Values and Governance Systems[1]

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July 1999

[1]Paper presented at the Second Annual Conference of the International Society for New Institutional Economics, ISNIE, Paris, 1998. Suggestions from Claude Ménard, Myrna Wooders, Rob Gilles, and from anonymous referees at ATOM, Paris, and at CentER, Tilburg, are gratefully acknowledged.

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Abstract

Cooperative behavior as well as other cultural rules and values are made explicit in organizational units that procure and provide a common service. The common service is procured by a club, which consists of a user-value function, a representation governance, and a budget-allocation function. The common service is provided by a ¯rm, which consists of a value-production function, an implementation governance, and a remuneration function. They extend the concepts of the consumer and the producer in neoclassical theory. The functions mentioned are determined by cooperative games.

A governance is represented by a structure of principal-agent relations. The representation governance is a bottom-up hierarchy, empowered by the members of the club. The implementation governance is a top-down hierarchy, empowered by the governor of the ¯rm. The optimal size of the club organization and the ¯rm organization in a competitive environment is determined under certain conditions.

This description of a club and a ¯rm allows characterization of some cultural dimensions in the society. For one such cultural dimension, viz. the degree of collectivism in society, the impact on the optimal organization is shown.

Keywords: Governance, cooperation, hierarchy, club, ¯rm, institution, service economy, values, culture, organization.

JEL-classi¯cation: C71, D23, D63, D7, H1, L22.

1 Introduction

An organization is ruled by internal values. These constitute its culture and determine eventually the performance of the organization. To a large extent, however, these internal values are determined by external values, i.e., the cultural values and the governance system of the society in which the organization performs. These observations are also valid for the ruling paradigm in economics, the general equilibrium model in neoclassical theory. The internal values of consumers and producers is to maximize utility and pro¯ts, which is consistent with and supported by the external market rules. These neoclassical models have given an impressive description of the economy on the basis of basically one value concept, the maximalization of individual utility. This force explains, a.o., the internal pro¯t-maximalization culture imposed on ¯rms under neoclassical governance of society. This correspondence between the internal values of all ¯rms and households with the external values in the society constitutes the basis of general equilibrium theory. However, there are more cultural dimensions in society than the utility maximizing one. When these other cultural dimensions are taken into account, the neoclassical concepts of a producer and a consumer have to be expanded. The rules governing these agents have to be designed by more sophisticated tools.

Why is this relevant? Why would one want to incorporate other cultural values in governance than the neoclassical values? The main reason is, of course, that such other values exist in society and may even di®er over the various countries. The questions posed here are (i) can tools be designed to describe these cultural dimensions in governance, and (ii) if so, what kind of e®ects do these cultural dimensions have on the organizations' behavior and on the economy's equilibrium concepts? Can cooperation be made compatible with a competitive equilibrium concept?

For that purpose, the concepts of a ¯rm and a club are extended with an organization that is based on internal cooperation and is endowed with an organizational control parameter. This extension is explained by transaction costs and lies therefore at the base of institutional economics. It also implies that the internal cooperative values may di®er from the competitive values ruling the market organization. Again the question arises, why one would want to incorporate other internal values in an organization than the external values existing in society? Such a divergence may very well frustrate adherence to the cornerstone of global economic order, the concept of a competitive general equilibrium. This great achievement of neoclassical theory has to be incorporated into any new approach. Fortunately, however, the introduction of a cooperative internal organization is shown to be compatible with an external competitive organization if only the interface between the internal and the external organization is well designed. The introduction of organizational capacity as a production factor has, of course, consequences for concepts such as Pareto e±ciency, which are void of organizational arguments. Finally, the e®ects of one other cultural dimension, individualism vs. collectivism, on the ¯rm and on the club organization is shown.

So the concept of a ¯rm is rede¯ned to include a description of a cooperative internal organization. Coase (1937) presented the seminal paper introducing this cooperative nature of the ¯rm. Coase observed that transaction costs are made by a ¯rm to buy labor services on a market. When these services are demanded regularly on the external market, it may be cheaper for the ¯rm to make these services available within the ¯rm by means of long term contracts. The ¯rm, as an organization of positions connected by agency relations, writes long term contracts for each position to be ¯lled. The ¯rm's organizational costs of writing and monitoring one long term contract may at most be equal to the organizational cost of writing and monitoring a number of short term contracts for the same position. Coase therefore introduced the organizational capacities of a ¯rm as a production factor, distinguishable from the technological capacities embodied in the ¯rm.

In order to determine the tradeo® between organizational and technological capacities, parameters need to be designed to describe organizational capacities, for the Chief Executive O±cer of a ¯rm controls the performance of the ¯rm by means of some of these organizational parameters, rather than the ¯rm's technical parameters. For that aspect, Oliver Williamson laid the foundations. In his seminal 1967 paper on the optimal size of a hierarchically structured ¯rm, Williamson determines, for a given technology, the optimal number of levels of the ¯rm's organization. The number of levels as the only organizational parameter to maximize pro¯ts has been investigated further by, a.o., Keren and Levhari (1979, 1982). These models are valid, however, for one speci¯c technology, i.e., the linear production function, for one speci¯c wage structure, i.e., proportional to the level in the hierarchy, and for homogeneous labor. These models are therefore too restricted to determine the relation and the tradeo® between organizational and technological features, which is needed to describe the concept of a cooperative ¯rm in a competitive environment. The model introduced by van den Brink and Ruys (1996) removes these restrictions.

In this paper, the technology is described by a value-production function de¯ned on the front-positions in the ¯rm that directly render services to the clients and, by being paid for these services, create the value-added of the ¯rm. This function can be derived from a physical production function and is well suited for handling aggregate services. It is de¯ned as the payo® function of a game on the set of front-positions. That function assigns a value[1] to various coalitions of front-positions, which coalitions represent teamwork or horizontal cooperation between the front-positions to enhance the value of their service for the client, such as a surgical team. The higher levels in the organization of the ¯rm exist only to improve the productivity of the front-positions, which describes vertical cooperation within the ¯rm. The organization is a nexus of agency relations, represented by a directed graph with a unique source or top-position. This top-down organization is called an implementation governance.

[1] Note that this value concept is adapted from cooperative game theory and is a real number representing, e.g., an amount of money. The values (described here in the plural) that are associated with rules have a completely di®erent meaning and have a sociological origin.

