THE NON-SEPARABILITY PROBLEM IN TRANSACTION COST ANALYSIS

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Transaction costs include a number of different monitoring, measuring and enforcing costs. Institutions together with a number of other variables determine the magnitude of these costs. The question addressed in this article is the extent to which the effects of particular institutions on transaction costs can be separately identified. This is of interest because institutions which lower transaction costs allow higher net social benefits to be achieved (NORTH 1990: 3-10, EGGERTSSON 1990: 10-25).

At one extreme is the possibility that the transaction cost determined part of net social benefits is fully decomposable into additively separable effects, each attributable to an institution or other variable. In such a world, changing a particular institution or the value of any of the variables determining the magnitude of transaction costs will have an effect on net social benefits which is always of the expected sign and magnitude. In fact transaction cost analysis has implicitly recognized additive non-separability for particular variables determining transaction costs. However, it has not addressed the implications of each of a *number* of variables having additively non-separable effects.

This article examines the implications of separability breaking down. The most important consequence is that incremental analytical methods through which the effects of discrete institutions and policy variables are discovered have to be abandoned. In the incremental approach, the assumption is that an efficient institution will work even better when combined with efficiency enhancing norms or efficiency enhancing distributions of power. When additive separability breaks down, an institution which is more efficient in one context will not necessarily be more efficient in another. The same is also true for informal institutions. Norms which have served to reduce transaction costs in one context may raise them in another. The analysis of efficiency then demands that the most important variables with additively non-

separable effects are identified and the functional nature of the interdependence explored.

The problem is established by distinguishing between two components of the overall transaction cost effect of institutions. Institutions can bring about a change in monitoring costs and also determine the extent of contestation. Each of these effects translates into an effect on net social benefits. We term these the monitoring cost and contestation cost components of the overall institutional effect on net social benefits. We then show that each of these components is jointly determined by the additively non-separable effects of institutions and at least one other variable. The joint effect of the institution is thus determined by the additively non-separable effects of *all* these variables.

Section I defines institutions and transaction costs. Separable and non-separable functions for net social benefits are defined. The former are shown to be necessary for the validity of the incremental approach to transaction cost analysis. In section II the effect of institutions on net social benefits is partially decomposed into the monitoring cost and contestation cost components of the institutional effect. Section III demonstrates that each of these components is determined by the non-separable effect of institutions and at least one other variable. The basic argument is established with reference to a comparison between two institutions each of which identifies a different set of agents as the residual claimant. The measured efficiency of the institutions and their ranking changes with changes in the values of a number of variables with non-separable effects on net social benefits. Sections IV to VI extend this result by considering a range of other institutions which have other variables with non-separable effects. Section IV considers the rate of transition to well-defined rights and shows why weakly-defined rights can sometimes perform better. Section V returns to well-defined rights and compares large and small firms. Section VI compares the effects of informal institutions which are more or less generalized in their scope. Section VII concludes.

I. INSTITUTIONS AND TRANSACTION COSTS

Institutions are *rules* which impose constraints on the actions of agents (SCHOTTER 1981: 11, NORTH 1990: 3, KNIGHT 1992: 2). Rules about which side of the road to drive on or more complex property rules about who makes which decisions and for what reward are institutions. How the institution is enforced may vary quite a lot. In some cases (such as road rules) where the institution solves a coordination problem, the institution may be largely self-enforcing once the rule becomes widely known. In other cases there may be incentives to free-ride or distributive conflicts and here third-party enforcement may be an essential part of maintaining the institution.

Theory distinguishes between *formal* and *informal* institutions. Formal institutions are backed up by third party enforcement, usually by the state. In practice this may be more or less regularly invoked. Formal institutions include property rights, taxes, subsidies and regulations. Informal institutions are rules which are voluntarily observed as norms without third-party enforcement. Formal institutions are actually usually maintained by a combination of third-party enforcement and norm-based self-enforcement by the agents involved. The degree of self-enforcement can determine the contestation costs of formal institutions. Once in place, institutions reduce uncertainty about agent actions. The positive or negative implications for output and welfare follow.

There is an important distinction between *ex ante* and *ex post* institutions. When institutions are discussed as policy variables, they usually refer to the *ex ante* rules being considered for a particular situation. The qualifier *ex ante* refers to the fact that the rules have not in fact been implemented. *Ex post* institutions are descriptions of rules in action. Thus the rule stipulating we should drive on the left is an *ex ante* institution. The description of road rules in Britain which says that drivers drive on the left 99 per cent of the time is a description of an *ex post* institution. The traffic violations in this case are small enough not to make a substantial difference but in other cases *ex post* violations may be significant. The divergence between *ex*

ante and *ex post* institutions is usually due to secondary bargaining or conflict after an *ex ante* institution has been introduced (WILLIAMSON 1985: 29). Policy discussions are about *ex ante* rules. The analysis of efficiency involves assessing the likely *ex post* outcomes.

Given the resource base, net social benefits are determined by a number of institutional and non-institutional variables which constrain allocative and productive decisions. At the most general level,

$$NSB = \phi (r_1, ..., r_i, x_1, ..., x_n) \quad (1)$$

where NSB is the net social benefit, $r_1....r_i$ are dummy variables representing institutions and $x_1....x_n$ are indices or dummy variables representing non-institutional variables. Institutions include informal institutions such as norms (NORTH 1990, NORTH 1981, PLATTEAU 1994a, 1994b). Non-institutional variables include technology and the balance of power between agents (BATES 1995, 1989, KNIGHT 1992, BOWLES 1985). The challenge for institutional analysis is to predict how net social benefits will change as a result of a change in a specific institutional or non-institutional variable.

By definition the effect of institutions on net social benefits operates through the effect of institutions on transaction costs. Transaction costs are defined as the costs of discovering the appropriate transactions and subsequently agreeing and enforcing contracts (NORTH 1995: 18, EGGERTSSON 1990: 14, MATTHEWS 1986: 906). Since institutions have no effect on resource endowments, their only effect on net social benefits is via transaction costs. It follows that if institutional change results in higher net social benefits, it must be the case that the new institutions are *associated* with lower transaction costs. This much is definitional. The question is whether these institutions will *always* be associated with similar transaction cost effects.

Consider two alternative functional forms for the expression in (1). The first assumes that the variables in (1) have additively separable effects as in

$$NSB = (\alpha_1 r_1 + \alpha_2 r_2 + ...+ \alpha_i r_i) + (\beta_1 x_1 + \beta_2 x_2 + ...+ \beta_n x_n) \quad (2)$$

Here the incremental effect of r_i on y depends solely on its coefficient α_i and not on the value of any other variable or coefficient. Suppose that an existing institutional structure consists of a number of institutions, $r_1....r_h$. Holding these and the values of the non-institutional variables $x_1... x_n$ constant, institution r_i is introduced. Suppose this results in a change in net social benefits of a magnitude denoted by $\Delta NSB(r_i)$. This observation is sufficient to tell us the sign and magnitude of α_i. The introduction of r_i in any other context will have an incremental transaction cost effect on NSB of this sign and magnitude.

Conventional transaction cost analysis does not directly measure transaction costs since these are difficult to identify in direct observations (TOYE 1995: 64-66, MATTHEWS 1986: 917). Instead, the implicit method is to read off the transaction cost effect by observing changes in net social benefits brought about by institutional changes (DEMSETZ 1969, ALCHIAN and DEMSETZ 1972, WILLIAMSON 1985, EGGERTSSON 1990). The implicit function explaining the transaction cost effect in this incremental method of analysis is of the form:

$$\Delta NSB(r_i) = f_{TC} (r_i) \quad (3)$$

The subscript TC on f indicates that the effect of r_i on ΔNSB operates through changes in transaction costs. With additive separability, the attribution of the transaction cost effect to r_i is valid. The institution r_i will have a discrete transaction cost effect of this magnitude even if other variables take different values. This follows from the additive separability of (2).

Separability, however, is a very special assumption which does not hold in many non-linear relationships. Suppose net social benefits in (1) are determined by a simple non-separable function such as:

$$NSB = \alpha_1 r_1(x_1+....+x_n) + \alpha_2 r_2(x_1+....+x_n) + ... + \alpha_i r_i(x_1+....+x_n) \quad (4)$$

Consider as before a situation where institutions r_1 to r_h and non-institutional variables x_1 to x_n are given. They are represented by the values of their indices or dummies. Institution r_i is introduced as before. In this case the effect of r_i on NSB depends not only on the value of α_i but also on the values of $x_1 \ldots x_n$. Changes in the values of the latter can change both the

magnitude and the sign of the ΔNSB associated with r_i.

