Hegemons, Leaders and Followers: A Game-Theoretic Approach to the Postwar Dynamics of International Political Economy

by

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Abstract

The article introduces the concept of hegemony to leadership theory, which has developed mainly as a critique of hegemonic stability theory. We argue that it makes sense to combine the two theories by introducing the concept of 'size' into neoliberal thinking about International Political Economy. We accept the neo-institutional hypothesis that a hegemon is not needed to provide public goods, and de monstrate with non-cooperative games how multiple leaders may jointly provide public goods. A game-theoretic model is developed illustrating with Nash equilibria the conditions under which a hegemon rationally switches from hegemony to leadership. It also shows why followers rationally switch from free-riding in their consumption of the public goods to taking part in leading, in the sense of contributing to covering the cost of the production of the public goods. The emergence of joint leadership leads to multiple equilibria in the sense of allowing for multiple stable leadership constellations. The actors are in a mixed-motive or coordination game where they have different preferences for the equilibria, and thus different preferences for which strategies to choose, and for who is to take part in covering the cost of the production of the public goods. Two aspects of joint leadership 'after hegemony' are treated, namely coercive and benevolent leadership on the one hand, and collective action in the sense of joint leadership on the other hand. Finally, future leadership constellations and the quest for international order are discussed.

Zusammenfassung

Der Artikel führt das Konzept der Hegemonie in die Leadership-Theorie ein, die ursprünglich als Kritik an der Theorie hegemonialer Stabilität entstand. Es macht jedoch Sinn, die zwei Theorien auf der Grundlage einer Konzeption der Akteursgröße innerhalb der neoliberalen Internationalen Politischen Ökonomie zu kombinieren. Ausgehend von der These des Neo-Institutionalismus, daß die Existenz eines Hegemons keine notwendige Bedingung für die Produktion öffentlicher Güter ist, wird mit Hilfe der nicht-kooperativen Spieltheorie gezeigt, wie verschiedene 'leaders' gemeinsam öffentliche Güter produzieren können. Darauf aufbauend wird ein spieltheoretisches Modell entwickelt, welches Nash-Gleichgewichte benutzt, um die Bedingungen zu illustrieren, unter denen es für ein Hegemon rational ist, für gemeinsame 'leadership' zu optieren. Gleichzeitig wird verdeutlicht, warum 'followers' rational ihr Trittbrettfahren einstellen und sich an der Bereitstellung der öffentlichen Güter beteiligen. Dies führt zur Ausprägung von multiplen Gleichgewichten. Die Akteure finden sich in einem Koordinationsspiel, in dem sie jeweils unterschiedliche Gleichgewichte und damit auch unterschiedliche individuelle Strategien präferieren. Der Konflikt entsteht an der Frage, welche Akteure sich 'after hegemony' an der Produktion der öffentlichen Güter beteiligen. Dabei sollte zwischen wohlwollend und zwangsgestützten 'Joint-leadership'-Systemen einerseits und impliziten gemeinsamen Aktionen andererseits unterschieden werden. Abschließend werden mögliche, vom Modell nahegelegte, künftige Leadership-Konstellationen und die sich daraus ergebende internationale Ordnung diskutiert.

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1 Introduction[1]

Hegemonic stability theory has over the last two decades emerged as one of the predominant theories within international relations theory and international political economy. Briefly, it holds that a dominant actor uses its power to create international economic regimes, most notably the International Monetary Funds in finance and exchange-rate politics, and the General Agreement of Tariffs and Trade. Drawing on the theory of public goods, the hegemonic stability theory argues that only a dominant actor, a hegemon, has the interest and capacity to maintain the stability of an open international economic system (Kindleberger 1976; Keohane/ Nye 1977: 44). Stated boldly, the advocates of the theory assume that a single hegemonic power creates a stable international economic order by providing international public goods. The theory also asserts that the decline of the hegemon leads to global economic instability and to regionalization of international economic affairs (Kindleberger 1986).

Hegemonic stability theory has also received criticism for its various limitations, such as limitations in the applicability of the public-goods hypothesis. Critics suggest that collective action on the part of small groups in the international system may be possible (Snidal 1985a; Gowa 1989: 307) and argue that the provision of openness and stability in the world political economy implies the supply of excludable rather than public goods (Conybeare 1984). In both respects it is crucial to note that there are different versions of hegemonic stability theory. Keohane (1980) and, in particular, Lake (1993) have distinguished between a deterministic theory of hegemony and a far less deterministic leadership theory. The crucial point separating both theories is the possibility of international cooperation, defined as change in the behavior of actors in response to the actual or anticipated preferences of other actors through a process of policy coordination (Keohane 1984: 51; Milner 1992: 467). The distinguishing feature between hegemonic and leadership theory lies in their explanation of international stability and international institutions. While hegemonic theory relies upon power differences, neoliberal cooperation theory considers international regimes constituted by international cooperation.

This article illustrates the possibility of introducing a concept of power and the notion of hegemony into leadership theory, thus uniting a couple of previously competing perspectives. Most important, in applying game-theoretic models, the article both rationalizes the strategic shift of followers from free-riding to taking part in leading, and shows the exact sense in which interaction between leaders occurs. In the international relations literature, several simultaneous leaders are often referred to as cooperating, while cooperation is defined as the adjustment of policies between several countries. However, not to obfuscate matters unnecessarily, we try to avoid the term since game theory distinguishes between cooperative and non-cooperative games. We make no reference to cooperative game theory. If two or three actors are all adopting a strategy of leading, they do not do so because of binding agreements but because this constitutes a Nash equilibrium in a non-cooperative game. Subsequently, we discuss the nature of conflict in joint-leadership models, stemming from the second-order problem of which actors contribute to the production of the public good. The main objective of this article is to show how various kinds of games between a hegemon and followers or between a group of leaders can be used to describe the changing structure of postwar international political economy, distinguishing between different epochs, 1945-1950, 1951-1970, 1971-1995.

Section 2 provides background material, introduces the theory of hegemonic stability, focusing especially on the concept of public goods in international political economy, and discusses briefly its neoliberal critique. Section 3 presents a game-theoretic model of hegemony and joint leadership. Section 4 analyzes the model, illustrates the changing equilibria in postwar world politics, and discusses the United States' hegemonic decline

and the emergence of joint leadership. Section 5 considers further implications of parametric changes within the model. Section 6 discusses coercive and benevolent hegemony and leadership. Section 7 provides an exhaustive characterization of all possible equilibria given the three strategies hegemon, leader, follower for different costs of producing the public good. Section 8 evaluates the prospects for prediction and the quest for international order.

2 The Theory of Public Goods in International Political Economy

For more than three decades since the publication of Morgenthau's seminal work *Politics among Nations* (Morgenthau 1948/1973), the dominant theory of international relations, realism, was based on the assumption that international politics takes place within the shadow of war (Aron 1962: 6). The anarchical international system and especially the absence of an authoritative government creates a permanent threat to all countries, which have to rely on the means they can generate and the arrangement they can make for themselves (Waltz 1979: 111). Therefore, to ensure their survival and independence in the long run, countries have a predominant interest in avoiding a loss in their relative capabilities even in the short run. In consequence, realism argues, economic well-being is not the prime interest of countries. Only if their survival is assured can countries seek other goals among which welfare holds a prominent role (Carr 1946: 145; Waltz 1979: 126; Grieco 1990: 39).

Arguing from these points of view, realism postulates a mercantilist world economic system as a natural consequence of international politics. While seeking to avoid relative losses, countries turn out to be anxious about the distribution of benefits and they are therefore very pessimistic about the possibility of international cooperation. Nevertheless, cooperation is considered a necessary condition for the existence of a liberal international trading system. A liberal international economic order presupposes the joint and, to some extent, coordinated political action of countries.

The resulting gap between realist expectations and the observable reality of postwar economic politics was not discussed until Charles Kindleberger (1973) analyzed the great depression and concluded that there is a crucial relationship between global economic stability and the existence of a single leader, a country which provides international public goods. Public goods are the kind of goods where exclusion of consumers is impossible and consumption by one actor does not exhaust its availability for other actors. In international economic affairs an open trading system, well-defined property rights, common standards of measures including international money, consistent

macroeconomics policies, proper action in case of economic crisis, and stabilized exchange rates[2] are said to be public goods (Kindleberger 1981).

It is not surprising that the foundations of the 'theory of hegemonic stability' were developed by an economist. Ever since David Hume the economics profession has been fully aware that a liberal international economic order is in the interest of all countries. However, the theory still breaks with classic liberal political economy (Frey 1984: 15-20). Countries may prefer protectionism if other countries do not reciprocate. David Ricardo's theorem of comparative advantage argues that free trade is in the interest of countries even if other actors do not liberalize their trade regimes. The theory of hegemonic stability is not a liberal theory in the sense of neoclassical economics. All the same, it is less mercantilistic and therefore closer to the liberal economic tradition than realism had been before. Furthermore, the notion of free trade being a public good is nowadays much more plausible than Ricardo's theory, which assumed capital to be nationally bounded.