The remuneration of each position in the organization is determined by a game that distributes the value-added of the firm over all positions in the firm. This model allows for a general equilibrium approach, as has been shown by Ruys and van den Brink (1999). So the essential components needed to describe the concept of a cooperative firm in a competitive environment, are (i) the value-production function describing the technology, (ii) the implementation governance describing the organization of the firm, and (iii) the remuneration function allocating the value added over the positions within the firm. For a given technology and remuneration system, the top-position determines the governance in order to maximize profits.

The concept of an implementation governance is rich enough to describe other organizational parameters besides the number of levels. In his seminal work, Hofstede (1980), on the basis of a large scale survey in more than 40 countries, identified some dimensions of culture that characterize a society, viz. its governance structures. Four of these dimensions are formally defined here by restricting governance on a way that is specific for each cultural dimension. In van den Brink, Ruys and Semenov (1999) these cultural dimensions are related to the distribution functions in the governance.

The same approach can be followed for describing the cooperative nature of a consumption unit in a competitive environment. For that purpose the concept of a club is used. The club concept is general enough to allow for a richer internal structure, and it has an established place in the neoclassical literature. A club can be described as a voluntary group deriving mutual benefits from sharing one or more of the following: production costs, the members' characteristics, or a good characterized by excludable benefits (Cornes and Sandler, 1986). In analogy to Coase's argument for the firm, a club is formed if the transaction costs of obtaining services outside the club are larger than the corresponding transaction costs inside the club. This comparative advantage is assumed to be caused by the internal organization of the club, which assumption constitutes the difference between our approach and traditional club theory. Our clubs may have some own internal values and motives based on cooperation that deviate from the values and motives in their outside, competitive world; they are not completely values-transparent in their environment.

In analogy to the firm, the internal governance of a club consists of a hierarchical organization, described by a directed graph. The difference is, however, that the authority within a club is not allocated top-down, but bottom-up. In contrast to the firm, the members of the club constitute the highest authority; they delegate power to higher levels within the organization. This type of organization is called a representation organization. The degree of organization within a club depends on the value of interaction between users of a service, called user-value. The user-value function is defined as the payoff function of a game between the members of the whole society. They can form all kinds of coalitions with each other, and so increase their user-value, but at the cost of organizing each other within one or more clubs.

So the user-value function is restricted by a graph representing the organization needed to form coalitions. The result is the positional-budget function, a game that assigns budgets to all positions within the club organization to optimally supply the members with the services demanded. It will be shown that, for each user-value function, the number of levels of the club-organization can be determined.

Ellickson et al. (1997) build on the Buchanan tradition in which many types of clubs are possible and people may be a member of more than one club. They view the activity of a club as a public project (see Mas-Colell, 1980) rather than as a provision of some level of public good. A club membership is an opening in a club available to agents with specified characteristics. Agents choose both private goods and club memberships, and private goods and club memberships are treated and priced in parallel fashion. The Ellickson et al. paper integrates club theory and general equilibrium theory, but their value-transparency assumption prevents it from establishing a link between neoclassical and neo-institutional economics.

This paper is organized as follows: The next two sections describe the optimal club organization needed to procure a common service. In Section 4 the optimal firm organization needed to produce a common service is presented. In Section 5, four cultural dimensions in governance are described in terms of the club and the firm concept, and for one of them the effect on the outcome is shown. The last section concludes.

2 The segments of a common service

Cooperation means that people interact. This interaction has to be stripped to its essentials for our purpose in order to make the idea operational. The concept of a common service is therefore introduced in this section, which service is homogeneous in content for suppliers and demanders, except for one dimension on which interaction between people is defined. This dimension may be interpreted as the real line on which people, the suppliers and demanders of the common service, are located. The common service is thus homogeneous except for a locational characteristic. The degree of aggregation needed to make a service homogeneous determines the scope of the analysis, e.g., health care or dental care.

We focus firstly on the service received. The procurement of a service by a group of people in a society is organized by means of a set of clubs. The club members voluntarily form a group deriving mutual benefits from sharing a good that is characterized by excludable benefits. Tiebout (1956) introduced the idea of restricting the set of consumers that benefit from a common service, which characterizes a local public good. A consumer may choose not to enter the local public good if rivalry or harmful interaction diminishes her utility too much. The net effect of internal interaction is beneficial for all involved. The Tiebout tradition has focussed on clubs as political jurisdictions, allowing for a partition of the population as part

of the basic description of the economy. Such a partition will result also in our approach.

A tradeable commodity is a carrier of some desirable property. An agent enters into an exchange transaction with another agent if the commodity that the other agent owns carries properties that she prefers over the properties carried by her commodity. The user-value of a commodity is assumed to be independent from the seller of that commodity. The user-value of the car you own is independent from the person who sold you the car. In the case of a service, however, the relation between the provider (seller) and the receiver (buyer) becomes crucial. The service rendered by a hairstylist involves the buyer personally, as does the services of a medical doctor. So the provider of a service gets access to the receiver of the service in order to provide the property desired by the receiver. A service is thus a relation between the provider and the receiver, which relation carries over the desired property. The carrier is the relation itself. When that relation is voluntary and anonymous, meaning that any provider or receiver may be substituted in the relation by another (identi¯able) provider or receiver, it is called a standard service. Nonstandard services are person-speci¯c services that cannot be provided by standard economic transactions, such as cases in which the receiver is vulnerable to the supplier. Hairstylist or medical services are usually standard services, because these services are embedded in a legal framework that provides protection against involuntary involvements.

Since a service is carried by a relation, we need to specify the location of the nodes of this relation, i.e., the service provider and the service receiver. In this paper we assume that the providers as well as the receivers are ordered linearly and are located on the line of integers or on the real line. A service received is, for example, a (speci¯c) student receiving a lesson from a (speci¯c) teacher, or a (speci¯c) patient receiving treatment from a (speci¯c) medical doctor. The user-value of a service represents the net bene¯ts of this service for a speci¯c receiver or user. Interaction between users may increase or decrease that value: a student may learn more in a class of interacting students, or a patient may recover slower in a room crowded with patients. The e®ects of this interaction are expressed by the user-value function of a service, which is the payo® function of a game de¯ned on the set of all possible coalitions of service receivers. This function implicitly de¯nes for each receiver of the service a cardinal utility function for that service on the set of all coalitions of receivers, as well as his willingness-to-pay for that service as a function of coalitions of receivers. This user-value function is homogeneous if any service receiver can replace another service receiver in the domain of the function without a®ecting the user-value[2]. That allows us to focus on the e®ects of interaction between agents and on the spatial characteristics of agents, which are relevant for the polity organization.

[2]So in the case of a homogeneous user-value function of a service, the service receivers are identical with respect to their consumption abilities regarding this service, but not as members of a society in which a consumers' organization is formed. Our approach is also suited for heterogeneous consumers, which however complicates the results.