Note that since resources are held constant, we can still describe the change in net social benefits associated with r_i in terms of changes in transaction costs associated with the introduction of r_i. But it is no longer possible to generalize from the observation any conclusions about the intrinsic transaction cost characteristics of the institution. The effect is now contingent on the positioning of the institution in a context defined by a combination of other variables. It is theoretically possible for the same institution to have an effect of the *opposite sign* to the one observed if it is introduced in a context with a different specification of variables.

Institutional economists have recognized the possibility that the effect of institutions can be additively non-separable with the effects of other institutions. BHAGWATI (1980) had observed that the efficiency of r_i can depend on the institutions $r_1 \ldots r_h$ representing existing institutions which we collectively term R. Amongst other things, R describes the existing allocation of property rights over assets which determine relative prices and therefore the measured change in net social benefits. This can be dealt with by amending (3) to record the initial institutional structure which led to the observation. This is done in equation (5) which recognizes that the transaction cost effect of r_i should only be expected if initial institutional situations are R-like.

$$\Delta NSB(R \rightarrow R + r_i) = f_{TC}\,(R, r_i) \qquad (5)$$

This is not necessarily an impossible restriction for the theory as the relevant initial institutional structure may be quite widely observed. However, we wish to consider the likelihood and implications of non-separable effects of the non-institutional variables $x_1 \ldots x_n$. If important non-separable effects can be identified, the implications for transaction cost analysis are serious. It is far less feasible to restrict the applicability of an incremental analysis to situations which are identical to the initial observation in all non-institutional variables as well. If we represent the x-variables collectively by X, and if we allow all these variables to have possible non-separable

effects with r_i, we would have to further amend (5) to record all these values:

$$\Delta NSB(R+X \rightarrow R+X+r_i) = f_{TC}\,(\,R,\,X,\,r_i\,) \qquad (6)$$

The transaction cost result summarized in this equation is virtually non-generalizable. The probability of finding another conjuncture (R,X) where this observation may be useful is very low. Thus if non-separability of the effects of a number of institutional and non-institutional variables is a possibility, the incremental approach has to be abandoned. Greater attention has to be given to identifying the functional form of (1) to identify the key variables with non-separable effects and the nature of the interdependence.

Institutional analysis does not often make explicit its assumption about the separability of effects. In most cases, however, we can deduce from the range of institutions or variables being considered that the implicit assumption is of additive separability. This is particularly clear in earlier work where the effects of institutions on net benefits were considered without specifying the values or conditions of other variables (see for instance DEMSETZ 1969, ALCHIAN and DEMSETZ 1972, WILLIAMSON 1985, EGGERTSSON 1990). More recent work inspired by NORTH (1990) does identify the importance of variables such as culture, ideology and power in determining institutional efficiency. However, even here the incremental effects of institutions are implicitly separately identifiable.

For NORTH, efficient institutions are decentralized, well-defined private property rights (ibid: 61-69). The research agenda is to identify cultural, ideological and other variables which make these institutions work better and to point out the possibility of path-dependant trajectories which may permanently keep us away from the first best institutions. The possibility of other institutions being equally efficient with different packages of cultures, distributions of power or other variables is not recognized. This effectively maintains the assumption of additive separability. Such an assumption is also implicit in attempts by institutional economists such as PLATTEAU (1994 a, b) to identify the informal norms or moralities which allow "market

economies" to work efficiently. The assumption is once again that the first best institutional structures of the market economy can be independently identified and the moralities necessary to make them work best identified subsequently.

II. MONITORING AND CONTESTATION COSTS

If institutional effects were additively non-separable with respect to a single non-institutional variable this would not in itself be too damaging. An incremental transaction cost analysis could still be viable with applicability restricted to contexts where the particular non-institutional variable had the same value as in the initial observation. However, in the general case the non-separability problem is more serious and involves a number of institutional and non-institutional variables. In this case the sign and magnitude of the effect of an institution on net social benefits may depend on the values of a *package* of variables.

If our non-separable function resembles equation (4) the demonstration of non-separable effects is considerably simplified. This is because in (4) the non-separable effect of r_i can be additively separated into a number of simpler non-separable components. Consider the last term on the right hand side of equation (4). While the effect of r_i on NSB is additively non-separable with the effects of $x_1 ... x_n$, the total effect $(\alpha_i r_i x_1 + ... + \alpha_i r_i x_n)$ can clearly be decomposed into n additively separable components of NSB. If we can establish that for each component the effect of r_i is additively non-separable with a particular x, we will have shown that the total effect of r_i is additively non-separable with $x_1 ... x_n$.

In an analogous manner, the total effect of an institution on net social benefits, $\Delta NSB(r_i)$, can be decomposed into a number of additive components of which two are particularly important. We will call these the *monitoring cost component* and the *contestation cost component* of the institutional effect in (7). The monitoring cost component of $\Delta NSB(r_i)$ denoted $\Delta MCC(r_i)$ is the part of $\Delta NSB(r_i)$ attributable to changes in the difficulty of monitoring following the introduction of r_i. The contestation cost component, $\Delta CCC(r_i)$, is the effect on

$\Delta NSB(r_i)$ of any changes in the intensity of contestation following the introduction of r_i. Any remaining part of $\Delta NSB(r_i)$ is notionally explained by the change in other cost components $\Delta OCC(r_i)$ which is a residual term.

$$\Delta NSB(r_i) \equiv -\Delta MCC(r_i) - \Delta CCC(r_i) - \Delta OCC(r_i) \qquad (7)$$

Both the monitoring and contestation cost components of $\Delta NSB(r_i)$ are due to distinct sets of transaction costs. The monitoring cost component is due to the transaction costs of detecting and preventing shirking and opportunistic behaviour. The contestation cost component is due to the transaction costs of enforcing institutions when one or more agents contest the choice of that particular institution. Our aim will be to show that the effect of r_i in determining the magnitude of each of these components is additively non-separable with at least one x-variable. This will establish that $\Delta NSB(r_i)$ is determined by the non-separable effects of r_i and all these x-variables. As (7) implies, the decomposition of the overall transaction cost effect of institutions into two sub-components is not necessarily exhaustive and finer sub-divisions are possible. Thus there is the possibility of identifying further non-separable effects.

MONITORING COSTS. Losses due to imperfect monitoring emerge whenever a productive enterprise requires coordinating collective effort. Even pure coordination involves costs of collecting and disseminating information. In addition team production can create incentives for shirking or opportunistic behaviour. This can result in losses of net social benefits. One of the ways in which institutions determine the magnitude of this loss is by determining the incentives for efficiently monitoring tasks. If r_i results in an improvement in monitoring efficiency, the improvement in output is recorded in (7) as a negative $\Delta MCC(r_i)$ and an equivalent positive effect on $\Delta NSB(r_i)$.

Monitoring is more efficient if some agents specialize in monitoring and have an incentive to monitor. Institutions determine this efficiency by defining the rights and incentives to monitor, often by making particular agents *residual claimants* (ALCHIAN and DEMSETZ 1972).

Some agents are, however, more likely to be efficient residual claimants. Institutions which establish these agents as residual claimants will have the biggest effect on lowering monitoring costs. The relative monitoring efficiency of different institutional structures depends on a number of variables which have been identified in the literature. These include the type of assets involved, the variability of factors and the informal norms of agents.

CONTESTATION COSTS. All institutions are not equally acceptable to all agents. If some agents contest the institution, net social benefits may be considerably lowered. Contestation can take place at different levels. The most everyday form of contestation is of the rent-seeking variety where resources are legally or illegally spent in trying to change institutions. Further up the scale, contestation can take the form of deliberate deviations from the rules with the intent of punishing other agents and signalling that these agents are determined to play a more privately beneficial strategy. This form of contestation is the easiest to examine in game theory models. The ability of agents to contest in this way is determined by their ability to hold out in conflicts where some of the costs are borne by themselves. Finally, in the most extreme form of contestation, extra-legal costs may be inflicted over and above non-cooperation. These include in particular the costs of violence.