The idea that a liberal international economic order is based on reciprocity is crucial for the analysis of international political economy. If we assume, contrary to Ricardo, that the reciprocal structure is considered a fair approximation of the world economy, then it follows that a common interest in an open and stable world economy does not necessarily lead to the provision of public goods since all actors have an incentive to free-ride (Olson 1965). The public-goods analysis of international political economy gained prominence parallel to the ascent of regime analysis. Regimes, international institutions, and the decision-making procedures which led to them, have been considered to serve the interest of all countries. However, in the absence of external enforcement, countries are reluctant to negotiate international regimes since all actors have an incentive to free-ride. Stated game-theoretically, defection is the dominant strategy of countries.

As Mancur Olson has argued, the probability that public goods (including those constituting a liberal international economic order) will not be provided is high, if the number of actors is large. According to Olson, one way to solve the problem is to introduce selective incentives. If a 'private good' is unavoidably linked to the public good, the latter may result as a by-product. Another explanation of the origins and persistence of collective action emphasizes the role of a dominant power [3]. Early contributions to this theory (Wagner 1966; Breton/ Breton 1969; Frohlich/ Oppenheimer/ Young 1971)

were appreciated by Olson (1971), but considered valid only if the imaginative leaders were to find selective incentives:

A leader or entrepreneur, who is generally trusted (or feared), or who can guess who is bluffing in the bargaining, or who can simply save bargaining time, can sometimes work out an arrangement that is better for all concerned . . . There is no certainty, and often not even a presumption, that an entrepreneur will sometimes be able to work out an arrangement that is agreeable to the parties concerned . . . When the group in need of a collective good is sufficiently large, an entrepreneur cannot possibly provide an optimal supply of the good through bargains or voluntary cost-sharing agreements with those in the group. (Olson 1971: 176-177)

Mancur Olson and Richard Zeckhauser argue in their economic theory of alliances that in the provision of collective goods there is a tendency for the largest member to bear a disproportionately large share of the costs (Olson/ Zeckhauser 1966). Natural leaders gain more from the provision of public goods and they place a higher absolute value upon it. Likewise, it can be argued that hegemons are more interested in international economic stability and openness and will therefore construct international regimes serving this end.

Even though hegemonic theory originated in the work of an economic historian, it is nevertheless hardly surprising that realism has adopted the power-based theory of public goods with only slight differences. Most important, political scientists argue that hegemons create liberal international economic orders not from altruism but from their own self-interest in open markets (Stein 1984: 357). According to Robert Keohane (Keohane 1980; Keohane 1984: 31) two statements are central for the realist theory of international stability: First, order in world politics is created by a single great power, a hegemon, who will stabilize the world economy (Kindleberger 1973: 305; Krasner 1976). Second, cooperation, the mutual adjustment of policies, depends on the perpetuation of hegemony, since the dominant power must enforce the rules and institutions.

Deviating from Mancur Olson's formal theory, realism assumes different constraints and capabilities of actors (Kindleberger 1976: 57). Countries simply differ in power, size, and wealth, and they therefore have different interests. How countries choose between their options depends strongly upon their position within the international system (Krasner 1976). This position is determined by economic factors such as availability of capital, the size of the internal market, and a competitive advantage in the production of manufactured goods. To be considered hegemonic, a country must have access to crucial raw material, control major sources of capital, maintain a large market for imports, and hold an absolute advantage in the production of advanced goods and services (Keohane 1984: 33).

From time to time through history, a hegemon emerges (Kennedy 1987) which has a strong incentive and the capabilities to produce a liberal world economic order. Since the hegemon has efficient production capabilities, the dominant power will be the primary beneficiary of a free international economic system (Wallerstein 1980: 38). More importantly, the hegemon also has the ability to 'punish' defectors (Alt/ Calvert/ Humes 1988: 446). If the dominant power also desires an open world economy, this power accepts its hegemonic role and stabilizes international economic relations and coerces other countries, i.e. followers, to open their economies as well. The hegemon might also tolerate the free-riding of small countries (Kindleberger 1976: 19). Therefore, the theory of hegemonic stability rests on a simple causal relationship, namely that a liberal and stable world economic system requires a *single* great power (Kindleberger 1973: 305). Consequently, if no hegemon exists, the public good of international economic stability will not be provided.

This argumentation was challenged by the neoliberal theory of international cooperation, namely by Duncan Snidal (Snidal 1985a). Following Robert Keohane's *After Hegemony* (Keohane 1984), Duncan Snidal argues convincingly that a small group of cooperating actors, what we refer to as 'joint leaders', can replace a hegemon, thus jointly providing international public goods. Openness, therefore, can arise or be maintained in the absence of a hegemon. Leadership theory, as David Lake (1993) coined this research program, is able to argue, without referring to hegemons, that joint leaders may provide international public goods. Countries are able to adjust their economic policies through a process of policy coordination. The problem that countries face in regard to the production of stability and wealth in the world political economy is dominantly expressed by the prisoners' dilemma (Conybeare 1984), which is considered to resemble the logic of collective action (Brams 1975: 144; Taylor 1976: 17-25; Hardin 1982: 25-30, Morrow 1994b: 281).

For Conybeare, the analytical shift from pure public-goods theory to the prisoners' dilemma is crucial since he denies that free trade, for example, is a public good. First, he stresses that the principle of non-excludability is not given. Countries may hinder economic subjects from one particular country from entering their markets. Tariffs and even more so quotas can be employed against different actors to quite different extents. Secondly, Conybeare points out that there is rivalry in the consumption of the benefits from free trade (Conybeare 1984: 9). It is therefore, as Timothy McKeown puts it, "not very sensible to view the international system as isomorphic with an economic system of perfect competition" (McKeown 1983: 78).

The possibility of monitoring the behavior of other actors and the resulting rivalry and excludability explain not only that the burdens of providing a public good can be shared; they also make clear that the benefits from an international public good may not be equal. This is crucial since it is quite common to assume that larger countries in general gain more from an open world economy than small countries do (although other factors such as the [export+import]/GDP ratio also play a role). Therefore, one should expect that larger countries have a higher incentive to invest in international openness (Krasner 1976: 322). However, by trying to maximize its own payoffs, a hegemon serves the benefits of other countries, and international public goods might be created as a by-product of the hegemon's production of private goods (Russett 1987: 222).

The problem Conybeare refers to depends heavily on the dichotomous notion of goods being either purely public or purely private. Conybeare is correct in stating that a liberal economic order and international economic stability are not pure public goods, but neither are they pure private goods [4] In all cases but monetary affairs the possibility of excluding single actors exists. However, this possibility is costly, for example in regard to the monitoring of norm-deviant behavior and to enforcement measures. Quite different from the production of private goods, the exclusion of other actors requires a political act. Therefore, the definition of a collective good in the narrow sense is not met. On the other hand, without costly discriminatory measures, openness and stability come close to resembling public goods. Moreover, if the enforcement of a cooperative agreement is costly (Oye 1985: 15), the policy measures themselves become a public good (Gowa 1989: 315).

It is currently undisputed that the connection between hegemony and openness in the world economy is more complex than previous contributions to the theory have so far considered. But it is also widely appreciated that an interrelation between power distribution and the maintenance and creation of international institutions does exist. Therefore, the hegemonic and the leadership strands of argument about international economic stability are not necessarily in competition. The present article shows that they are easily and fruitfully linked if one presupposes both, that is both the possibility of a hegemon as well as several joint leaders. In this regard we distinguish between hegemonic and leadership provision of public goods. Joint leadership between two or several large powers is possible, but unilateral, hegemonic provision of international public goods demands less transaction costs and will pay off for all actors under certain circumstances.

More important, the following game-theoretic model develops simple explanations, illustrating how and why a hegemonic system turns into a joint-leadership system. It

indicates the conditions which presuppose unilateral or collective action. In addition, we discuss the consequences of joint-leadership systems in general, pointing out the relevance of disagreement and political struggle among second-dominant powers, namely the EC and Japan, over the participation in covering the cost of producing international public goods. These aspects, which resemble either a battle-of-the-sexes or a coordination situation, are ignored in the dominant prisoners' dilemma model of international politics, which focuses on commitment, enforcement and strategic interaction.