The scope of interaction between the receivers of a standard service determines a hierarchical structure in the service. The education service, e.g., may have several levels: the student as individual receiver, the interacting students on the level of a class, the interacting students on the level of the school, etcetera. On each level a speci¯c educational service may be o®ered as a segment of the aggregated education service. This hierarchical structure of the service partitions the set of students into subsets. If such a standard service can be decomposed hierarchically in levels of aggregation of interacting users or receivers, is called a common service. At each level, segments of that common service can be speci¯ed, where a segment is determined by the size of the group interacting on that level[3]. In the case of a homogeneous user-value function, the numbers of segments of a common service is equal to the number of levels of aggregation. That determines the size of the club organization.

Since the receivers of a common service are paying for the service as well as for the organization, they determine together how many levels the club organization should have. That is equivalent to saying: how many segments of the common service they want to identify and to procure. The more segments are distinguished, the more delivery contracts have to be made and the more sophisticated and costly club organization will be. The organization of a club is characterised by a representation governance or a bottom-up organization. This is represented by a hierarchical graph consisting of a set of positions connected by principal-agent relations, where the principal-positions on the lowest level are occupied by the members and an agent-position on the top is occupied by the commissioner representing all the members. The receivers of the common service are the members of the club, who delegate power and a budget to one or more o±cer-positons, including the commissioner-position, just enough to procure the segment of the common service for which that o±cer is appointed.

The tradeo® between the bene¯ts and costs for the service receivers of extra organization is expressed by the budget-allocation function. Minimalization of this function determines the number of levels of each club and, given the scope of interaction at each level, the number of clubs. This structure is called the polity of the procurement of a common service. In the case of individual procurement of a service, the polity has no organizational layer and each member is formally his own club. Take a barber's service. When no regulation of the market of haircutting services is required, this service has only one segment and its polity is completely decentralized. But possible monitoring of this service or of its market would require a higher segment that covers the whole market.

The demarcation line of (the segments of) a common service procured by a club is thus determined by both its members' willingness-to-pay and the costs that are involved in contracting transactions for the provision of each segment of the common service. When such a segment is not tradeable on a market, in the case of market failures, transactions are performed on a higher level segment. That requires a representation organization. The utilities

[3] This ordering of segments of a common service corresponds with the subsidiarity principle.

form a good example. Since market failures have prevented `electricity from the switch' to be treated as marketable commodity, it has been considered a service on a higher aggregation level, procured by the local communalities and provided by a vertically integrated industry. The same is true for `water from the tap'. Technological and organizational innovations have made some of the segments of these services marketable. That has altered the demarcation and the organization of the club procuring the common service of providing electricity to households drastically.

3 The club organization

The main problem for a club that procures a common service is to valuate and to determine the number of segments of this common service, i.e., the optimal degree of representation organization, given the structure of interaction between the receivers of this service. That problem is faced in this section.

A club is a voluntary group deriving mutual bene¯ts from procuring and sharing a common service characterized by excludable bene¯ts, by establishing an organization with a representation governance that is empowered by the members to procure designated segments of the common service. Examples of a club are: the legislative branch of the government in a society, the policy making branch of a union, of an association, or of a cooperative, a household, all as far as it concerns the collective decision making in that organization to buy a common service, or to empower the executive branch of the organization to provide it. For the government of a country, the spatial characteristic determining the segments of a common service represents the territorial subdivision of the nation into states, provinces, counties, cities, etcetera.

The governance is an organization represented by a directed graph of positions, which are connected by principal-agent relations. In a representation governance the ultimate principals are the members at the lowest level of delegation. Delegation and empowerment of agent-positions, called o±cers, is organized bottom-up, with a unique agent-position at the top. Each o±cer performs an agent for a group of principal-positions at a lower level, except for the lowest level of positions, the members of the club, who have no principals. That group of principals empowers the o±cer-position su±ciently to let it decide about the procurement of the segment for which it is responsible[4].

It is endogenously determined whether one or more clubs will procure a common service for the members of the society. The set of clubs that provides the same common service for the whole society is called the polity of that service. The decision about the number of levels needed to provide optimally the common service is made by all members of the society together, on the basis of the bene¯ts as determined by the user-value function, and

[4] In social choice theory this o±cer position is represented by the decision of the group itself. The agent-role of the o±cer, executing the decision, is not relevant in that context

the (transaction) cost resulting from the organization of clubs. This governance forms a restriction on the user-value function, because the payo® for some member-coalition depends now also on the costly contribution of the o±cer-positions in the club. That de¯nes a new game on the set of possible coalitions of all positions in the club, with a payo®-function assigning budgets to each o±cer-position. These budgets are needed to pay for the service that is provided by the club to its members. Since these budgets are borne by the members, the payo®-function of the extended game is called a budget-allocation function. The size of a club is endogenously determined by minimalizing the burden for the members of the society.

The homogeneity assumption of the user-value function implies that each club in the polity has the same organization structure. So we can restrict the problem of determining the optimal number of levels to the `representative' club[5]. Let there be, for example, 4 members in the society. Then there are four di®erent polities possible with a span of users-interaction varying from 1 to 4. The ¯rst polity is that each member has her own cooperation and is her own o±cer and commissioner. Each of her decides for herself. There are two polities with a span of users-interaction 2, as is depicted in Figure 1, one with a 1-level governance and one with a 2-level governance. There is one polity with a span of users-interaction 4 and a 1-level governance[6]. See Figure 1 for a one level and two level governance structure of a polity with m = 4 members.

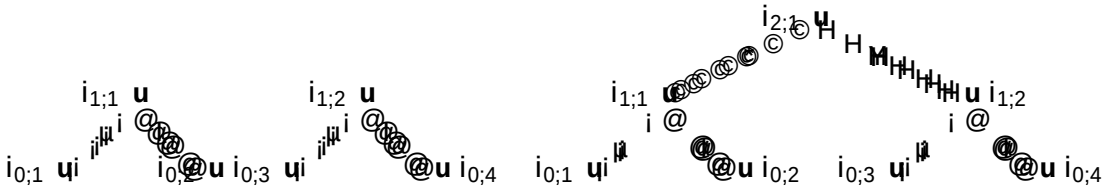

Figure 1: A one- and a two-level polity with span of interaction 2 and m = 4

In Table 1 the three components of a club are summarized. They constitute the context of the procurement of a common service by the members of a society.