The contestation cost is larger the more determined disadvantaged agents are in contesting particular institutions. When stable institutions emerge, their stability is usually based on the fact that the willingness and ability to engage in contests differs amongst agents. *While the monitoring problem arises primarily as a result of incentives to shirk, the contestation problem is primarily due to distributive conflicts over the choice of particular institutions.* It may sometimes be difficult to disentangle the two in practice but they are theoretically distinct problems and have different determinants.

In the next four sections we look at the determinants of the sign and magnitude of each of these components of the institutional effect and the possibility of tradeoffs between them. We do this

by examining four institutional choice situations. The first involves a comparison between two institutions which make different sets of agents residual claimants. This analysis follows most directly from existing discussions in the literature and is presented in the next section. This example serves as a template for subsequent examples and so the argument is developed at greater length.

III. ALTERNATIVE RESIDUAL CLAIMANTS

The institutional choice problem considered here is between two institutions r_A and r_B which make one of two agent types, A and B respectively, residual claimants. Consider the monitoring cost considerations first. This has been extensively discussed in the literature and we examine two contributions. The first argues that if some assets are more firm-specific than others, institutions which make owners of such assets residual claimants will result in the most efficient monitoring and *ceteris paribus* the highest net social benefits (ALCHIAN 1987, PAGANO 1991). This is equivalent to achieving the biggest reduction in the monitoring cost component of net social benefits. A second and closely related approach argues that if the technical ability of factors to cause variations in net social benefits varies across factors, institutions which make the owners of the more variable factor residual claimants will result in the biggest reduction in the monitoring cost component of net social benefits (BARZEL 1989).

In both cases, monitoring efficiency is achieved by giving the right to monitor to the agent whose monitoring produces the highest net social benefit. In the asset-specificity analysis of ALCHIAN (1987) and PAGANO (1991), technology defines which assets are more specific to certain activities. Asset specificity is measured by the loss in value suffered by an asset when transferred to the next best activity. Asset owners whose assets have a high degree of firm or activity specificity will suffer the most from a decline in the fortunes of the collective enterprise. Making the owners of these assets residual claimants ensures that the monitoring will be done by the agents who stand to lose the most from enterprise failure in general and shirking in particular. The gain in net social benefits as a result of efficient monitoring is thereby maximized.

In the BARZEL approach there is no asset specificity but some factor owners can cause greater variations in net social benefits either because of some feature of technology or because quality variations are greater for some factor types. In this case the claim is that the factor owner who can create the largest variation in net social benefits should become the residual claimant. Here net social benefits are maximized not by giving the residual rights to the agent with the greatest *incentive* to monitor but rather by giving the right to monitor to the agent who it would *cost* the most to monitor.

Note that the ALCHIAN and BARZEL arguments taken separately can give conflicting answers. There is no reason why the owner of the more firm-specific asset should also be the owner of the factor which has the more variable quality. Nevertheless a full specification of technology and factor quality would allow us to identify the institution which brings about the largest decline in the monitoring cost component in (7). This is shown in figure 1.

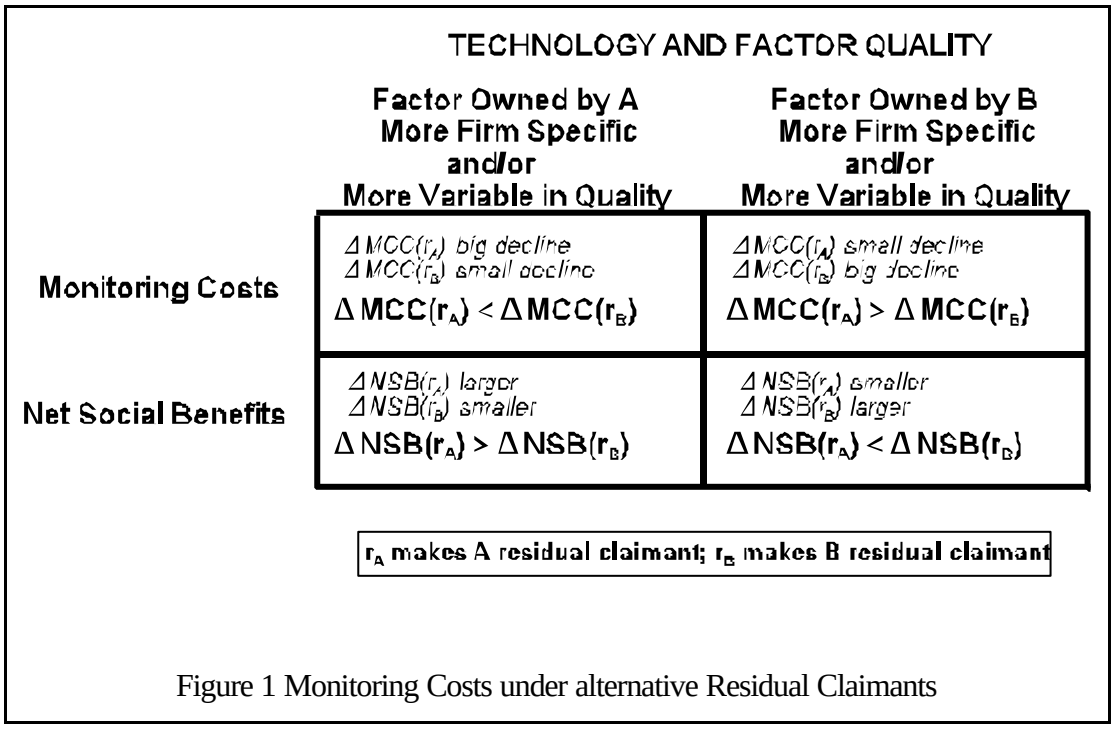

Figure 1 Monitoring Costs under alternative Residual Claimants

The last row of Figure 1 is of particular interest. In absolute terms, the ΔNSB associated with each institution can have a sign and magnitude which is determined by technology. This implies

that the effects of institutions and technologies on net social benefits are not additively separable. The ranking of the two institutions in terms of monitoring efficiency is also shown. In terms of equation (3), r_A can be more or less efficient in saving transaction costs both absolutely and relative to r_B depending on the technology which is to be exploited through cooperation. *It is not enough for technology to be held constant*. We need to have technology specified, say along the left hand column of figure 1, to ensure that a particular institution, say r_A, will minimize monitoring costs.

		B	
		Residual Claimant	**Subordinate**
A	**Residual Claimant**	**1,1**	**10,5 (r_A)**
	Subordinate	**5,10 (r_B)**	**1,1**

Figure 2 Potential Payoffs from Alternative Residual Claimants

Now consider the determinants of the contestation costs involved in setting up the two institutions. Consider the payoffs in a game of coordination with conflict shown in figure 2. Two agents have the option of cooperating in a team. We assume that net social benefits are highest when team production is coordinated hierarchically with one agent as the residual claimant. To focus on contestation costs assume that the net social benefit does not depend on *which* of the two agents is the residual claimant. The implicit technological assumption is that the agents do not differ in terms of their asset specificity. However some version of Taylorism (see PAGANO 1991: 317-18) makes hierarchical management a source of greater efficiency.

The two socially efficient strategy combinations are equivalent to the institutions r_A and r_B which make A and B respectively the residual claimants. The net social benefit in both cases is 15 units but individual payoffs are differently distributed. Contestation results in lower net social benefits of 2 units when both agents try to be the residual claimant. Equally, net social benefits

are low when both individuals act as subordinates which can be interpreted as production which is not hierarchically coordinated. For simplicity the net social benefit in this case as well is assumed to be 2 units shared equally by the two agents.

In a non-cooperative game, r_A and r_B are both Nash equilibria but game theory does not tell us which one will emerge. It is to each agent's advantage to claim to play the Residual Claimant strategy. If this commitment is credible, the best response of the other agent will be to accept the role of subordinate. In dynamic models conflicts can occur when information is incomplete regarding each agent's holding power. Agents reveal their holding power through conflicts and thereby acquire reputations for future interactions. While reputation is being established, the social payoff is 2 units.