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3 A Game-Theoretic Model of Hegemony and Joint Leadership

Game theory, or more specifically non-cooperative game theory, provides a powerful tool for the analysis of international affairs since strategy is the essence of politics. The strength of game theory involves focusing on strategic interaction between two or more players, where each player has a set of strategies available, and where the payoff to each player depends on the strategies chosen by all the players. Contrary to play against "dead nature," where a player maximizes his payoff in a given, fixed environment, in game theory each player seeks to maximize his payoff given that all the other players also seek to maximize their respective payoffs. Hence in an n-player game, we get n simultaneous maximization problems to solve. The most famous and frequently used solution concept in game theory, which we will also use in this article, is the Nash equilibrium. A Nash equilibrium is a state of affairs where no player has an incentive to deviate unilaterally from his chosen strategy. That is, he can not improve his payoff by deviating unilaterally. Hence we also have an equilibrium e.g. if two players can both improve their payoffs by deviating in a certain manner, while a third player receives a lower payoff. In non-cooperative game theory, binding agreements between the players are thus not allowed. Each player seeks instead to maximize his own payoff disregarding the payoffs others receive. There are frequently more than one equilibrium, and the players typically have different preferences between these, and try to coordinate on one they prefer. Which equilibrium is chosen may depend on historical precedent, framing effects, saliency, anchoring and adjustment procedures, etc. In world politics and international political economy game theory is used to illustrate the structure of decision-making of countries confronted with collective dilemmas. Unfortunately, game theory very seldom takes into account that actors differ. The game-theoretic approach to international politics has been restricted to equal-actor games and treats, as Duncan Snidal puts it, "very large and very small ones as equal partners in a prisoners' dilemma" (Snidal 1985b: 47). As a result, its direct usefulness to the analysis of international relations and more particular to the analysis of the consequences of power distribution is limited. This restriction obviously limits also the game-theoretical analysis of hegemonic decline. Furthermore, it is quite common for international-relations theorists to restrict game-theoretic models to their

simplest form, namely 2x2 matrixes. To illustrate the concepts of hegemony, free-riding, and joint leadership, however, a more complex model is required. We present in this section five assumptions underlying the model and the model itself, which is able to illustrate much more than previous models how a decline in interest in international public goods leads to an increase in joint action. The hegemonic decline of a leading actor, therefore, should lead to more 'cooperation' as this phrase is used in international relations theories. In section 4 we analyze the implications of changing the one variable in the three-actor model, namely the size of each country, and in section 5 we discuss the implications of changing four parameters in the model, namely production costs of public goods, transaction costs, and the sharing rules of the hegemon and of the leaders.

We use size to reflect a country's interest in stable international economic relations. Even though small countries may profit more in relative terms, larger economies import and export more in absolute terms and they also participate more in the production of international liquidity. The interest in international public goods and the gains from the provision of these, therefore, depends to some extent on relative size.

In order to keep the model as simple as possible, we introduce a 3x2x2-model which is based on the following five assumptions:

Assumption 1

Public goods are produced if a minimum of either one hegemon or two leaders exist. [5]

This is a rigid assumption and it may seem to be implausible. But since we introduce this assumption to a three-actor model, it can be reformulated so that contribution to covering the costs by a suitably chosen majority of the actors involved leads to the production of international public goods.

Assumption 2

Only the US has so far been capable of acting as a hegemon. The EC and Japan can at most act as leaders. Therefore, the US has three strategies: to act as hegemon (H), to lead (L), or to follow (F). The EC and Japan can either lead (L) or follow (F).

The literature holds that only the largest countries are willing to act as hegemons (Lake 1984: 150). The model allows for the assumption that either the EC or Japan acts as a hegemon. However, the model also indicates that this will lead to huge losses, which can be referred to as 'imperial overstretch'. To keep the model as simple as possible, we have opted for a 3x2x2-matrix instead of a 3x3x3-matrix, assuming that only the largest actor can be a hegemon. In the general analysis in section 7, the EC and Japan are also allowed to be hegemons.

Assumption 3

There is costly excludability of consumption. However, countries with 'larger economies' are likely to receive a higher payoff from the consumption. We roughly indicate the payoff from the consumption as the size of a country's economy relative to the aggregated size of the OECD economies, that is us/oecd, ec/oecd, and j/oecd.

The empirical relevance of this assumption is open to discussion, though we consider it to be an approximation to reality. For any model a tradeoff has to be struck between simplicity, generality, empirical support, etc. Using the empirical data available today, it is not clear that an alternative to assumption 3 is more appropriate, because a multiplicity of other factors interact in many different directions. In the light of this, there is virtue in simplicity. However, it is important to note that assumption 3 can be varied in any way for which one might find an argument or empirical support without altering the deeper nature of our argument presented in this article. Assumption 3 nevertheless needs a few comments. Competing concepts would argue that it is not size but world market integration that is causing an interest in a stable and open world economy. In this regard, there are both a relative and an absolute measurement of world market integration. The relative one is called openness and is calculated as exports plus imports divided by the countries nominal gross domestic product. This assumption would lead to the hypothesis that highly specialized and small countries like Sweden (which has an export/GDP ratio about five times that of the US), Taiwan, and Korea have a larger interest in stabilizing the liberal world economy than large countries such as the US and Japan. The absolute indices of world market integration are simply exports. Countries which export more goods and services have an higher interest in a liberal trading system. Again, there are good reasons to doubt this. Countries with a highly specialized export industry that has a world market monopoly have no interest in open trading structures since they are able to sell their goods anyway. The oil-exporting countries are a good example for this case. Furthermore, even if we consider exports as the basis of an interest in international public goods, the US, EC, and Japan can be considered the dominant actors. The only difference would be that the three actors are more similar, which leads to political results that we discuss in more detail in sections 7 and 8. There may be a better measurement of the

payoffs a country gains from the world economy than size. However, there is no obviously better, simpler way to measure this.

Assumption 4

Both the political process to reach an agreement on providing a public good and the coordination of policies are costly. If we denote the total costs of producing a public good as $c_s(c+c_T)$, where c is the cost of hegemony if there are one hegemon and two followers, c_T are transaction costs of coordinating policies, and c_s, $0<c_s<1$, is a sharing rule specifying what fraction of the costs each actor incurs. The transaction costs are then $c_T=0$ if the public good is provided by a hegemon and $c_T>0$ when there is joint leadership.

The production cost of an international public good includes the political-economic process of coordinating macroeconomic policies. It is perhaps impossible to measure this cost exactly, and it may make sense to assume that this cost is higher in the early years of an international regime than in later ones. However, international regimes do not work perfectly immediately upon implementation. They have to be maintained, which requires continued input of political and economic resources. The same can be said about transaction costs, which include the costs of reaching an agreement, the costs of monitoring the political action of cooperative actors, and the cost of agreeing to maintain an international regime.

Assumption 5

A follower does not take part in covering the cost of producing the public good.

This is self-evident since a free-rider does not change its policies but rather gains from the policy changes of other actors.

Let us assume for expositional convenience linearly increasing transaction costs,

$$c_T(h+l) = a(h+l-1) \quad \text{for} \quad h+l \geq 1 \qquad (3.1)$$

where h, h=0,1, is the number of hegemons l, l=0,1,...,3-h, is the number of leaders, and a is a parameter [6]. This means that the more actors are involved, the more difficult it is to reach an agreement and the higher are the monitoring costs. Hence it is easier to integrate a limited number of similar countries than to integrate the world economy.

The sharing rule we use for the hegemon's cost is $c_s = c_{sh} = 1$ for $l=0$, $c_{sh} = 2/3$ for $l=1$, and $c_{sh} = 1/2$ for $l=2$. We do not need a function to specify this sharing which is exhaustively described in the previous sentence. However, in order to account more conveniently for the sharing in our model, let us choose a function that goes through these three points. An appropriate function is

$$c_{sh}(H / h = 1, l) = \frac{1}{12} l^2 - \frac{5}{12} l + 1 \quad , \tag{3.2}$$

which allows for the possible joint presence of a hegemon and one or two leaders. We refer to this constellation as coercive hegemony, which we discuss in further detail in section 7. Briefly, coercive hegemony refers to an intermediate political constellation between pure hegemony and joint leadership, and thus introduces the possibility that a hegemon may urge followers to bear some production costs of the international public good.

In the absence of a hegemon ($h=0$) assume $c_s = c_{sl} = 1/2$ for $l=1$ or $l=2$, and $c_s = 1/3$ for $l=3$. With a hegemon ($h=1$) assume $c_s = 1/3$ for $l=1$ and $c_{sl} = 1/4$ for $l=2$. Although a function for c_s is not necessary either, let us, consistently with equation (3.2), choose one that goes through the desired points, viz.

$$c_{sl}(L / h, l) = -\frac{1}{12} l^2 (1 - h) + \frac{1}{4} l \left(1 - \frac{4}{3} h\right) + \frac{1}{3} \quad . \tag{3.3}$$

Summing up, if there is a benevolent hegemon, it bears all the costs. If the hegemon urges followers to participate, the hegemon bears twice the costs of each leader. If there is a joint-leadership constellation, the costs are shared equally.