The governance of a polity has been described as a directed graph of positions and of

[5]For reasons of simplicity we assume that, if there are m members in the society, k facilities of scope s, then m = ks. This assumption is not essential for our results.

[6]In general, given ¯xed span of users-interaction s, one level governance makes it possible for the sets $\{i_{0;1};\ldots;i_{0;s}\}$, $\{i_{0;s+1};\ldots;i_{0;2s}\}$, :::, $\{i_{0;m-s+1};\ldots;i_{0;m}\}$ to coordinate decision making within these sets. This requires the presence of level one coordinator positions $L_1 = \{i_{1;1};\ldots;i_{1;m=s}\}$. The governance structure G_1 is de¯ned conformly by $G_1(i_{1;k}) = ;$ for $k \in \{1;\ldots;m=s\}$, and $G_1(i_{0;(k-1)s+1}) = ::: = G_1(i_{0;ks}) = i_{1;k}$ for all $k \in \{1;\ldots;m=s\}$. Expanding governance further yields governance levels $L_n = \{i_{n;1};\ldots;i_{n;m=s^n}\}$ with maximal number of governance levels equal to $n_{max} = {}^s\log m$ and $L_{n_{max}} = \{i_{n_{max};1}\}$.

1. Members of a society, which is represented by a linearly ordered, finite set N_0, may interact in using or consuming a common service. The value of this interaction is expressed by the user-value function, w, of that common service, assigning to all possible coalitions $E \subseteq N_0$ of members the user-value of the common service. This function is homogeneous with respect to the users of the common service.

2. In order to procure the common service, members form a structure of clubs with a representation governance, which structure is called the polity of that common service in the society. Each club determines the optimal number n of organizational levels. A polity is a directed graph $(N_n; G_n)$ with a set N_n of positions and a set G_n of principal-agent relations that delegate power bottom-up. Each agent is controlled by a group of principals of a uniform size s, called the scope of users-interaction. A member in the set $N_0 \subseteq N_n$ is a principal that has no agent, which means that the governance is empowered bottom-up. When there are n levels in a polity, there exist $k = m/s^n$ clubs in the society, where m is the number of members in the society. Each club with n levels has s_n members and one commissioner. The other intermediate positions are occupied by officers.

3. For each level n, the contributions and resources from the members are allocated according to a budget-allocation function, b_n. This function assigns a budget to each position in the club in order to provide its officers with the means to procure the corresponding segment of the common service.

Table 1: The three components of a club organization

agency relations, with each agent being controlled and empowered or financed by a group of principals[7] of a uniform size s. This number s is also called the scope of users-interaction of the polity of a common service. In the case of a firm the direction of control is reversed and the `scope of control' means the number of agents controlled by one principal. Since the burden-function expresses the cost and benefits of interaction between receivers of various segments of a common service, it can also express differences in costs and benefits as determined by specific cultural dimensions present in the society.

In the case that the budget-allocation function of a service leads to a polity structure with one or more clubs, some partition of the linearly ordered set of members-positions, representing the society, follows. Therefore, in the polity structure discussed here the members have some specific position and can no longer be treated anonymously, as was the case in the user-value function. A particular member may be connected to some members and may not be connected to other members[8]. For the examples illustrated in Figure 1 these partitions are $P^1 = \{\{i_{0;1}, i_{0;2}\}, \{i_{0;3}, i_{0;4}\}\}$ and $P^2 = \{N_0\}$, while $P^0 = \{\{i_{0;1}\}, \{i_{0;2}\}, \{i_{0;3}\}, \{i_{0;4}\}\}$.

[7] Solution of this type of problem requires the assistance of social choice theory.

[8] Given governance level n we define the partition $P^n = \{P_1^n, \ldots, P_{m/s^n}^n\}$ with $P_k^n = \{i_{0;(k-1)s^n+1}, \ldots, i_{0;ks^n}\}$, $k \in \{1, \ldots, m/s^n\}$, i.e., P^n is the partition of N_0 into maximally connected subsets in G_n.

The members of society with polity level $n = 1$ and partition P^1 clearly cannot be treated anonymous[9]. The budget-allocation function is assumed to be symmetric. Together with homogeneity of the user-value function it follows that the same budget is assigned to all positions within one level of the representation club. Therefore, we may say that a budget is assigned to each level, instead of a budget being assigned to each position. So $b_n(k)$ is the budget assigned to all positions in level k of a polity with n governance levels. The sum of these budgets is a burden for each member at the zero level of a club. The user-value minus the value needed for distributing budgets among the officer-positions in the club, is the net user-value given by $b_n(0)$ of the budget-allocation function. Each (representative) member wants to maximize this term over the set of feasible levels.

Example 3.1 In this example we use a specific budget-allocation function that satisfies structural monotonicity and symmetry. (This budget-allocation function is based on the concept of a permission value as developed in a game theoretic context by Gilles, Owen, and van den Brink (1992) and characterized in van den Brink and Gilles (1996) and van den Brink (1997)). The permission value distributes the dividend of each set of members $E \subseteq N_0$ equally among the members in E and all officer positions that serve these members, i.e., all officer positions in the set $G_n(E) := \{j \in N_n \mid$ there exists a sequence of positions $(h_1, \ldots, h_t)$ such that $h_1 \in E$; $h_{k+1} \in G_n(h_k)$ for all $1 \leq k \leq t-1$ and $h_t = j\}$.

Consider a polity with $m = 4$ front positions $N_0 = \{i_{0;1}; i_{0;2}; i_{0;3}; i_{0;4}\}$ and span of interaction $s = 2$. The two possible governance structures are illustrated in Figure 1 and the 'empty' structure in which there is no governance. If $w(E) = |E|$ for all $E \subseteq N_0$ (separable user-value function with dividend equal to one for coalitions of size one, and dividend equal to zero for all other coalitions) and using the permission value as budget-allocation function, it follows that $\beta_n(0) = \frac{1}{n+1}$ which is decreasing in n, so $n^* = 0$.

If $w(N_0) = |N_0|$, and $w(E) = 0$ if $E \neq N_0$ (complementary user-value function with dividend of the coalition of all members N_0 equal to $|N_0|$, and dividend of all other coalitions equal to zero) then the permission value as budget-allocation function yields $\beta_n(0) = \frac{|E|}{|N_{n_{max}}|}$ if $n = n_{max}$, and $\beta_n(0) = 0$ otherwise. So, $n^* = n_{max} = s \log m = 2$.