Following the work of KREPS and WILSON (1982) conflicts have been modelled as games of incomplete information. Stable institutions emerge once differential bargaining power has been established (MAYNARD-SMITH 1982: 105, OSBORNE and RUBINSTEIN 1990: 88-9, KNIGHT 1992: 126-36). Power in such models is usually defined as the differential ability of agents to hold out in conflicts. Holding power is in turn based on differential asset positions. A broader definition of power will be suggested later. The length of time over which conflict strategies may be played is indeterminate as evident in the multiple equilibria in repeated games with incomplete information (FUDENBERG and MASKIN 1986).

Conflict does not disappear when a third-party enforcer is introduced. In textbook presentations of the Leviathan solution, the third-party enforcer often resolves the distributive conflict by selecting either r_A or r_B and introducing large punishments for deviation. While it is true that a third-party enforcer can affect outcomes by changing payoffs, contests can still take place. This is because the enforcer is often also involved in a game of incomplete information and agents have an incentive to engage in conflicts to influence the enforcer's decisions. It is more realistic to see the problem as a transformed non-cooperative game with three agents, A,

B and the enforcer.

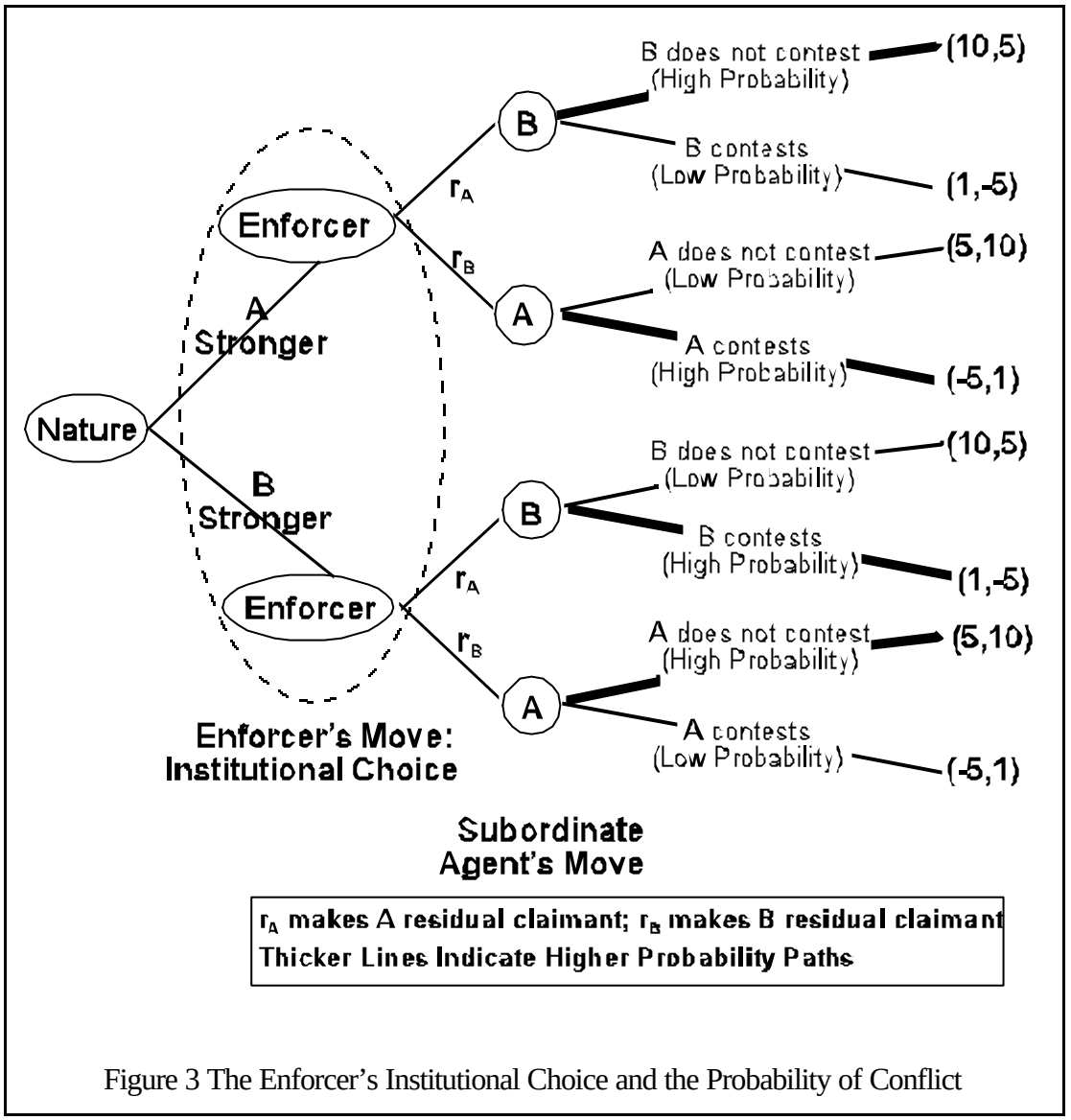

Figure 3 The Enforcer's Institutional Choice and the Probability of Conflict

A simplified version of the initial stages of such a game is presented in figure 3. Incomplete information about agent type is shown by nature's first move which determines whether A or B is stronger. The enforcer is second mover and has incomplete information about agent type shown by the information set in broken lines. The enforcer has prior beliefs about agent strength which may be updated in the course of the game by observing the behaviour of agents. The enforcer's move involves selecting r_A or r_B with the aim of maximizing net social benefits. The enforcer's objective is common knowledge. Since stronger agents are more likely to contest

being subordinates the enforcer's objective is to make the stronger agent the residual claimant.

Following the enforcer's move, subordinates have to decide whether to accept the institution or contest it. The situation is similar to figure 2 with the difference that now there are punishments for violators. We assume that the next move belongs to subordinates. If a subordinate wishes to contest, the private payoff is no longer 1 unit (as in figure 2) but -5 as a result of a punishment imposed by the enforcer. While the punishment makes contestation less likely, it need not rule it out entirely. After observing whether contestation takes place or not, the enforcer makes the next move (not shown in figure 3) by deciding whether to retain the existing institution or to change it.

In a repeated game of incomplete information and low time discount, contests can ensue as agents try to establish reputations which will get them to their preferred equilibrium. Contests are a signalling mechanism on the basis of which the enforcer can revise prior beliefs about agent type. This can determine the institutional choice by the enforcer in a repetition of the game on the basis of revised prior beliefs. If the initial institution favours the weaker agent, the probability of contestation is very high as stronger agents signal their strength. Even when institutions favour the stronger agent, weaker agents may occasionally try to convince the enforcer that a mistake has been made. The sequence of payoffs is therefore indeterminate and depends on the enforcer's prior beliefs and the process of updating on the basis of observed conflicts.

Nevertheless some probabilistic conclusions can be drawn based on the likely responses of agents shown by the paths in heavy lines in figure 3. Suppose for simplicity that the initial situation is one of contests between the two agents which result in a social payoff of 2 units as shown in figure 2. The average payoff per game may be higher than this if the agents occasionally coordinate successfully. The enforcer introduces one of the two potential rules to resolve this conflict. The social payoff over a finite number of repetitions of the game depends

on the accuracy of the enforcer's prior beliefs about relative power.

If A is stronger and the enforcer selects r_A the probability of contestation is low. An efficient social payoff of 15 units is likely to be achieved in each repetition of the game unless the enforcer has volatile beliefs about agent strength in the face of occasional contests by B. The introduction of r_A thus results in an increase in net social benefits of 13 units, from 2 to 15 per period. This increase is due to a decline in contestation and so the contestation cost component of the effect of r_A is minus 13 units. On the other hand if B is the stronger agent and the enforcer selects r_A, B is very likely to contest this. The social payoff shown in figure 3 is now -4 (ignoring the fines going to the enforcer). This is a decline in net social benefits of 6 units from 2 to -4 units and the contestation cost component of the effect of r_B is therefore plus 6 units.