The payoff for being a hegemon is

$$P(H / h = 1, l) = 10 \frac{country}{oecd} - c_{sh}(H / 1, l)\left(c + c_T (1 + l)\right) \quad , \tag{3.4}$$

where we multiply by 10 to get conveniently sized payoffs.

The payoff for being a leader is

$$P(L/h,l)=\begin{cases}10\dfrac{country}{oecd}-c_{sl}(L/h,l)\big(c+c_T(h+l)\big) & if \quad h=1 \quad or \quad l\geq 2\\ -c_{sl}(L/h,l)\big(c+c_T(h+l)\big) & else \quad .\end{cases} \tag{3.5}$$

The payoff for following is

$$P(F/h,l)=\begin{cases}10\dfrac{country}{oecd} & if \quad h=1 \quad or \quad l\geq 2\\ 0 \quad else \quad .\end{cases} \tag{3.6}$$

Obviously, it is more expensive to act as hegemon than to act as a leader. And it is more expensive to lead than to follow. But since the provision of an international public good is a positive-sum game for all countries involved, it may pay for countries to be a hegemon or to participate in joint leadership. The requirements of these constellations are discussed in the following sections.

4 Analysis of the Model

We have already discussed the fact that no unequivocal indicator for the size of an economy exists. To keep the model as simple as possible [7] and adhering to what is common in the literature (Krasner 1976; Kindleberger 1981: 249), we estimate the interest of countries in an open and stable world economy according to their size. We lay down the size of an economy as real gross domestic product in accordance with the Penn World Tables, which permit cross-country comparisons [8]. Our model is such that other values for the sizes of the various economies, and also other factors not pertaining to size, can be used without altering the nature of our argument. Moreover, we do not intend to argue about the ability of actors, especially the US, to operate as a hegemon (Strange 1987; Russett 1987).

In this section we will analyze the model choosing parameters for which we believe there is empirical support. It is inconvenient to include parameters in the game matrices, and specifying within what ranges of the parameters we get different equilibria, because such an analysis will be close to unreadable. The chosen parameters and weights of the various terms in equations (3.4)-(3.6) is of importance. These matter not in their absolute values, but in their relative values, and are adjusted to empirical observations. Since our goal is to illustrate that a change in the relative actor sizes may lead to different equilibria, it is

convenient to keep the other parameters constant in the analysis The exact level of these parameters is secondary. However, changing these parameters affects the analysis. Hence in section 5 we discuss implications of parametric changes within the model, and in section 7 we carry out an exhaustive characterization of the equilibrium strategies. We believe there is empirical support for choosing a=12/5 in equation (3.1), which gives $c_3(h+l=1)=0$, $c_3(h+l=2)=12/5=2.4$, and $c_3(h+l=3)=24/5=4.8$. We also choose c=21/5=4.2, which is varied further in section 7. For 1960 we estimate the size of the economies as a percentage of the OECD economy as (us,ec,j)=(30,35,5), where oecd=100. With these parameter values, equations (3.1)-(3.6) can be illustrated by the game in Table 4.1.

		EC						EC					
		F			L			F			L		
	F	0	0	0	0	-2.1	0	F	0	0	-2.1	5.0	0.2	-2.8
US	L	-2.1	0	0	**1.7**	**0.2**	**0.5**	L	1.7	3.5	-2.8	2.0	0.5	-2.5
	H	**0.8**	**3.5**	**0.5**	0.6	1.3	0.5	H	0.6	3.5	-1.7	0.5	1.3	-1.8
		Japan follows						Japan leads					

Table 4.1 The game in 1960 with c=4.2

Table 4.1 has two Nash equilibria in pure strategies, viz [H,F,F]=[0.8, 3.5, 0.5] and [L,L,F]=[1.7, 0.2, 0.5]. A situation in which two leaders provide the public good, even if the hegemon is able to produce the public good unilaterally, can be defined as coercive hegemony. Our model implies that after a point in time, which we estimate to be about 1950, the US would have preferred the latter of these options. However, historically determined by even larger differences in the sizes of actors in the advent of the second World War, the former has been chosen, in preference to the EC [9] and Japan. Since [H,F,F] constitutes a Nash equilibrium, it is costly for the US to choose the leadership option unless it coerces the EC to switch from following to leading simultaneously. Therefore, a declining relative advantage may lead to a political struggle between the hegemon and the second ranking powers even before the hegemonic period comes to a definite end. Since coercion is costly even for a dominant power and more so for a declining power, the hegemon may opt to ignore the possibility of coercive burden-sharing.

Furthermore, the model also illustrates that the hegemonic strategy [H,F,F] is not just the historical equilibrium but also has a higher 'collective payoff' for all involved. This is a plausible assumption at least for the period from 1945 to 1965. What is important for the production of order in the international system, since there are just two equilibria and both lead to the production of a public good, is that the public good continues to be provided even though political struggle may occur between the US and the EC over the participation of the latter. Game-theoretically, Table 4.1 illustrates a mixed-motive game where the US prefers the equilibrium [L,L,F]=[1.7, 0.2, 0.5], the EC prefers the equilibrium [H,F,F]=[0.8, 3.5, 0.5], and Japan is indifferent toward the equilibria.

For 1975 we estimate the size of the economies as a percentage of the OECD economy according to the Penn World Tables as (us,ec,j)=(40,35,15), where oecd=100. With c=4.2, equations (3.1)-(3.6) give the game in Table 4.2.

Table 4.2 has only one Nash equilibrium in pure strategies providing the public good, viz [L,L,F]=(0.7, 0.2, 1.5) which means that the EC has an interest in emerging as a leader and accepting part of the cost of producing the public goods, while the US changes from being a hegemon to being a leader. Japan still has a dominant strategy in following. Note that [H,F,F]=(-0.2, 3.5, 1.5) is no longer an equilibrium as hegemonic leadership becomes too costly for the US. Table 4.2 also has a Nash equilibrium where all actors choose the strategy of following, thus indicating that the probability of the public good being produced diminishes. This situation corresponds to a coordination game between the US and the EC. If the US and the EC agree upon the mutual destructibility of the situation should both opt for following, then negotiations and eventually joint action may be expected to follow. The emergence of an [F,F,F] equilibrium indicates that joint-leadership systems are much more vulnerable against instability than hegemonic systems. In cases of emergency or crisis it is not at all clear whether joint action will be achieved. Moreover, a time gap between hegemonic and collective leadership systems should be expected since there is a conflict between the former hegemon and the former follower over the conditions and the distribution of costs between major actors in a joint-leadership system. It is at this point crucial that countries learn that structural conditions have changed and that thorough analysis is required.

		EC							EC					
		F			L				F			L		
	F	**0**	**0**	**0**	0	-2.1	0	F	0	0	-2.1	4.0	0.2	-1.8
US	L	-2.1	0	0	**0.7**	**0.2**	**1.5**	L	0.7	3.5	-1.8	1.0	0.5	-1.5
	H	-0.2	3.5	1.5	-0.4	1.3	1.5	H	-0.4	3.5	-0.7	-0.5	1.3	-0.8
		Japan follows							Japan leads					

Table 4.2 The game in 1975 with c=4.2

The model discussed so far has a number of satisfactory implications, which in general illustrate the postwar development of international political economy. Fig. 4.1 shows the chronological development from 1945 to 1995 of the payoff to the US of choosing H (hegemony) when both the EC and Japan choose to follow; the payoff to the US of choosing L (joint leadership) given that either the EC or Japan choose L; and the payoff to the US of choosing F when the public good is not provided, that is, if either EC or Japan or both choose F.

Observe in Fig. 4.1 that the curve for the US payoff for hegemony goes through the points (1960, 0.8) and (1975, -0.2), and that the curve for the US payoff for joint leadership goes through the points (1960, 1.7) and (1975, 0.7). This is consistent with the payoffs in the matrixes in Tables 4.1 and 4.2. The US hegemony payoff turns negative circa 1968, which conforms with the broadly accepted views of the situation. The US joint-leadership payoff is higher than the US hegemony payoff after circa 1950, which can be given a game-theoretic justification. Some supporters of hegemonic stability theory (Kindleberger 1976) hold that US hegemony was also beneficial for all, both the hegemon and its followers, during the period 1950-1968. Joint leadership was not observed during the period 1950-1968, and it is therefore difficult to estimate the accompanying payoffs. On game-theoretic grounds, however, it seems more plausible to argue that US hegemony during the period 1950-1968 was chosen because it gave a positive US payoff, and that the alternative was a follower strategy yielding zero payoff. That is, no non-US actor was willing to opt for joint leadership during this period, and the joint leadership payoff for the US was thus not attainable. The reason can be seen from the Tables 4.1 and 4.2. For the EC, the payoff for joint US/EC leadership was 0.2 both in these years, whereas the EC follower payoff was 3.5 in 1960 as well as in 1975.