For an application of the permission value to the firm we refer to van den Brink (1996), van den Brink and Ruys (1996), and Ruys and van den Brink (1998). 2

The Example 3.1 shows how the optimal size of a representation organization is determined for two types of budget-allocation functions. From the homogeneity assumption of

[9] The budget-allocation function b_n can be obtained from the user-value function w by means of the following steps. First it is redefined for a governance level n: $v_n(E) = \sum_{P \in P^n} w(E \cap P)$, for all $E \subseteq N_0$. Then it is extended to all positions in the polity: $\forall_n(E) = v_n(E \cap N_0)$, for all $E \subseteq N_n$. Finally, the budget-allocation function $b_n : N_n \to \mathbb{R}$ is defined by the positional-value or the permission value, which is the Shapley value restricted by a hierarchical graph.

the user-value function it follows that each local optimization within a club is equivalent to global optimization of the polity. In that case, group optimization for society can be reduced to optimization in a club, where each (representative) member of a club wants to maximize her net user-value of a common service over the set of feasible levels.

4 The ¯rm organization

The main problem for a ¯rm that provides a common service is to valuate and determine the extent of the provision and the number of production levels to support this provision, i.e., the optimal degree of an implementation organization, given the structure of productive interaction between the providers of this service. That problem is faced in this section.

It has already been remarked already that the internal organization of the ¯rm is not considered in neoclassical economic theory. The ¯rm is simply an entity that transforms some commodities into other commodities. In his seminal work Williamson (1967) investigated the issue of an optimal size of a hierarchically organised ¯rm and introduced the internal organization of the ¯rm in economic analysis. Several authors, in particular Keren and Levhari (1979, 1982) extended Williamson's work. Our approach to the ¯rm builds on this tradition, but generalises it by allowing for di®erent production functions and remuneration systems. We take authority relations into account but also other relations within the organization.

The second di®erence is that our approach is suited to immaterial services rather than to material commodities. The production function is an appropriate tool to represent the relation between quantitative inputs and outputs. This tool is less appropriate for the case of services and for describing behavioral features of the individual agents concerned. The concept of a common service has been introduced in the previous sections and generalizes upon the commodity concept. Both a commodity and a common service may be the output of the production process described in this section. However, we consider the input of labor as a common service for the ¯rm, which ¯rm provides a particular common service to the society. The technology of this ¯rm is described by a value-production function and expresses the structure and the value of interaction between those laborers, called the service-providers or the front-workers, that provides the particular service to the clients, the service-receivers. The value-production function is de¯ned on the set of coalitions that the service-providers may form.

Those coalitions of service-providers, however, can only be formed by an implementation organization supporting those service-providers. The ¯rm is such an organization of roles or positions (rather than of individuals) that implements the optimal production structure. The description of this organization requires that the service-providers are linearly ordered. Individual laborers employed on positions in the ¯rm that support the various segments in the ¯rm are called coordinators. These positions are formed according to the partition that cooperation between service-providers requires. The responsability for the whole ¯rm is

carried by the coordinator-position at the top of the hierarchy, called the governor-position. The governor may be a legal person. He empowers the ¯rm organization, is responsible for the governance in the ¯rm and for its performance. If the ¯rm is a commercial ¯rm, he will impose a pro¯t-maximizing culture on the ¯rm. In that case, the service will be marketable and the external environment of the ¯rm consists of three competitive markets: the product market, the labour market and the capital market. The prices formed on these markets are, respectively, p, w and r. The three basic components of a ¯rm are summarized in Table 2.

1. Members of the labor force of a society who provide the common service, called the front-workers, are collected in a linearly ordered, ¯nite set W. The production technology determines how these front-workers cooperate and interact in producing or providing the common service. The value of this interaction is expressed by the value-production set of that common service. Each function in thie set assigns to all possible coalitions $E \subseteq W$ of front-workers the value-added of the common service, for the corresponding number of levels. Each value-production function is homogeneous with respect to the front-workers.

2. In order to provide the common service, a structure of ¯rms with an implementation governance is formed by the unique position in each ¯rm that empowers the organization, called the governor. The structure of ¯rms is called the industry of that common service in the society. Each governor determines the optimal number n of organizational levels in the ¯rm. A ¯rm is a directed graph $(N_n; G_n)$ with a set N_n of positions and a set G_n of principal-agent relations that delegate power top-down. Both depend on the size n of the ¯rm, which is the organizational parameter controlled by the governor. Each principal in the ¯rm, called a coordinator, controls a group of agents of a uniform size s, called the scope of providers-interaction. Coordinators only serve to increase the productivity of the front-workers. The governor is the unique principal-position in a ¯rm that empowers the organization, i.e., he provides the initial resources needed for the ¯rm's operation and determines the size and the internal rules and culture of the ¯rm by specifying the agency-relations of the organization.

3. The value added of the ¯rm is distributed among all positions in the ¯rm as positional income according to the given remuneration function, to reward the initial resources made available by the production factors. This function is a cooperative game restricted by the governance and de¯ned on all positions of the ¯rm. It satis¯es properties that re°ect the social or cultural values of society.

Table 2: The three components of a ¯rm organization

Since the governance structure has a tree structure, a level in the organization can be de¯ned as the set of positions each of which has the same distance to the top-position[10]. Let

[10] Let $L_0 = N_0 = \{i_0\}$ represent the top-level with the governor-position of the ¯rm. Then $L_\ell = \sum_{i \in L_{\ell-1}} G_n(i)$, for $\ell = 1; \ldots; n$, and $N_\ell = N_{\ell-1} \cup L_\ell$. Additional structure is required to guarantee that

n be the number of levels in a ¯rm. The set of positions N_n in that ¯rm can be partitioned in level sets $L_0; ::: ; L_n$, where $L_0 = \{i_0\}$ is the highest level set with the governor as the only member, the lowest level set $L_n = W_n$ is the set of service-provider positions, and the intermediate level sets L_ℓ for some $\ell = 1; ::: ; n - 1$, are the sets of coordinators at level ℓ. The number of service-provider positions, $|W_n|$, is equal to s^n in an n-level ¯rm[11]. So the governor can completely determine the governance structure $(N_n; G_n)$ of the ¯rm by choosing the number of levels n of the ¯rm.

In Figure 2 the governance structure of a one-level and two-level ¯rm is given for the case that the span of interaction, s, equals 2.