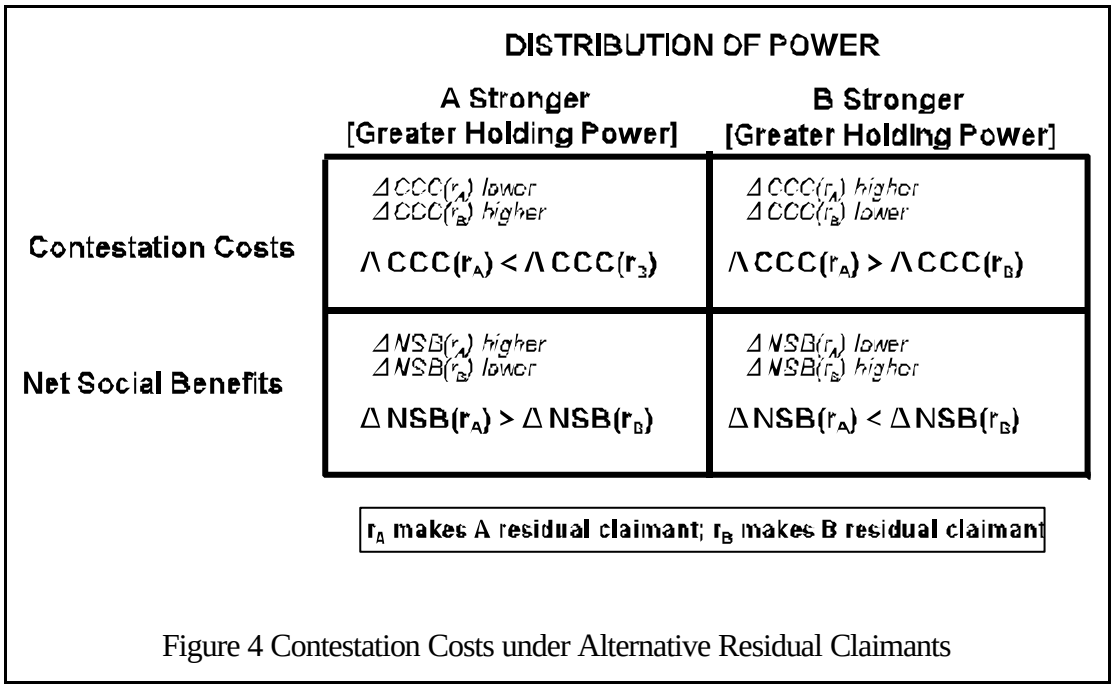

Figure 4 Contestation Costs under Alternative Residual Claimants

Figure 4 summarizes these possibilities and shows that the contestation cost component of net social benefits cannot be additively decomposed either. The magnitude and sign of the contestation cost effect of an institution are jointly determined by the institution and the balance of power into which it is introduced.

Power in figure 4 can be broadly interpreted to include organizational and ideological as well as economic power (see for instance MANN 1986, 1993). We have used power as the *ability* to hold out in costly conflicts. The ability to hold out is not always based on the differential ownership of assets. It can also be based on differences in organization across groups. Moreover, power can be based on a differential *willingness* to engage in conflict. Willingness to contest depends amongst other things on culture and ideology. These define what each group considers to be legitimate. Agents who feel that some rights are unjust or illegitimate may engage in conflicts which in purely economic terms they can ill afford. If their commitment to defend their principles is credible, these agents are likely to end up with their preferred equilibrium payoffs. Conflicts still act as signalling mechanisms in much the same way as before.

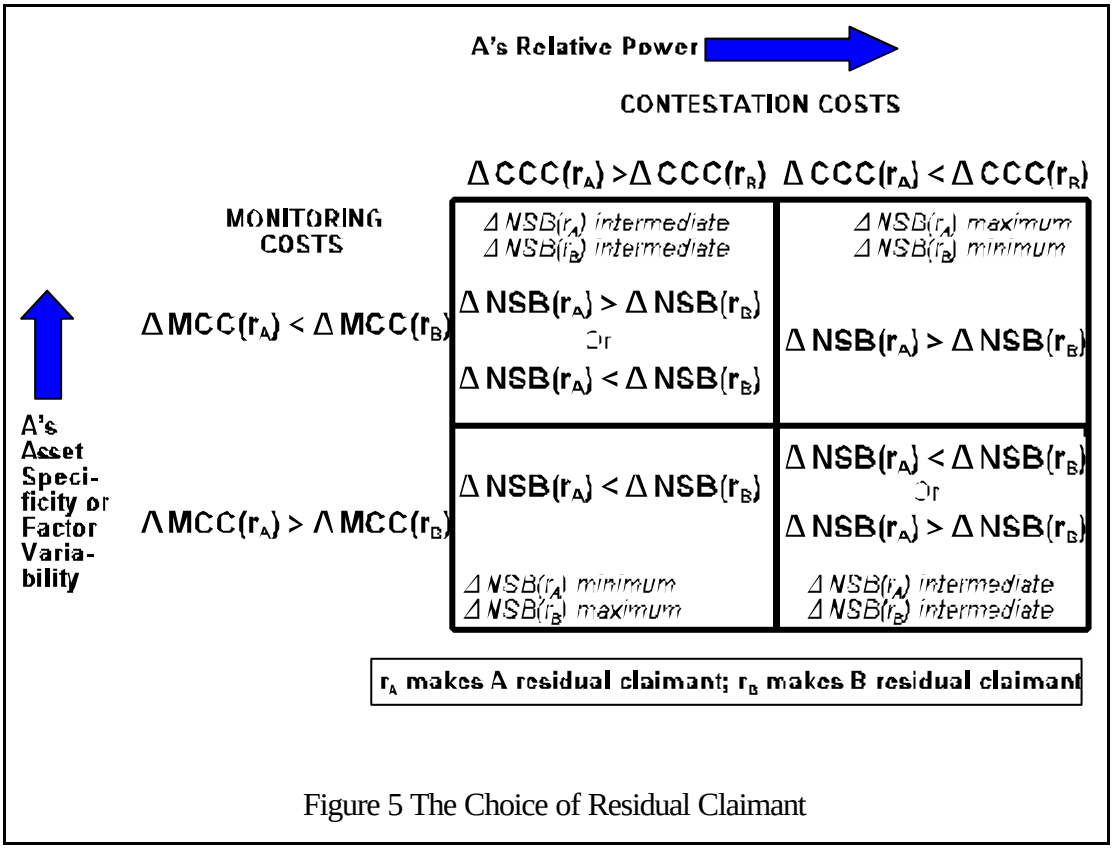

Figure 5 The Choice of Residual Claimant

There are no *a priori* reasons to expect that the institutions which are efficient in ensuring monitoring will also be efficient in ensuring low contestation costs. Figure 5 shows the implications of superimposing the two sets of non-separable effects on each other. In real

observations we only observe the effects of institutions on net social benefits. The distinction between monitoring and contestation cost components is a notional one but may nevertheless be useful for explaining why $\Delta NSB(r_i)$ can take many different values. The latter now depends on the values of all variables with non-separable effects. The rows show monitoring costs. A's asset specificity or factor variability increases from bottom to top resulting in $\Delta MCC(r_A)$ falling and $\Delta MCC(r_B)$ rising. The columns show contestation costs. A's power relative to B increases from left to right resulting in $\Delta CCC(r_A)$ falling and $\Delta CCC(r_B)$ rising.

We cannot preclude *a priori* any particular combination of the distribution of power, factor qualities and asset specificity. It follows that the relative magnitude of the change in net social benefits under r_A and r_B can take a range of values shown by the possibilities in the four boxes. The distribution of power and asset specificity may be such that the monitoring and contestation cost components pull in the same direction making one of the institutions much better than the other. These possibilities are shown in the top right hand and bottom left hand boxes. In the former r_A and in the latter r_B is clearly superior. As a result $\Delta NSB(r_A)$ is maximized in the top right hand box and $\Delta NSB(r_B)$ in the bottom left hand one.

It is not necessary that the agents owning firm specific assets happen to be the ones who are more powerful. These problematic combinations are shown in the top left hand and bottom right hand boxes. Here the monitoring and contestation cost components of the institutional effect pull in opposite directions. Consequently, the relative ranking of institutions as well as the sign and magnitude of ΔNSB associated with each is indeterminate unless the sign and magnitude of each cost component is known. This requires an identification of the effects of all additively non-separable variables. Since there may be degrees of asset specificity as well as variations in the distributions of power, it is possible that small changes in these variables can result in the efficiency ranking of institutions *switching*. Thus even in this simple example of selecting a residual claimant, the transaction cost effect of r_A or r_B is clearly determined by a non-separable function as in equation (6).