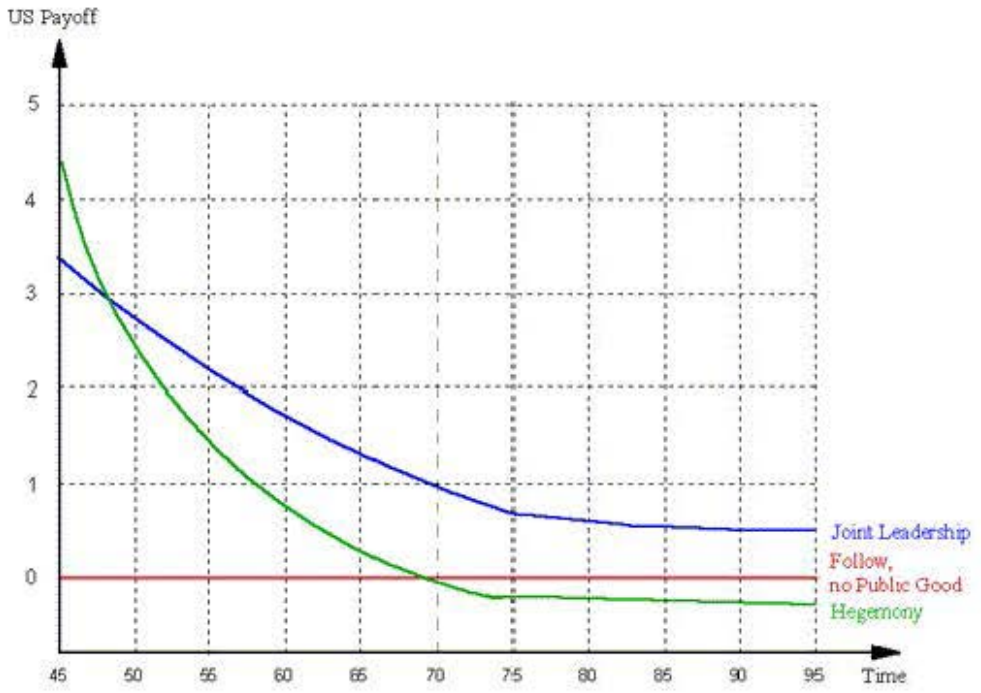


Fig. 4.1 Chronological development from 1945-1995 of US payoffs

This considerable difference constituted a powerful disincentive for the EC to opt for anything other than a follower strategy, leaving the burden to the US, which was not capable of coercing the EC into joint leadership. The situation was even more pronounced for Japan. The joint US/Japan leadership payoff for Japan was -2.8 in 1960 and -1.8 in 1975, whereas the Japan follower payoff was a considerably higher: 0.5 in 1960 and 1.5 in 1975. Hence it seems plausible to argue that the US accepted hegemony during the period 1950-1968 not because hegemony gave a larger payoff than joint leadership (which it did not), but because it gave a larger payoff than 0 for the follower strategy, and because no one could be enticed or coerced into joint leadership. Before 1950, however, the US hegemony payoff was plausibly larger than a hypothetical joint-leadership payoff. Europe lay in ruins after the war. The US provided not only economic aid in the form of the Marshal Plan and facilitated European integration, but was also the dominant actor in the establishment of global economic institutions. This helps explain how US hegemony first got started. Once established, the HFF equilibrium became historically entrenched and remained for decades a salient focal point (Schelling 1960).

The following sample of 3x2 models shows the development of international postwar politics. In order to explain the central findings as simply and familiarly as possible, the Tables 4.3-4.6 operate with two rather than three actors. The actor labeled 'rest of the world' does not refer to all other actors in the world aside from the US, but rather to any actor endowed with sufficient unity and power to choose between the two strategies of following and leading. The games are illustrated from the US's viewpoint relative to the rest of the world, showing the strategic dilemma of a hegemon in decline and the strategic dilemma of followers given hegemonic decline. Confining attention to the ordinally ranked preferences of these two actors, Table 4.3 shows the situation during the period 1945-1950.

		Rest of World: Follower	Rest of World: Leader
US: Follower		1,1	1,0
US: Leader		0,1	**3,2**
US: Hegemon		**4,4**	2,3

Table 4.3 A simple model of the world political economy, 1945-1950

		Rest of World: Follower	Rest of World: Leader
US: Follower		1,1	1,0
US: Leader		0,1	**4,2**
US: Hegemon		**3,4**	2,3

Table 4.4 A simple model of the world political economy, 1950-1970

Between 1945 and 1950 there was no political struggle between the US and other actors over the distribution of costs in the provision of international public goods. Table 4.4 illustrates two equilibria, [H,F] giving (4,4) and [L,L] giving (3,2), and the actors easily coordinate on the former. The situation can be interpreted as one in which the transaction costs of coordinating joint leadership exceed the additional costs a hegemon incurs if it provides the public good on its own.

Around 1950, due to the recovery of the European countries from the Second World War, the equilibrium strategies from Table 4.3 remain, while the equilibrium payoffs change to (3,4) and (4,2), as shown in Table 4.4. That is, the game changes from a coordination game in Table 4.3 to a battle-of-the-sexes game in Table 4.4, the latter introducing distributional conflict over who is to provide the public good. Table 4.4 shows that the hegemonic role of the US had been an historical equilibrium, not maximizing its utility.

Since 1970 the payoff to the US for choosing the hegemonic strategy has fallen short of the payoff for choosing the follower-strategy. Increasing costs and decreasing capabilities have led to a situation in which the hegemon has opted to contribute only partly (in the sense of leading short of hegemony) or not to contribute at all (in the sense of following, i.e. defecting) to covering the cost of the production of the public good. This situation is shown in Table 4.5.

		Rest of World: Follower	Rest of World: Leader
US	Follower	**1,1**	1,0
	Leader	0,1	**4,3**
	Hegemon	0,5	3,4

Table 4.5 A simple model of the world political economy, 1971-1995

In Table 4.5, [H,F] has disappeared as an equilibrium strategy and has been replaced by the equilibrium strategy [F,F]. The equilibrium strategy [L,L] from the Tables 4.3 and 4.4, however, remains. Hence the battle-of-the-sexes situation in Table 4.4 has been replaced by a new coordination game, where the actors have to coordinate on the strategy combinations [F,F] and [L,L]. Although the latter might seem most appropriate, it took about five years to realize it, probably mainly because of historically entrenched inertia and rigid perceptions of the situation in international relations. First, the EC was reluctant to opt for joint leadership since it hoped that the US would proceed in its hegemonic role of providing the public good of openness and stability in economic affairs. Secondly, realizing that even a minimum degree of leadership in the form of cooperative behavior is vulnerable to exploitation, the US opted for the very opposite of hegemonic leadership, viz a follower strategy, yielding the payoff [1,1]. The [F,F] strategy during the period 1970-1975 led, among other things, to the collapse of the Bretton Woods system of fixed exchange rates. Since 1975 the actors have gradually realized the alternative equilibrium strategies [L,L], with the accompanying payoffs (4,3), and have started to explore the various manners in which this equilibrium can be realized.

US	hegemon		follower	leader
EC, JAP	followers			leaders
results	(4,4)	(3,4)	(1,1)	(4,3)
'45	'50		'70	'75 '95

Table 4.6 Equilibria from Hegemony to Joint leadership: A Model of Postwar Developments

The equilibrium development over the last half century, as discussed in the Tables 4.3-4.5, can be characterized as in Table 4.6. The structural change from a coordination game between [H,F] and [L,L] to a battle-of-the-sexes game between [H,F] and [L,L] and then to a coordination game with a different set of equilibrium strategies, [F,F] and [L,L], explains why post-hegemonic international governance has become more complicated. The first transition involved no change in equilibrium strategies, and the same focal point equilibrium (Schelling 1960) could be maintained. The latter transition, however, shattered the focal point equilibrium [H,F], and introduced a new one [F,F], leading to uncertainty about whether this latter equilibrium or an unexplored joint-leadership equilibrium [L,L] is to be chosen.