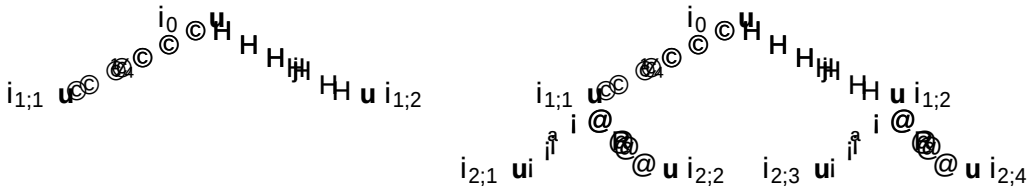

Figure 2: A one- and a two-level ¯rm governance structure with span of interaction 2

For reasons of simplicity, we assume in this paper that the value-production function is homogeneous with respect to the service-provider positions, meaning that all service-provider positions in an n-level ¯rm are identical in the value-production process. Such a value-production process can be described by a homogeneous value-production function $f_n: \{1; ::: ; |W_n|\} \to R$ de¯ned on the number of - identical - worker positions[12].

The sequence of agency relations decentralizes decision making at each consecutive level and allows the decrease of the complexity of the decision problem at each level. It results, however, in certain level-dependent agency costs. These agency costs are stated as a percentage of ¯nal providers-value and are represented by $1 - \alpha^n$, with the parameter α between zero and one. They therefore increase in the number of hierarchical levels. Examples of such costs are the facilities needed for the coordinators to operate, resulting in a loss of output, or costs involved in the processing and control of level-dependent budgets and information, implying a loss of control of a coordinator over the behavior of his successors. Adding a level

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the set of positions at level n, L_n, is equal to the set W_n of positions having no successor. This follows from the assumption that each principal in the ¯rm has the same number of agents, the span of interaction s. So $|G_n(i)| = s$ for all $i \in M_n = N_n \setminus W_n$. The positions at the ℓ-th level of the ¯rm are member of the set $L_\ell = N_\ell \setminus N_{\ell-1} = \{i_{\ell;1}; ::: ; i_{\ell;s^\ell}\}$, for $\ell = 1; ::: ; n$. The relational structure is then speci¯ed by $G_n(i_{l;k}) = \{i_{l+1;(k-1)s+1}; ::: ; i_{l+1;ks}\}$, for $l = 0; ::: ; n - 1$ and $k = 1; ::: ; s^l$.

[11] The number of positions in the ¯rm, $|N_n|$, equals $\sum_{\ell=0}^{n} s^\ell = (s^{n+1} - 1)/(s - 1)$. The number of principal positions, $|M_n|$, equals $\sum_{\ell=0}^{n-1} s^\ell = (s^n - 1)/(s - 1)$.

[12] Alternatively, a heterogeneous providers-value process is represented by a value-production function $f_{W_n}: \{0; 1\}^{|W_n|} \to R$. We will not consider that in this paper.

in the organization may thus bene¯t the governor by increasing the scale of value-production, at the cost of an increase in agency costs.

We assume the value-production function to be monotone in the sense that increasing the set of workers does not decrease providers-value[13]. Since the span of interaction of the ¯rm is given, the only way to increase the number of service-provider positions is to increase the number of levels in the ¯rm. An extra level has a positive e®ect on value added through the value-production function. On the other hand, there is the negative e®ect of the level dependent agency cost.

Note the following important di®erence in the governance of the club discussed in the previous section and of the ¯rm discussed here. Since the ¯rm structure is expanded top-down, the scope of value-production and the added value of the ¯rm depends on the number of ¯rm levels. Since the polity structure is expanded bottom-up (implying that the set of members is ¯xed for di®erent polity levels) the `user-value' in the polity is independent of the number of polity levels. So, the user-value function is the same for all levels, while the value-production function depends on the number of levels.

The output produced by the ¯rm is sold at a competitive output price $p > 0$. Thus, if all service-provider positions are e®ectively occupied by labor resources, then a gross revenue equal to $pf_n(s^n)$ at an output price $p > 0$ is generated. The net revenue or the value added is obtained by subtracting the level-dependent cost from this gross revenue[14] yielding $p\alpha^n f_n(s^n)$. Note that the parameter α, being the complement of the level-dependent agency cost parameter, can be seen as an agency e±ciency parameter. It may correlate with the span of interaction parameter s, but both are given here.

By de¯nition the value added of a ¯rm also equals the reward paid to the production factors, i.e., the value added equals the sum of the positional wages and the positional returns on capital. The remuneration system distributes the value added[15] of a ¯rm.

This distribution function φ assigns a positional income to any position in the ¯rm. This remuneration system determines the positional wages that are paid to the laborers occupying the positions. The positional income allocated to position $i \in N_n$ in a ¯rm producing according to f_n is denoted by $\varphi_i(f_n)$. Since we assume a homogeneous ¯rm with a symmetric remuneration system we can speak about wages assigned to levels instead of wages assigned to positions, i.e., for each level ℓ, $\varphi_\ell(f_n) = \varphi_i(f_n)$ for $i \in L_\ell$. Similarly, the positional return on capital of the governor position is denoted by $\varphi_0(f_n)$.

We impose two natural conditions on the form of the remuneration system, in addition to the e±ciency condition mentioned earlier. Firstly, this function should satisfy structural monotonicity, meaning that a supervisor does not receive a lower wage than his successors.

[13] A value-production function is monotone if $E \subseteq F \subseteq W_n$ implies $f_n(|E|) \leq f_n(|F|)$.

[14] For notational convenience we do not consider material cost that depends on the level of providers-value. Considering these costs to have given input price $c > 0$ does not change the results.

[15] In game theory this property is called e±ciency.

Secondly, we assume it to be symmetric, meaning that in a homogeneous ¯rm it assigns the same wage to all positions within one coordination or worker level.

For given size n the four components described above de¯ne an n-level ¯rm, denoted by $F_n = (N_n; G_n; ; f_n; ')$. Three of these components vary with the parameter n, the number of levels. So a ¯rm is a function F that assigns to each number of levels the speci¯cation F_n of components[16]. Since the pro¯t of a ¯rm depends on ¯rm size, the governor can determine pro¯t by choosing the number of levels of the ¯rm. Increasing the size of the ¯rm can have a positive and negative e®ect on the value added. The negative e®ect results from the level-dependent agency cost as expressed by the parameter $1 ¡ ®^n$. The possible positive e®ect results from the fact that more workers can be active. The governor of the ¯rm chooses n in order to maximize pro¯t.

In the preceeding paragraph we described the internal organization of the ¯rm F. The external organization of the ¯rm is represented by the reservation wage of workers, $w > 0$, the reservation rate of return on capital of the governor, $r > 0$, and the price of a unit output, $p > 0$. Not all ¯rm sizes are feasible, however.