IV. HOW WELL DEFINED SHOULD RIGHTS BE?

By extending our search for the determinants of monitoring and contestation cost components of institutional effects we can address a range of more realistic problems. In this section we examine NORTH's (1990) claim that well defined property rights lower transaction cost. Will the policy decision to define property rights clearly always result in lower transaction costs? This is an applied question relevant for many developing and transitional economies. In such economies, rights over the residual in state owned enterprises are not clearly defined and are implicitly split between a number of groups. These can include the central state, local state authorities, managers, employees and consumers (LEE 1993: 180-1). It is not surprising that monitoring efficiency is often low (TIROLE 1986). In theory the transition to privatization should define property rights better by identifying exclusive, alienable residual claimants. These could be proprietor/managers or shareholders. Monitoring efficiency should improve as a result.

The most efficient residual claimant depends on a number of variables including asset specificity and factor variability as discussed in the last section. The institution which clearly defines rights over the residual for a particular claimant is denoted by r_C where the subscript indicates that the right is clearly-defined. An alternative *ex ante* institution is r_W where the rights of a particular residual claimant are clearly defined over parts of the residual but remain weakly defined over others. The degree of weakness is measured by the portion of the residual which remains unclearly allocated with potential claims by other agents. We assume in figure 6 in line with mainstream analysis of the agency problem (LEE 1993) that r_C is always better than r_W in terms of monitoring efficiency. However, whether this recommends the choice of r_C depends on contestation costs.

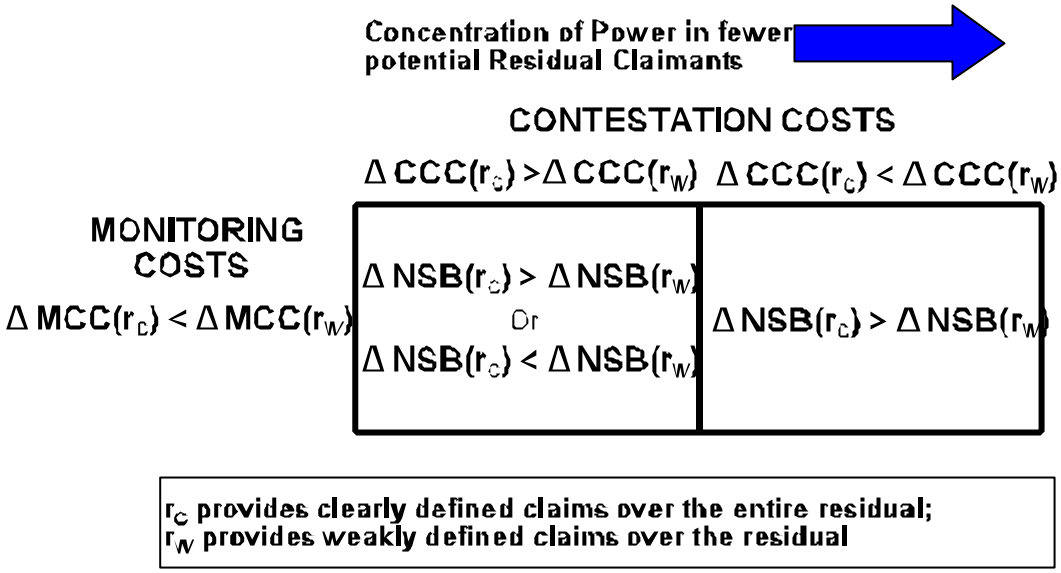

Figure 6 The Choice between Clearly-Defined and Weakly-Defined Rights

If the distribution of power is sufficiently concentrated such that potential beneficiaries dominate other agents, r_C will be superior to r_W in terms of contestation costs too. If this is not the case, the agents who stand to lose claims over parts of the residual as a result of r_C being introduced are likely to impose substantial contestation costs on net social benefits. Transferring discrete components of the residual to the potential beneficiary one at a time is likely to minimize contestation costs during the transition. As rights over successive components of the residual are transferred to the efficient monitor, monitoring efficiency can increase but it is important that contestation does not increase so much that this is wiped out.

A consolidation of the power of the new class allows successive transfers to them in the future at low contestation cost. This is shown in figure 6 as a contestation cost advantage for a succession of r_W institutions along the left hand column in a snapshot comparison of the two institutions during the transition. Thus for some distributions of power, an *ex ante* policy decision to support a succession of r_W institutions during the transition which leads very gradually to r_C can outperform the *ex ante* choice of r_C.

A comparison of aspects of the Chinese and Russian transition strategies of reforming their industrial enterprises in the eighties lends support to these possibilities. The Chinese transition strategy was decidedly slower in terms of transferring rights. Rights over the residual in large enterprises remained weakly defined even though there was a discernible transfer of rights towards enterprise managers. The slow rate of this transfer throughout the eighties meant that incentive structures for monitoring were not optimal and monitoring efficiency was lower than it could have been (LEE 1993: 182, 185, 191). On the other hand, contestation costs were low as well so that the net effect of the small improvements in monitoring efficiency remained positive. There was a considerable improvement in the performance of Chinese large-scale enterprises throughout this period (NOLAN 1996).

In contrast, the much more rapid transition to an *ex ante* blueprint of clearly defined rights in Eastern Europe and the ex-Soviet Union has been described as capitalism by fiat (PEJOVICH 1994). The *ex ante* rights created by privatization did not translate into *ex post* rights of the western type because of high levels of contestation through legal and extra-legal means. Manifestations of this contestation included employee unrest, the extraction of rents by mafia-like protection rackets and regional conflicts. The distribution of power in the transitional economies was such that contestation costs were likely to be high with a rapid transition to clearly defined rights. The left-hand column of figure 6 shows that for some distributions of power and potential monitoring gains, the improvement in net social benefits may be higher with r_W than r_C. Indeed it is possible for $\Delta NSB(r_C)$ to actually be negative in some situations. Even allowing for the differences between China and Eastern Europe, their differential success with industrial reform can to some extent have been due to the non-separable effects of variables frequently ignored in transaction cost analysis.

V. ALTERNATIVE INSTITUTIONS: LARGE VERSUS SMALL FIRMS

The search for non-separable effects can be extended to more complex institutional choice problems. In this section we consider alternative firm structures. Transaction cost analysts have

attempted to identify the factors which determine whether large hierarchical firms (r_L) or smaller less hierarchical firms (r_S) are likely to be more efficient. This efficiency analysis can be an input into policy aimed at encouraging particular types of firm structure.

A number of technological variables determine the relative monitoring cost efficiency of large versus small firms. These include the lumpiness of the assets subject to asset specificity and the number of firm specific assets whose appropriable quasi-rents are interdependent. Lumpy assets subject to asset specificity can induce large firm size because of the monitoring costs of leasing in the services of such assets. An owner of such assets who attempted to lease out services to smaller firms would be subject to potential opportunistic *ex post* contract violations on the part of purchasers who would attempt to hold the owner hostage (KLEIN, CRAWFORD and ALCHIAN 1978, WILLIAMSON 1985).

Monitoring costs could be saved by the owner setting up production on his own. Lumpiness then induces a large enough scale to ensure optimal use. If there are a number of such assets whose appropriable quasi-rents can be appropriated by opportunistic bargaining in this way, monitoring costs are saved by incorporating all these assets in a single firm. The relative monitoring cost advantage of large and small firms are shown in the top and bottom rows of figure 7. An increase in the lumpiness and number of firm specific assets makes large firms more efficient in saving monitoring costs.