5 Implications of Parametric Changes Within the Model

Our model allows for changes of one variable, country-size, and the four parameters: production costs of public goods, c, the transaction costs, c_T, and the sharing rules of the hegemon, $c_H(H/h,l)$, and of the leaders, $c_L(H/h,l)$. Additionally, assumption 1 in section 3 about the minimum requirement for producing a public good can be changed. Our main concern in the preceding section has been to differentiate between the size of the actors. In this section we discuss changes in the c/c_T ratio and changes in the $(c+c_T)/(us+ec+j)$ ratio. It is also possible to vary the shape of the transaction-costs function (3.1), although this does not change the nature of our argument and will thus not be discussed further. Moreover, it is possible to vary the distribution of costs between the actors and to change the minimum requirements for the provision of a public good. We can replace the assumption 1 in section 3 that either one hegemon or at least two joint leaders are sufficient to produce an international public good with the assumption that the provision of the public good requires a minimum of input. The latter two modifications are discussed in section 7. All changes have theoretical as well as empirical implications, with richer implications if parameters vary concurrently.

Most important for our study, the general structure of the game, which strongly advocates bilateral leadership, does not change unless the size of the Japanese economy rises well above .25 and/or the size of the dominant actor decreases to about .30. This implies that joint leadership of more than two countries only pays if the actors are similar or even equal in size. Tripartite leadership is unlikely to occur even when the public good yields a high payoff and the costs, including transaction costs, of its production are low.

Transaction costs originate from policy changes and international negotiations. They emerge when actors have to identify the possible effects of their action, when they are trying to identify their best option, and when actors are bargaining about an agreement (Scharpf/ Mohr 1994: 46). These aspects can but need not be quite costly. Generally, one should expect that rising transaction costs increase the probability that a public good will not be provided. In our model decreasing transaction costs lead to a greater number of possible equilibria in which the public good is provided. Most important to note, even in the period after 1970, as shown in Table 5.1, the [F,F,F] option is no longer an equilibrium if transaction costs are low. Instead, the US has an incentive to provide the public good unilaterally if it is unable to coerce the EC or Japan to lead jointly. Therefore, the model implicates a sharp increase in the probability that the public good will be produced in the event of the transaction costs C_T being low. The lower the cost c of producing the public good, the more probable is unilateral or joint leadership. As we discuss in more detail over the next sections, a multiplicity of possible equilibria leads to a second-order problem of which equilibria to choose. There will be disagreement between the actors, stemming from the different distribution of net gains from the different equilibria. While the US is indifferent in regard to which actor it will share the leadership role with, either the EC and Japan have a strong incentive to follow if the other actor (EC or Japan) leads. Between the EC and Japan there is a first-mover advantage in committing to follow, which involves letting the other bear the cost of leadership. Conflict occurs not only between the EC and Japan, but also between Japan and the US as well as between the EC and the US if the US tries to coerce one of the former to join in leadership. Considered from the EC's viewpoint, the preference structure is $P_{US/Jap} = 3.5 > P_{US/EC} = 0.2 > P_{US\ sole\ leader} = 0$. However, since Japan has a dominant strategy of following for all public goods whose production and transaction costs $c+c_T$ exceed 3.0, the EC has a weak incentive to lead. It is important to note, however, that the absence of transaction costs and low costs of the public good lead to a situation in which more than two Nash-equilibria are possible. With c=2.4 and no transaction costs, that is $c_T=0$, our 3x2x2-model gives the payoff matrix in Table 5.1.

		EC							EC					
		F			L				F			L		
	F	**0**	**0**	**0**	0	-2.1	0	F	0	0	-1.2	**4.0**	**2.3**	**0.3**
US	L	-1.2	0	0	**2.8**	**2.3**	**1.5**	L	**2.8**	**3.5**	**0.3**	3.2	2.7	0.7
	H	1.6	3.5	1.5	-2.4	2.7	1.5	H	2.8	3.5	0.7	2.8	2.9	0.9
		Japan follows							Japan leads					

Table 5.1 The game in 1975 with c=2.4 and c_T=0

Table 5.1 has four equilibria, namely [H,F,F], [L,L,F], [L,F,L] and [F,L,L]. The joint triple-leadership option [L,L,L] gives, not surprisingly, the same total (collective) payoff of 6.6 as the [H,F,F] equilibrium. This implies that each actor has an incentive of switching to following, i.e. free-riding, since the production of the public good requires only two actors. If joint leadership in this regard is considered to be fair, the actors are in a collective dilemma, which resembles a prisoners' dilemma. Conflict occurs since the costs of providing the public good must be distributed while each actor has a first-mover advantage of switching to free-riding. The assumptions of this payoff matrix, therefore, are the closest approximation of our simple 3x2x2-model to Olson's (1965/1971) theory.

The most controversial assumption of our model, assumption 1 of section 3, holds that the production of an international public good requires either one hegemon or two leaders. This assumption was helpful in modeling the changes in the strategies of the hegemon and the followers during hegemonic decline. However, this assumption is far less convincing when the nature of joint leadership is discussed.

There are at least two ways of changing the model in a manner that allows for a discussion of minimum requirements in the provision of public goods. First, the requirement that the existence of and the coordination between two leaders is sufficient for the production of a public good can be relaxed or given up. The requirement that three actors are necessary for the provision of a public good implies that the public good most probably will not be provided if the transaction costs and the production costs of the public good are high. Only if actors are more similar in size than we have assumed, or actors' sizes become more similar in the future, is tripartite leadership likely to occur.

The second way of allowing for a closer approximation to reality involves the introduction of a distributive function of production costs. So far we have assumed an

equal distribution of costs between all actors in a joint-leadership group. As Yoichi Funabashi has shown, it is - at least in some issue-areas - possible to distribute costs between actors unequally. In his analysis of exchange-rate management within the Group of 5 and the Group of 7, he pointed out that the distribution of intervention shares was a major source of political conflict. While in the first draft proposal of joint action the distribution was 25% for the US, 25% for Japan and 50% for the EC, the compromise plan proposed a share of 30% each for the US and Japan and 40% for the EC (Funabashi 1988: 20). Incorporating these assumptions into our model while using the comparative sizes of 1985 from the Penn World Tables, we arrive at what resembles a prisoners' dilemma with [F,F,F] as the unique Nash equilibrium. However, with joint action, all actors can receive a higher payoff both collectively and individually. The distribution of costs within the European Community has involved smaller shares for Great Britain, France and the smaller countries than it has for Germany. It seems that Germany has found this distribution unfair and has thus not covered the cost in full. Hence it is hardly surprising that Germany has later been accused of free-riding by the US. The smooth cooperation of Japan, however, is not predicted by the model. The model predicts that Japan should be much more reluctant to lead than has actually happened. It is feasible, however, that the US coerced Japan to lead, since the economic imbalances between both countries made Japan vulnerable to political pressure.

Concluding this section, we now summarize the implications of our model. The following hypotheses emerge from the preceding analysis:

1. Increasing the cost c of producing the public good reduces the possibility for one single actor to act as a hegemon because this becomes too costly. Increasing the cost of producing the public good, in response to a world economic crisis for example, requires joint leadership even if the capabilities of the hegemon are sufficient to stabilize international regimes in normal situations.

2. Decreasing the transaction costs c_T of producing the public good increases the likelihood of the emergence of joint leadership. In our model it increases the number of Nash equilibria in which multiple leaders jointly provide the public good.

3. The possibility of distributing production costs of a public good among multiple actors increases the likelihood of joint leadership even though the situation still resembles a coordination game and distributive conflict might prevent actors from reaching a joint-leadership equilibrium.

4. The number of actors participating in joint leadership depends predominantly on the minimum requirement for their production. In addition, it is influenced by the shape of the transaction-cost function, c_T in equation (3.1). If additional actors do not significantly

increase the transaction costs of decision-making, the probability of tripartite leadership increases.

Joint-leadership systems require an agreement between the members of a small or a 'k-group' on every political action which needs policy coordination. Contrary to what is the case for a hegemonic system, different interests have to be taken into account. This not only increases transaction costs, but also makes agreement problematic even if actors agree that a coordinated solution is in the interest of all actors. Considerations of this kind have led Robert Keohane to distinguish between harmony and cooperation (Keohane 1984: 51). While harmony refers to a situation in which the pursuit of self-interest by one actor contributes to the interest of all, cooperation requires that conflicting viewpoints and actions are brought into conformity:

Cooperation therefore does not imply an absence of conflict. On the contrary, it is typically mixed with conflict and reflects partially successful efforts to overcome conflict, real or potential. Cooperation takes place only in situations in which actors perceive that their policies are actually or potentially in conflict, not where there is harmony. (Keohane 1984: 53-54)

In other words, Keohane argues that cooperation is needed to overcome conflict stemming from uncoordinated policies that lead to suboptimal outcomes for all actors. The situation Keohane has in mind and analyzes resembles a typical prisoners' dilemma. Joint action can help the actors to achieve a better outcome if an institution is implemented. This allows for an easy observation of the noncooperative behavior of actors and helps to enforce rules.