In order for the ¯rm to be active the worker and coordinator positions have to be occupied by employees. For the moment we assume the potential employees to have a positive reservation wage w. They will accept a position in a ¯rm with n levels if and only if the internal wages o®ered do not fall below their reservation wage w. A ¯rm can only produce if the workers accept the internal wages o®ered to them. Similarly, the governor has a positive reservation rate of return on capital r. If positional returns on capital for the optimal level of the organization are lower than this reservation rate of return on capital, then the governor will not activate the ¯rm, i.e., $n = 0$. Therefore, the governor chooses ¯rm size n such that pro¯t is maximal under the constraint that the wages o®ered to the workers is at least equal to their reservation wage w. If, at this level, the positional returns on capital are lower than the reservation rate of return on capital r, then the ¯rm is not activated. So, in general, the set of feasible ¯rm sizes $N(w; r; p)$ can be empty or unbounded.

The *optimal ¯rm level* is the lowest level of the ¯rm that maximizes pro¯t under the constraints that the wages assigned to service-provider positions are at least equal to the reservation wage and the pro¯t of the governor position at least is equal to the reservation rate of return on capital[17].

Note that the optimal ¯rm level could be in¯nite, while the optimal polity level by de¯-nition is ¯nite. The optimal ¯rm level is ¯nite if the set $N(w; r; p)$ is bounded. The following proposition shows that this holds if the value-production functions f_n are such that average productivity of the labor inputs is non-increasing in ¯rm size n, i.e. $f_{n+1}(s^{n+1}) \quad s f_n(s^n)$

[16] In principle any parameter of the governance may be chosen.

[17] The function $n: R^3_+ ! R$ de¯ned by $n(w; r; p) = \min\{n \in N(w; r; p) \mid '_0(f_n) = \sup_{ñ \in N(w;r;p)} '_0(f_ñ)\}$ and $n(w; r; p) = 0$ if $N(w; r; p) = ;$, where $N(w; r; p)$ is the set of feasible levels, assigns the optimal ¯rm level to each triple of positive reservation prices.

for all $n \in N$.

Proposition 4.1 [van den Brink and Ruys (1996)]
Let a firm F with average labor productivity non-increasing in firm size be given. Then, for any positive vector $(w; r; p)$ of reservation prices, the set $N(w; r; p)$ of feasible firm levels is bounded.

The above proposition shows that the optimal size of the firm is finite, even for some cases of increasing returns. However, the existence of a positive optimal level is not guaranteed. One of the reasons for non-existence is the fact that if we allow for different value-production technologies when the governor varies the number of levels, the set $N(w; r; p)$ of feasible levels may be empty.

5 Cultural dimensions in governance

In this section we introduce four cultural dimensions and describe them in terns of the components of the club or of the firm, as summarized in Table 1 an Table 2. Then we show for one dimension, Individualism vs. Collectivism, that the cultural characteristics influence the optimal outcome.

Clubs and firms operate in an external environment that is represented by several parameters determining the internal performance of these organizations. The prices of marketable goods are standard parameters in an market economy. New parameters are determined not only by considerations of economic rationality but also by the specific features of societies, in particular their cultural characteristics. In addition, culture may affect the objective function which is maximized in choosing the governance structures. In these two ways, the culture of a society will influence the governance structures of organizations operating in this society. In his seminal work, Hofstede (1980) identified and introduced some dimensions of culture that characterize a society, viz. its governance structures. These characteristics have been described intuitively. Our approach allows for a precise decription of these cultural dimensions, although this precise description may exclude some intuitions that would otherwise be admitted. In this paper we will not provide the precise definitions for all dimensions, but rather try to explain them in a non-technical way. We will be more specific on one of these dimensions.

Power distance refers to the extent to which the less powerful members of society accept that power is distributed unequally. Large power distance, in particular, was found to be associated with deeper organizational hierarchies in corresponding societies. It leads to larger differences between agents at different levels of a hierarchy in their language and way of thinking, which makes their communication more difficult. In addition, when power distance is high, managers are reluctant to delegate decisions to the front workers, and the latter expect superiors to give them detailed instructions and supervise them closely. These factors

lead to a decrease of feasible span of interaction with increase of power distance; the span of interaction can thus be used to measure power distance in the ¯rm.

We have assumed in Section 3 that under a speci¯c budget-allocation function, presumably chosen by the members of the club, these members choose the organizational structure which minimizes the di®erence between their burden and their budget. This is, of course, not the only possible way of organizing the procurement of collective goods. Members of a society may delegate to the top-position the power to determine the budget distribution system, or the pattern of club organizations in the society, or both (of course, in many societies people do not even get a chance to perform such a delegation, let alone to determine other aspects of the governance system). A restriction is formed by the reservation values. So the governance structure may re°ect the objectives of the top-position rather than of the front-positions. In societies with higher power distance people will have a higher propensity for such type of delegation (and have a higher acceptance of the fact that the agent at the top position, in whatever way he arrived at it, determines the governance system). Thus, the relative role of legislative and executive powers may be considered as an indicator of the power distance. A large power distance will result in a deep governance, as compared to the governance formed without this restrictions.

Uncertainty avoidance refers to the extent to which people feel threatened by uncertainty and ambiguity and try to avoid these situations. People in societies with di®erent uncertainty avoidance will di®er in the extent to which certainty and stability in their life is important for them, and thus in the extent they are prepared to give up other goods in exchange for such a certainty. For workers, in particular, the desire for stability in life will manifest itself in the desire for a higher stability of income, that is, for a better job security. Workers may have reservation levels of job security as elements of their participation constraint. In this case governors will have little choice other `than to agree to these requirements. Alternatively, taking such requirements into account is dictated by strong social norms or government regulations (and such norms and regulations would be caused by corresponing cultural factors); the governors will have little choice in this case as well. Finally, the governors may discover that satisfying such requirements leads to a greater loyalty and motivation of workers, which increases workers' e®orts or allows the introduction of more e±cient technologies which require such an attitude from workers (such as diversi¯ed quality production in Germany and 'lean' production in Japan). Whatever the particular mechanism, in ¯rms where workers are more uncertainty avoiding, the probability of dismissal of workers is likely to be lower; alternatively, the expected long-term wages will be higher. This is expresses by the remuneration function.

Femininity-masculinity deals with a relative emphasis in society on achievement and success on the one hand, and caring for others and quality of life on the other. One of the typical characteristics of these societies is large-scale welfare systems { that is, comprehensive public procurement of (private) goods like education, medical services and social safety nets.

People are more inclined in feminine societies than masculine societies to view a common service as multidimensional and complementary, which implies the necessity of their procurement through a single club. The degree of masculinity/femininity in a club is determined by the multi-dimensionality of procurement, representing a large degree of interaction. This is expressed by the budget-allocation function.