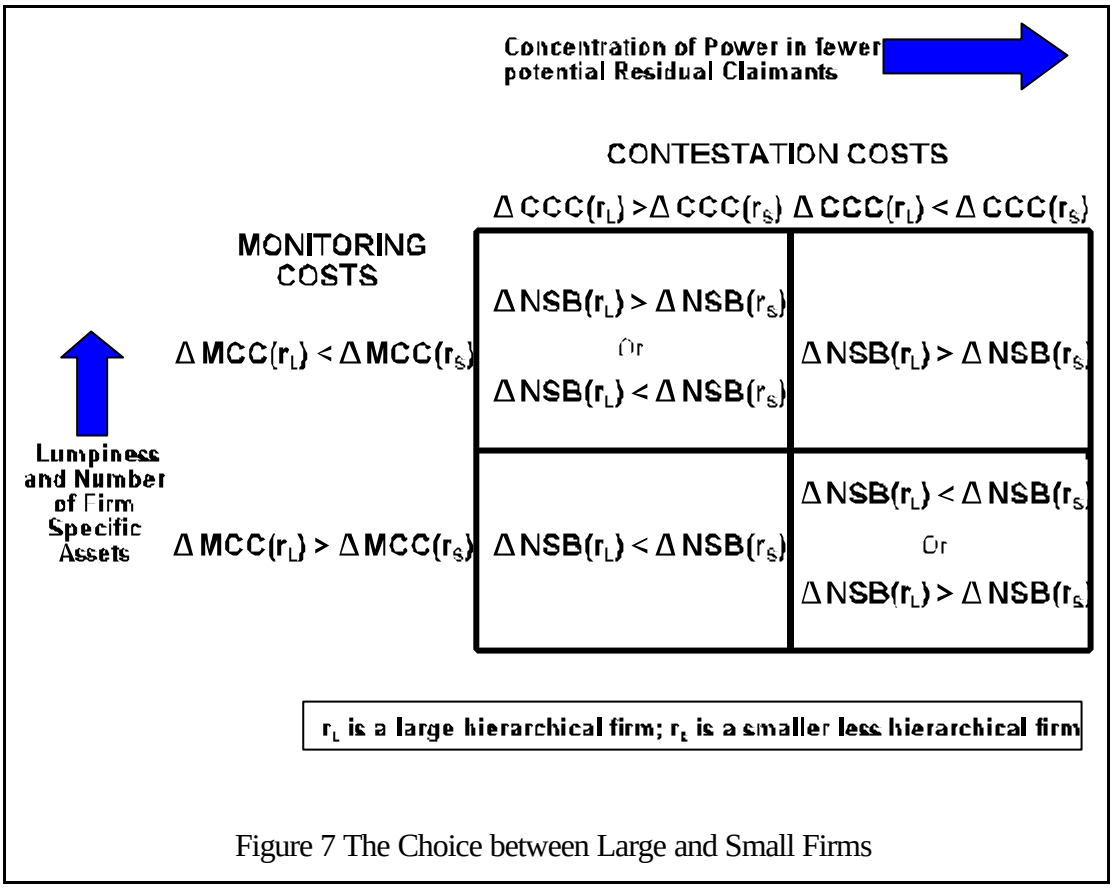

Figure 7 The Choice between Large and Small Firms

The contestation cost effects of large versus small firms depends on the balance of power defined by the asset-base and ideologies of the agents affected. If power is dispersed, the concentration of asset ownership in large firms is likely to lead to high contestation costs. The contestation could take the form of rent-seeking activity to persuade policy makers to break up "monopolies" or even more direct political contests. One of the objectives of the asset-specificity analysis of WILLIAMSON was to show that the political concern with monopolies in the U.S. was misguided (1985: 365-84). However antitrust legislation in the U.S. was not initially driven solely or even largely by economic models which happened to be wrong.

BENSEL (1990) has shown that contestation by Southern states fearful of the concentration of economic power in the North following the Civil War played a key role in the introduction of the Sherman Antitrust Act in the late nineteenth century. However the North had just won the Civil War and the contestation of the antitrust lobby which resulted in the Sherman Act

implied low contestation costs for the emerging corporate giants. In many developing countries, contestation from powerful middle class groups is an important source of contestation costs faced by large firms. In many cases such contestation can more than wipe out their relative monitoring efficiency.

In societies where power is more concentrated the contestation cost implications of the two institutions can switch. Large firms may no longer have higher contestation costs if the beneficiaries also happen to be the more powerful agents in society. Indeed, if power is very concentrated, small firms may face higher contestation costs if powerful agents engage in predatory raiding or seek to create artificial advantages for large firms by rent-seeking activities.

While the patterns suggested are simplistic, the indeterminacy is consistent with the arguments of industrial sociologists like WHITLEY who show that the efficiency of firm structures depends on the authority structures in which they operate (1992: 5). In the successful East Asian economies the predominant firm structure has varied from the relatively small family businesses which play an important role in Hong Kong and Taiwan to the giant South Korean chaebol. WHITLEY's argument suggests that firms operate effectively if residual claimants are able to harness power structures necessary for the efficient operation of that firm. Our terminology provides a language for an economic analysis of these inter-dependencies.

The efficiency of relatively small firms in Taiwan was based on a combination of small-scale technologies and a dispersed distribution of power amongst the native Taiwanese capitalists who were primarily involved in this sector. Paradoxically, the mainlander dominated authoritarian state was to a large extent responsible for the dispersion of power within this sector. It was fearful of concentrations of economic power in native Taiwanese hands and prevented any section from enjoying preferential access to the state. This combination of dispersed power and relatively small-scale technologies allowed small firms to be efficient as in the bottom left-hand box in figure 7. However there were key industries where assets were

lumpy and these were largely kept in the public sector. Here the relevant distribution of power was between the authoritarian mainlander dominated political leadership of the Kuomintang and the rest of society. The contestation faced by public enterprises was consequently low. This produced the efficient combination of firm structures, distributions of power and technologies shown in the top right hand box of figure 7 (WADE 1990: 262-276).

In contrast, South Korea's industrial strategy was based on technologies with much more lumpy assets and most of these were concentrated in giant private sector chaebol. These operated in a political context where the immense concentration of resources could be sustained at low contestation cost. The concentration of power which allowed this was not based on the prior existence of powerful private sector agents. Rather it was based on the successful creation of an authoritarian political settlement by Park Chung Hee's coup in 1961 which allowed the state to create the concentrations of private wealth necessary for its industrial policy (AMSDEN 1989). The concentration of political power and its deployment to protect the chaebol meant that contestation from excluded sections of society was low (WHITLEY 1992: 183-197).

These successful developing countries were in many ways exceptional. There are many examples of developing countries where optimal combinations of technologies, power distributions and institutional structures did not emerge. An example is Pakistan's attempt at industrial policy in the sixties. Like South Korea, Pakistan attempted to exploit technologies with scale economies by encouraging the creation of large holding companies with preferential subsidies. One of the factors eventually leading to the failure of this strategy was the heavy contestation of the distribution of assets by excluded sections of society (KHAN 1989, 1995). A relatively dispersed distribution of power placed Pakistan in the top left hand corner of figure 7 where contestation costs were high enough to wipe out the monitoring cost advantage of large firms using lumpy assets.

The contestation costs facing large firms in Pakistan does not necessarily mean that the Taiwanese institutional mix would have worked better. Taiwan depended on the initial location of lumpy investments in a public sector facing low contestation costs. In most developing countries the public sector too does not enjoy the power conditions to allow these technologies to operate. Contestation by excluded groups in such countries also implies large contestation cost effects for public sector enterprises (see for instance BHASKAR and KHAN 1995).

Critical evaluations of industrial efficiency in developing countries often concentrate on the causes of intra-firm monitoring failure. By distinguishing between monitoring and contestation costs, we may instead find that a substantial part of the inefficiency in poorly performing countries is due to contestation costs. This is important because the determinants of these inefficiencies are quite different. A consideration of figure 7 suggests that given a limited choice of technologies, the efficient operation of firms may require making the distribution of power a policy variable in some developing countries.

VI. INFORMAL INSTITUTIONS: CULTURES AND MORALITIES

Informal institutions are typically norms defined by culture and ideology. The economic effect of norms has received a great deal of attention (GAMBETTA 1988, ELSTER 1989, NORTH 1990, PLATTEAU 1994a, 1994b). The interest in culture stems from the observation that different cultures stress different combinations of norms. When formal institutions attempt to solve free rider problems, the presence or absence of norms can have an effect on monitoring costs. Thus the introduction of private property rights is likely to have a bigger effect on net social benefits if people are predisposed to respect property rights. Most of the institutional interest in culture has come from this perspective.

As with successful institutions, economists have sought to identify common features in the norms observed in successful economies. PLATTEAU (1994a, 1994b) argues that the distinctive feature of the cultures underlying the successful market economies of the western world is that

they support *generalized morality*. Morality is generalized when normative principles of reciprocity go beyond kin to become applicable in *general* (1994b: 770). PLATTEAU identifies the Church (both Catholic and Protestant) as having "played a central role in the process of moral norm generation and maintenance throughout modern western history" which contributed to the lowering of monitoring costs (ibid: 771).