In a prisoners' dilemma an agreement on mutual cooperation should be easy to negotiate, but the enforcement of the norms is difficult. This is the reason why a strong institutional setting, a dominant group of countries which seek to enforce the agreement, may help to create and stabilize international regimes (Martin 1993: 99). However, from this perspective it is quite unclear why a hegemon should unilaterally create and maintain international public goods. With the assistance of other main actors it would be easier to ensure rule compliance. A similar assumption holds for joint leadership exercised by a limited number of countries. We discuss this topic, based on the notion of transaction costs, in the following section. Returning to the assumption of equation (3.2) that coercive hegemony is possible, we analyze the structural requirements, which lead to such a constellation in one issue-area.

6 Coercive and Benevolent Hegemony and Leadership

The assumption that multiple actors join in the production of public goods partly contradicts the empirical findings of hegemonic eras as well as contemporary world politics. The central decision-making body for international economic leadership is the world economic summit. This institution embodies the United States, Canada, Japan, Germany, France, Great Britain and Italy. Our model accounts for disagreement, since it assumes increasing transaction costs when the number of actors participating in the decision-making process increases. Furthermore, our model also encapsulates a second and more political notion of disagreement: in all cases in which more than one equilibrium leads to the provision of international public goods, we should expect political conflict over the proper way to produce it.

The analysis of our model has led to the conclusion that the emergence of joint leadership yields multiple equilibria, implying that contemporary world politics does not resemble a prisoners' dilemma but rather a coordination game emerging from an earlier battle-of-the-sexes game. In this case as well as in classical hegemonic constellations, actors can use power resources to cause other countries to participate in the production of international public goods.

During the declining phase of US hegemony, the main source of conflict has been whether other countries, most notably European countries or Japan, should share the leadership role with the US. It had been possible for the US to force European countries and Japan to share the burdens of international leadership. In current world politics, the main source of disagreement is rather which two leaders should contribute to the provision of international public goods, or whether trilateral leadership is appropriate. The leaders can be selected 'randomly' or based on their interest in special issue-areas. Actors can also use power to change 'natural' leadership constellations. They can urge followers to participate in the production of an international public good.

Pertaining to these issues, there is currently much ongoing debate regarding whether the leader acts benevolently or coercively. Beth and Robert Yarbrough (1992: 50), for example, state that the main source of disagreement within hegemonic stability theory stems from the extent of benevolence or exploitation (coercion) by the hegemon. The model in section 3 allows us to make a more succinct specification of whether the hegemon will act benevolently or coercively [10]. If we assume that coercion is more costly than benevolence, the cost of coercion can then be considered as part of the hegemon's transaction costs $c_{Thco}=c_T$ given in equation (3.1). We thus rewrite (3.1) so that

$$c_{Theo}(h+l) = \frac{12k}{5}(h+l-1) \quad for \quad h+l \geq 1 \quad , \tag{6.1}$$

where the parameter k increases as the cost of coercion increases. We assume that the nature of hegemonic coercion of other actors, whether it is through providing positive incentives or negative sanctions, is such that the other actors get a higher payoff from compliance than from non-compliance. The hegemon will act benevolently if

$$P(H_B / h=1, l=0) > P(H_C / h=1, l) \tag{6.2}$$

Inserting (3.4) into (6.2) gives

$$c_{sh}(H/1,l)\left(c + c_{Theo}(1+l)\right) > c \tag{6.3}$$

Inserting (6.1) into (6.3) for h=1 and resolving with regard to k gives that the hegemon will act benevolently if

$$k > \frac{5c}{12l}\left(\frac{1}{c_{sh}(H/1,l)} - 1\right) \tag{6.4}$$

If (6.4) is not satisfied, the hegemon will coerce two other actors rather than one to lead if, analogously to (6.2) and (6.3),

$$-c_{sh}(H/1,2)\left(c + c_{Theo}(3)\right) > -c_{sh}(H/1,1)\left(c + c_{Theo}(2)\right) \tag{6.5}$$

Inserting (6.1) into (6.5) for h=1 and resolving with regard to k gives that the hegemon will coerce two other actors rather than one to lead if

$$k < \frac{5c}{12}\left(\frac{c_{sh}(H/1,1) - c_{sh}(H/1,2)}{2c_{sh}(H/1,2) - c_{sh}(H/1,1)}\right) \tag{6.6}$$

Let us assume c=4.2=21/5. Inserting the sharing rule (3.2) into (6.4) and (6.6) then implies that the hegemon will act benevolently if k>7/8 and will coerce the two other actors to lead if k<7/8. With a sharing rule $c_{sh}(H/1,1)=2/3$ (as before) and $c_{sh}(H/1,2)=3/5$, the hegemon will act benevolently if k>7/8, will coerce one other actor to lead if 7/32<k<7/8, and will coerce the two other actors to lead if k<7/32. With a sharing rule $c_{sh}(H/1,1)=3/5$ and $c_{sh}(H/1,2)=1/2$ (as before), the hegemon will act benevolently if

k>7/6, will coerce one other actor to lead if 7/16<k<7/6, and will coerce the two other actors to lead if k<7/16. A hegemon therefore acts unilaterally if it considers the costs of coercion higher than the possible contribution of followers. The probability of coercion increases the more costly an international public good is and the lower the transaction costs are.

The question of benevolence versus coercion is also relevant in a situation of joint leadership where hegemony is absent. Benevolent leadership occurs if a couple or a group of actors can produce the public good without other possible leaders since the institutional costs of rule enforcement exceed the enforceable contribution of followers. Coercive leadership occurs if the cost of punishing defectors is outweighed by the contribution defectors make when they switch to cooperation. A case of coercive leadership is the multilateral exchange-rate management within the institutional setting of the world economic summit between the Plaza and the Louvre agreement (Funabashi 1988). [11]

7 An Exhaustive Characterization of the Equilibrium Strategies

This section provides an exhaustive characterization of all the possible equilibria for the model in section 3: for four different costs c of producing the public good, that is c=4.2, c=4.8, c=6 and c=3.6, given transaction costs c_T according to equation (3.1), that is given $c_T(2)=2.4$ and $c_T(3)=4.8$. The change we make in the assumption is to allow all three actors, the US, the EC and Japan, to choose between the three strategies of being a hegemon, a leader or a follower. Both changes bring symmetry into the analysis and provide for a more timeless evaluation which is valid for any three actors, any of which may emerge as a future hegemon. We also assume for simplicity that us+ec+j=90=constant. A cost c=4.2 of producing the public good gives the equilibrium characterization in Fig. 7.1.