Collectivism-individualism re°ects whether people look only after themselves and their immediate family, or belong to 'in-groups' which 'look after them' in exchange for loyalty. In some (individualist) societies people can entrust other people with organizing the procurement of collective goods on the basis of a contract. In these societies there is no restriction on the formation of clubs; collective goods can be provided via clubs, the members of which do not have anything in common other than an interest in this particular collective good. In other (collectivist) societies, the contract would be not enough: a trust relationship has to be established before such a delegation. Such a relationship can be based on existing meaningful association between people (family ties, common religion, race etc.) or have to be established anew. The degree of trust necessary may di®er for di®erent purposes: sometimes a trust based on common association is su±cient, but often additional investments in establishing trust are necessary. As a result, in collectivist societies people prefer to organize the procurement of collective goods, and of many private goods, within speci¯c groups of people who are associated with each other in some way (besides having a common interest in a collective good), e.g. through family ties, common religion, race, or working at the same enterprise. We call these groups clans. There may be two types of clans: those in which members trust each other for some exogenous reason (family, ethnicity etc.) and which are thus given independently of the will of the members; and those, in which trust relationships are established anew (e.g. 'family-like' enterprises). In either case the size of the clan will be limited. For the ¯rst type of clan this is obvious; if the trust is established anew (the second type of clan), for the most purposes there would be a limit on the size of a collective in which trust can be e®ectively established and maintained. Thus, if a trust relationship has to be established before delegation of decision-making rights in a club, it would place a restriction on the set of clubs that could be formed (and in particular, on the maximum size of a club). The more the propensity of people to require the establishing of such trust (the more collectivist the society is), the stronger is such a restriction. This restriction will be embedded in the user-value function. Thus, the strength of this restriction may serve as a measure of the degree of collectivism.

After this general discussion on cultural dimensions we shall consider the collectivism vs. individualism dimension in more detail to provide an example of formal analysis of di®erences on cultural dimensions and of their e®ects on governance structures. We assume for simplicity that the whole society is divided into clans of a ¯xed size, and it is impossible to form trust relationships between members of di®erent clans. To simplify the presentation we restrict

ourselves to comparing two polar cases of an individualist society (where the restriction is not important) and a collectivist society (where it is absolute). Di®erent dimensions can be measured through di®erent components of a club or ¯rm. As mentioned, the degree of collectivism will be measured through the user-value function. In the previous section we de¯ned the user-value function as a function that assigns to any coalition of members in a society their user-value if they consume a service jointly. An alternative representation of these user-values is to assign to any coalition of members the increase in user-value that was not already obtained by subsets of this coalition. These values are given by the dividends which for $E \subseteq N_0$, recursively, are given by

$$\Delta^w(E) = w(E), \text{ if } |E| = 1$$

and

$$\Delta^w(E) = w(E) - \sum_{F \subseteq E, F \neq E} \Delta^w(F), \text{ if } |E| \geq 2.$$

For a game theoretic discussion of these dividends we refer to Harsanyi (1959). The degree of collectivism is now measured by clan size. If the clan size is given by $n^c \in \mathbb{N}$ then dividends of all coalitions with size larger than clan size must be equal to zero. If, for example, clan size is equal to one, then we have a linear user-value function given by $w(E) = |E|$ for all $E \subseteq N_0$. If we use a budget-allocation function satisfying symmetry and structural monotonicity[18] then in this case with separable user-value the optimal polity size equals $n^* = 0$. Members do not want to pay taxes to invest in a governance structure because governance cannot improve their user-value, while it induces the cost of the coordinator positions. Advancing this argument it follows that polity size is non-decreasing in clan size as is to be expected[19].

Proposition 5.1 If the budget-allocation function satis¯es structural monotonicity and symmetry and clan size is equal to one then the optimal polity size is equal to zero.

The linear user-value function can be seen as an extreme case. The maximal clan size is $n^c = |N_0|$, which yields no restriction on the user-value function. However, if we assume that the dividends of all sizes smaller than this maximal clan size are zero, then we have another extreme user-value function with complementary user-value in which all members are necessary in order to generate a positive user-value. In this case the optimal polity size $n^* = n_{max}$, and thus the maximal number of governance levels will be formed, $S^{n^*} = |N_0|$. This is the only structure that yields a positive user-value.

[18] Remember that by de¯nition we assume a budget-allocation function to distribute exactly the total value added.

[19] With clan size increasing we mean that the dividends of coalitions with size not exceeding clan size stay the same.

Proposition 5.2 If the budget-allocation function satisfies structural monotonicity and symmetry and the user-value function satisfies $w(N_0) > 0$, and $w(E) = 0$ if $E \geq N_0$, then the optimal polity size is equal to the maximal size n_{max}.

For intermediate cases (between linear and complementary user-value) governance levels between 0 and n_{max} can be possible. It is clear that the model can easily take account of reservation values for the various positions.

The implications of collectivism to the firm can be considered in a similar way, as has been done in Example 3.1. In collectivist societies people prefer to have 'family-like' trust relationships within a firm, and are not satisfied simply with business-like relationships of exchange of labour for wages. This may impose a restriction on the size of a firm which can be formed (alternatively, if trust relationships are not an absolute necessity but enhance productivity, this may place a limit on the size of a firm that can be efficient); the impact of such a restriction can serve as a measure of collectivism in a firm.

6 Conclusion

In this paper a neo-institutional governance structure has been presented for the procurement and the provision of a common service. The provision takes place in firms with an implementation governance, forming the industry of that common service. The procurement is organized by clubs with a representation governance, forming the polity of the common service. Clubs empower firms, as the legislative branch of a government empowers the executive branch. An optimal governance for an industry and for a polity can be derived by maximizing its objective functions, resulting in standard characteristics of a governance. Simultaneously cultural dimensions of a society can be defined precisely in terms of these governance characteristics. We have shown that cultural values existing in a society influence governance. This may lead to actual governance systems that deviate in some ways from the standard governance. A government policy of changing the actual, culturally influenced governance in the direction of the standard, optimal governance goes at a substantial cost, what we call social transition costs. A policy of not imposing the standard governance, however, will cause another type of cost, which may be called social transaction costs. The fundamental questions are whether, how fast and how far should a society aim at implementing the standard governance. Or should the government guard the society's cultural identity and is the society prepared to pay for it, given the associated social transaction cost? Although these questions are not answered, tools are presented here which may contribute to formulating the questions more precisely.

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