Whether the evidence allows us to conclude that Christianity did have such an effect on monitoring costs can be disputed (MOORE 1994: 827-8). We could also dispute whether particularism in developing countries is due to non-generalized *morality* or other factors. However we will concentrate on a different problem which is more serious for PLATTEAU's claim that generalized moralities are a precondition for the efficient operation of market economies. Like formal institutions, the informal institutions implicit in cultures can have both contestation and monitoring cost implications. This is because cultures, particularly religious ones, can simultaneously define both the boundaries within which trust is applicable as well as distributive values within these boundaries. A generalized morality can be egalitarian or hierarchical as PLATTEAU recognizes (ibid: 770-71). Equally, particularistic or less generalized norm structures can also be egalitarian or hierarchical within different boundaries.

We denote a generalized norm structure by r_g and a norm structure more restricted in its applicability by r_p. Norms create stable expectations within a more or less widely defined group. Generalized moralities define a wider group for which the norms are applicable. We can agree with PLATTEAU that the more generalized the norm, the wider the scope of its applicability and *ceteris paribus*, the lower the monitoring costs for a wide range of activities. This is shown in the top row of figure 8.

However, the structure of norms also defines distributive claims which can intensify or dampen the conflicts inherent in the operation of particular technologies. To simplify the discussion we assume that generalized norms are more egalitarian than particularistic ones. This is not an

unreasonable assumption given that generalized norm structures tend to be justified by an appeal to universalist principles. Hierarchical or egalitarian norms have contestation cost implications by determining the legitimacy of particular distributive allocations and the willingness of agents to contest contrary allocations. The contestation cost implications are summarized in figure 8.

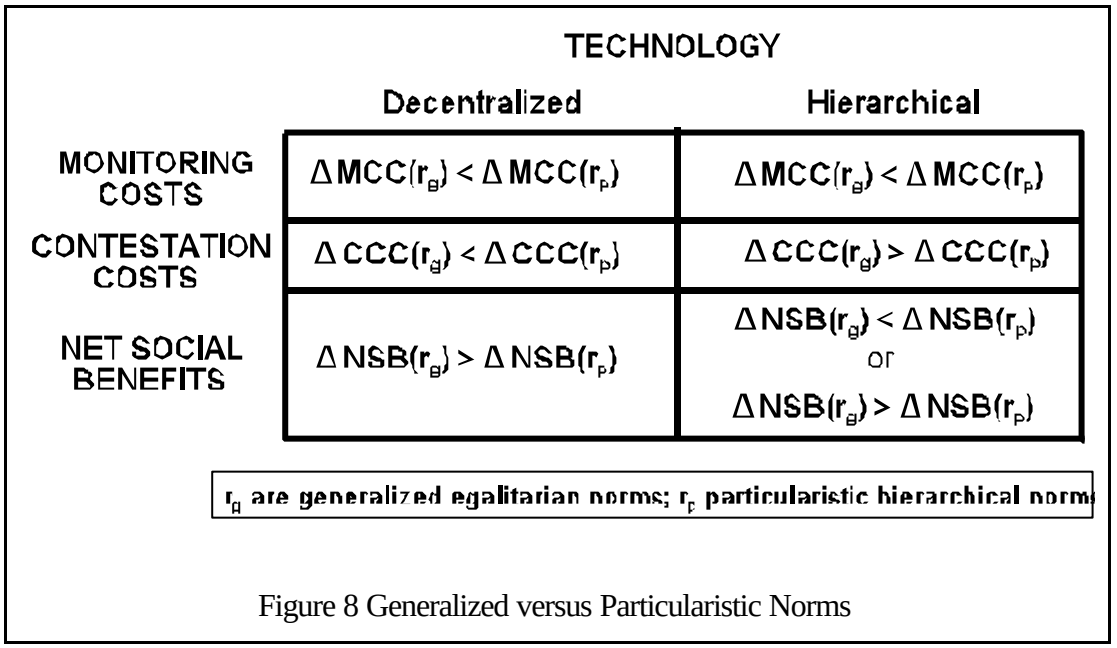

Figure 8 Generalized versus Particularistic Norms

MANN's ambitious (1986) work on historical sociology suggests that Christianity may indeed have had a positive effect on the growth of market exchanges in Europe from the medieval period onwards. In MANN's account, its effect was most pronounced over the tenth to the twelfth centuries when technologies were relatively small scale (ibid: 373-413). Despite peasant revolts on the basis of Christianity's egalitarian appeal, the effects of the reduction in the monitoring costs of long distance trade predominated. However, as technologies and particularly military technologies became more hierarchical, nation states and the ideologies of nationalism gained prominence. This was perhaps fortunate for Europe because it is likely that despite a growing hierarchization of the church, internal contradictions between egalitarian and hierarchical interpretations of Christianity would in the end have resulted in high contestation costs.

The contemporary role of Islam in many developing countries illustrates how generalized moralities may not be sufficient for the market order with modern technological conditions. With more hierarchical technologies, generalized moralities with egalitarian interpretations can result in high contestation costs. In contrast, hierarchical secular philosophies in East Asian countries have been more successfully adapted in support of emergent capitalism. Rather than general principles applicable to all, these have stressed loyalty to closely defined groups and high levels of intra-group discipline. The group at its broadest has been the nation. South Korean elites, for instance, were successful in drawing on traditional patriarchal kin-based loyalties as well as norms of nationalistic discipline inherited from the Japanese to construct the norms supporting the chaebol-dominated economy (SUH 1989, JANELLI 1993).

These norms have not necessarily been very efficient in terms of lowering monitoring costs. For instance, there is substantial evidence of large-scale corruption in South Korea on the part of powerful agents dominating the economy (KHAN 1996). If norms had a part to play in the success of this economy, it is more plausible to argue that the hierarchical and particularistic norms contributed to keeping contestation costs low. For its package of technology, power and formal institutions, norms which were quite different from the generalized morality of early Christianity proved very efficient.

VII. CONCLUSIONS

We have discussed a number of non-separable effects which determine the overall transaction costs and hence the efficiency associated with institutions. The argument has been presented in general terms as well as with reference to a number of more specific institutional choice problems. At the general level we have concentrated on two components of the transaction cost effect of institutions to arrive at some conclusions.

i) To identify the efficiency effects of institutions all variables with non-separable effects need to be identified. With multiple non-separable effects we cannot say whether an institution

is better than another in terms of *overall transaction costs* unless we know the values of all variables with additively non-separable effects. This limits the applicability of the incremental transaction cost methodology described in section II and discussed in specific examples. The function determining the transaction cost effect of an institution is similar to equation (6) where the values of a number of institutional and non-institutional variables have to be specified to fix the transaction cost effect.

ii) Tradeoffs between different components of the institutional effect are important. It is unrealistic to construct an analysis which has its applicability restricted to the *conjunctures* of conditions which were present in the initial observation. Consequently, analysis must seek to identify the most important components of the transaction cost effect and the variables which have non-separable effects on each of these components. The tradeoffs between different components of net social benefits need to be identified as institutions are changed with given values or ranges of values for other variables. The monitoring and contestation cost components of the institutional effect are particularly important. If institutional change improves monitoring costs but worsens contestation costs, we would want to know the severity of the tradeoff.

iii) Other variables such as informal institutions may also have non-separable effects. The complications created by non-separable effects are equally damaging for attempts to identify in isolation the effects of other variables with non-separable effects. Formal institutions, technologies, balances of power *and* informal institutions can have additively non-separable effects on monitoring and contestation costs. With non-separability we are likely to observe efficient or inefficient *combinations* of norms, distributions of power, technologies and formal institutions. Cultural features which proved to be efficiency enhancing in some contexts may prove to be efficiency-retarding in others.

iv) Policy need not and sometimes cannot be restricted to institutional change alone. With non-separable effects the combination of variable values may be such that institutional

policy alone may sometimes fail to have much of an effect on net social benefits. We have seen that the distribution of power in particular may be such that efficiency enhancing policy options may be very restricted. Under these circumstances analysis of the different components of the institutional effect is necessary to identify possible directions of change for other variables. If the distribution of power has non-separable effects, policy making may sometimes have to be explicitly political and attempt to change the distribution of power directly.

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