreements over them are struck and implemented, they would be difficult to alter (since, for example, the Palestinian people would physically move into such lands). That is not the case, relatively speaking, with other issues such as the elimination of terrorism. Notice, moreover, that agreements over the former set of issues would significantly reduce Israel's bargaining power over the other set of issues. An application of our argument and insights would suggest that the persistence of this costly conflict is due (at least in part) to the large degree of inequality in *ex ante* bargaining power.

The immediate, main "policy" consequences of our insights that would help engender efficiency-enhancing institutional change are self-evident: reduce inequality in bargaining power, limit change in bargaining power, and/or enhance the efficiency gains associated with institutional change. Such conclusions should guide policy makers in the right direction. But the matter of exactly how one does such things depends on the particular situation in question.

Institutions — be they economic, political or social — lie at the very heart of modern societies. Some are explicit, while others are only implicit. Some are formalized in laws and regulations, while others are part of the culture and norms. They shape human behaviour, and determine economic performance and individual well-being. As such the importance of exploring ways to promote and induce efficient institutional change is crucial, especially for the benefit of the poorer parts of the world. Our analysis has only just touched the surface of the burning issues and questions. We hope others will take-off from where we have left.

Appendix: A Numerical Example from Industrial Organization

Recall the R&D joint venture problem outlined in the introduction. Two firms are involved in a two stage game, in which they first invest in R&D effort and then compete in a product market (see, for example, Tirole (1989)). In the status quo, the firms conduct R&D independently and non-cooperatively, which is inefficient since there are dis-economies to R&D.

The second (product market competition) stage is modelled as follows. The two firms have constant marginal cost and are Bertrand (price) competitors in a homogeneous goods market. This assumption serves to allocate bargaining power to the low cost firm. Profit sharing agreements are illegal, but the firms may share the market. In order to convexify the payoff frontier it is assumed that the firms may share the market probabilistically, that is, each may be the monopolist with some probability.[11] The surplus from collusion is shared according to the Nash Bargaining Solution with the Betrand Nash Equilibrium payoffs as threat points.[12]

Suppose that market demand is linear, and that inverse demand is given by $P = 1 - Q$. The firms' marginal costs are $c_1, c_2 \in [0, 1)$. The monopoly prices for the firms are thus $p_i^m = (1 + c_i)/2$, with monopoly profits of $\pi_i^m = (1 - c_i)^2/4$. There are two cases to consider: equal marginal costs, and unequal marginal costs. In the first case the Nash equilibrium of the Bertrand price competition game will have each firm sell at the common marginal cost, and thus both firms have zero profits. The NBS for the collusion game then allocates the monopoly profits equally, and each firm will obtain a profit of $(1 - c_i)^2/8$.

In the second case, the low cost firm will serve all the market. Call the low cost firm Firm 1. Firm 2's cost are either above Firm 1's monopoly price, in which case Firm 1 simply is a monopolist, or below, in which case Firm 1 sells $1 - c_2$ units at a price of c_2. Since there is no surplus from product market collusion if firm 1 sells at its monopoly price we will focus on the second case. The Nash equilibrium for the Bertrand game therefore has payoffs for Firm 1 of $(c_2 - c_1)(1 - c_2)$. Firm 2 obtains zero in either case. The payoff frontier from collusion (allowing for randomization) is

$$\pi_2(\pi_1) = \frac{(1 - c_2)^2}{4} - \frac{(1 - c_2)^2}{(1 - c_1)^2}\pi_1.$$

[11]In many markets it is legal for a firm to withdraw from the market "voluntarily".

[12]The NBS is used for convenience only, similar results can be obtained using an alternating offers type bargaining game. We make the usual assumption that the Nash equilibrium of the Bertrand game for two firms with constant marginal costs involves the firms sharing the market at a price equal to their marginal costs, if marginal costs are equal. If marginal costs are unequal, the low cost firm will serve all of the market at the lower of its monopoly price or the high cost firm's marginal cost.

In the Nash Bargaining Solution each player receives half of the surplus in excess of his disagreement payoff (inside option). It follows that the NBS for the collusion game has payoffs of:

$$(\pi_1, \pi_2) = \left(\frac{(1-c_1)^2}{8} + \frac{(c_2-c_1)(1-c_2)}{2}, \frac{(1-c_2)^2}{8} - \frac{(c_2-c_1)(1-c_2)^3}{2(1-c_1)^2} \right)$$

In the first stage of the game the firms may invest in R&D which can lead to an innovation that reduces the marginal cost of production below the current lowest marginal cost. The probability of achieving such a breakthrough is independent of the initial marginal cost of the firm. Research comes in discrete lumps, each at a fixed cost of k. One may think of these as research laboratories. The success of any given laboratory is independent of the success of any other laboratory. Furthermore, the technology exhibits dis-economies, so that the probability of a successful innovation by any given laboratory is declining in the total number of laboratories in operation.[13]

In this first stage of the game the firms can either operate independently or cooperate on R&D. Cooperation on R&D is efficiency enhancing since it saves on the duplication of effort (investment cost) as well as internalizing the externality. We will focus on an equilibrium in which both firms operate one lab. Let p_2 denote the probability of success for a lab if two labs are in operation, and let c denote the new marginal cost from the drastic innovation, where $c < c_1 < c_2$. In order for the Bertrand equilibrium not to occur at the monopoly price we require that $2c_2 > 1 - c$, i.e., $c > 1 - 2c_2$. By computing the payoffs for both firms if they do invest, and comparing them to the payoff if they do not, we can find restrictions on the investment cost k for which it is an equilibrium for both firms to invest in one lab in the absence of collusion. For example, if $c = 0.25$, $c_1 = 0.3$, $c_2 = 0.4$, $k = 0.002$, and $p_2 = 0.2$ we get expected firm profits of 0.0850234 for the low cost firm and 0.0321484 for the high cost firm. Total expected industry profits in this equilibrium are therefore 0.117172.

Now suppose the firms were to cooperate on investment. Under the above parameters the equilibrium for the collusive R&D game will involve investment in one laboratory if $p_1 = 0.3$.[14]

The expected payoffs *before* investment costs are then 0.0849688 for the low cost firm and 0.0371652 for the high cost firm, for industry profits of 0.120134, net of the investment cost of $k = 0.002$. Cooperation thus is indeed joint profit maximizing.

[13]We are thinking here of an unmodelled limited supply of suitable scientists.

[14]Of course, p_3 must be suitably chosen to make it optimal for there not to be three labs.

However, no matter how the R&D expenditures are allocated, the firm with the initial low costs (Firm 1) will not find it in its interest to engage in joint R&D since its maximal expected profit of 0.0849688, obtained by not bearing any of the R&D costs, is less than the 0.0850234 it can achieve by refusing to cooperate.[15]

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[15]Note that we need to assume that no side payments are possible at this stage. This is implied by our "transaction cost" assumption — discussed in the Introduction — that players are wealth-constrained and unable to borrow the required funds. Indeed, if, for example, firm 1 could charge firm 2 a licensing fee or some other device to transfer cash in the initial stage, an equilibrium in which both firms agree to cooperate will exist.

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