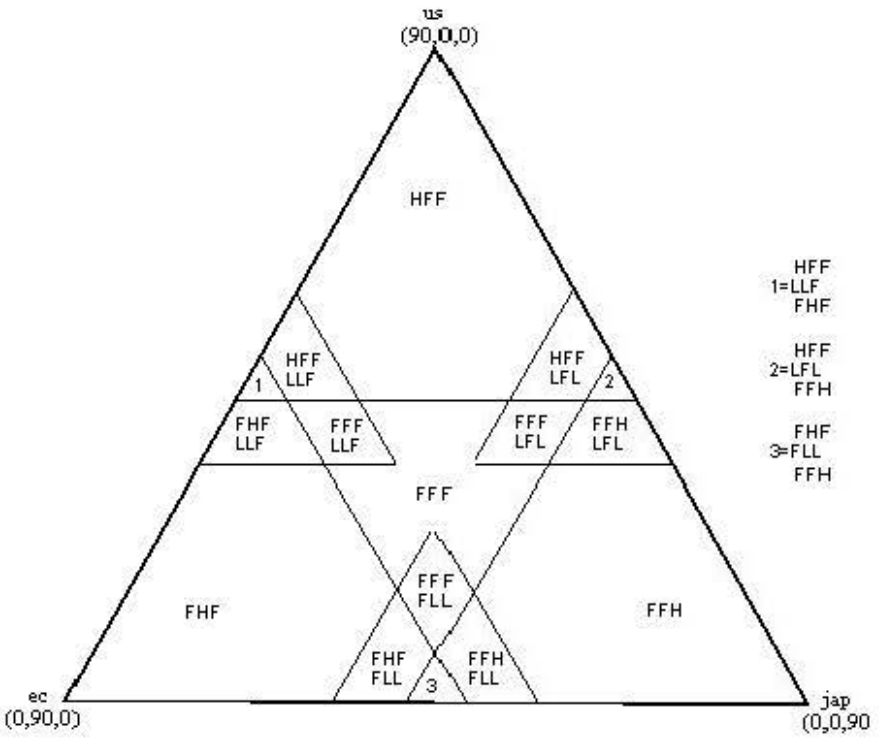


Fig. 7.1 Equilibrium characterization for c=4.2

Fig. 7.1 shows that one predominant actor, say the US, leads to the unique hegemonic equilibrium HFF (simplified writing of [H,F,F]). (The analysis is symmetric and yields the unique hegemonic equilibrium FHF or FFH if the EC or Japan, respectively, is predominant.) As the predominance of the one actor decreases to (us,ec,j), where us<42=10c, HFF is no longer an equilibrium. If the size j of Japan is close to zero and the size of the US is sufficiently larger than the EC beyond the minimum of us=10c=42, then LLF emerges as a second equilibrium, as illustrated by the trapezium in the upper left part. The reason is that the relative sizes of the EC and the US converge, resulting in the joint equilibria HFF and LLF. There are analogously two joint equilibria HFF and LFL when the size ec of the EC is close to zero, for us>42, as illustrated by the upper right trapezium. If the size j of Japan is close to zero and the size of the US is sufficiently larger than the EC beyond the minimum of us=42 and below the maximum of us=48, then FHF also emerges as a possible equilibrium, as illustrated by the HFF/LLF/FHF triangle in the center left part. If the EC and Japan have comparable sizes and 24<us<42, there is a unique defection equilibrium FFF, as illustrated by the not entirely circumscribed triangle pointing down between us=42 and the point (24,33,33). The reason is that the three actors then have comparable sizes, no single actor being sufficiently large to act as a hegemon, and no two actors jointly being sufficiently large to

engage in joint leadership. However, for $10(c+c_7(2))/2=33<us<42$, and the sizes of the EC and Japan being sufficiently unequal, say ec>j, there are two equilibria FFF and LLF, as illustrated by the parallelogram slightly to the left from the center (30,30,30). The reason is that the US and the EC are then both sufficiently large to provide joint leadership. If the sizes of the EC and Japan become more unequal, j approaching 0, given $33<us<42$, FFF disappears as an equilibrium and is substituted with FHF, as illustrated by the FHF/LLF trapezium on the left in Fig. 7.1.

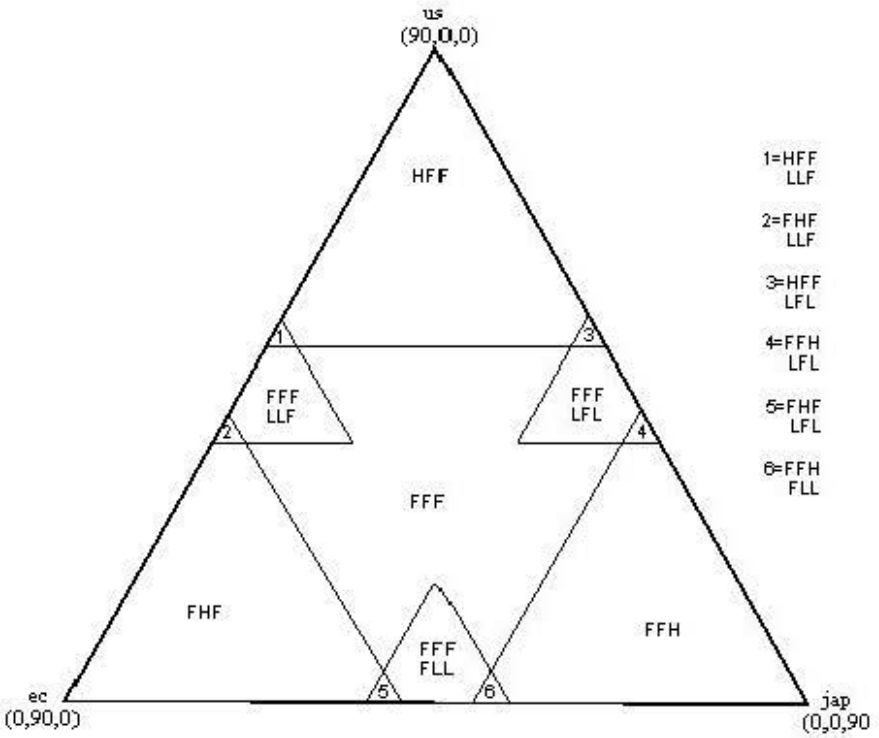


Fig. 7.2 Equilibrium characterization for c=4.8

Increasing the cost c of producing the public good to c=4.8 gives the equilibrium characterization in Fig. 7.2. Fig. 7.2 illustrates a more strict requirement for attaining a hegemonic equilibrium, viz that an actor has a size larger than 10c=48, say HFF for us>48. The HFF/LLF trapezium in Fig. 7.1 has moved leftward and has been replaced by the tiny triangle far left in Fig. 7.2 for the size of the US being slightly larger than us=48 and the size of Japan being sufficiently close to j=0. The 'downwardly' directed triangle, giving the unique defection equilibrium FFF, will expand upward to us=48 and downward to the point (18,36,36). Further, the FFF/LLF parallelogram in Fig. 7.1 has moved leftward and been replaced by the five-edged area to the left in Fig. 7.2. Finally, the small HFF/LLF/FHF area to the left in Fig. 7.1 surrounding the point (45,45,0) has

disappeared since hegemony is no longer possible when the size of an actor is less than 48.

Note especially that Fig. 7.2 has fewer areas with multiple equilibria than Fig. 7.1. We find that this is a general trend when the cost c of producing the public good increases. The reason is that the more strict requirement for hegemony yields a smaller HFF area (if an actor is sufficiently large, which is less likely), a larger FFF area (if the actor sizes converge, which is more likely), and very few areas where joint leadership alone or combined with a hegemony or a follower strategy is possible (if two actors are comparably large and the third actor is small, which also is less likely).

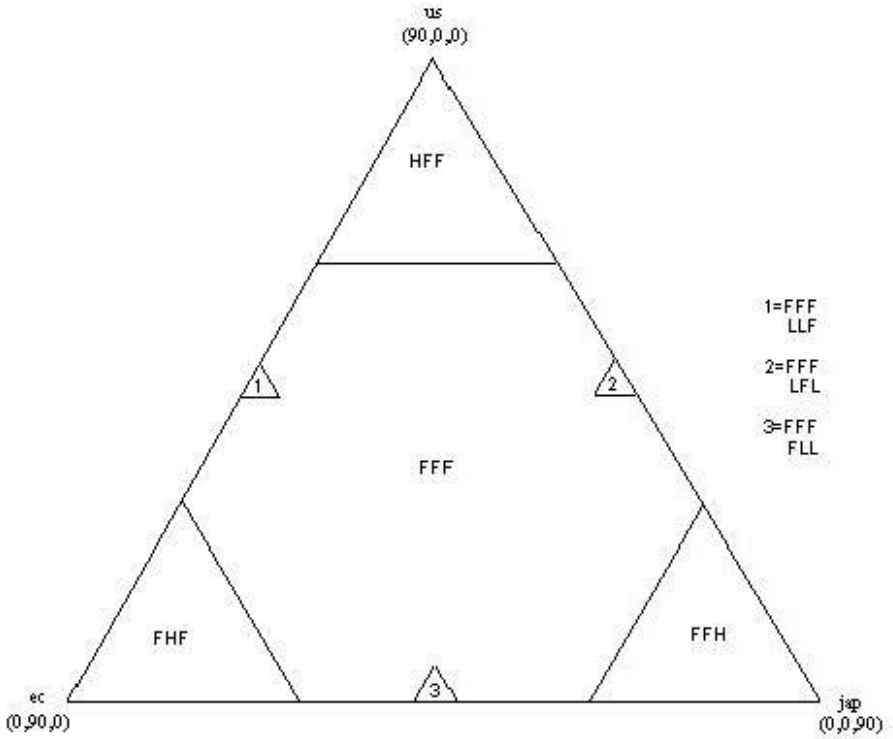


Fig. 7.3 Equilibrium characterization for c=6

Increasing the cost c of producing the public good further to c=6 leads to the equilibrium characterization in Fig. 7.3. Fig. 7.3 illustrates a unique HFF equilibrium for us>10c=60. The 'downwardly' directed triangle from Fig. 7.2 has increased in size and been replaced by what is virtually a hexagon surrounding the center in Fig. 7.3. Finally, the five-edged area to the left in Fig. 7.2 has become smaller and been replaced by the tiny FFF/LLF triangle to the left in Fig. 7.1 surrounding the point (45,45,0).

The decreasing number of areas with multiple equilibria is even more pronounced in Fig. 7.3 than in Fig. 7.2. For an increasing cost c of producing the public good, one either gets unique hegemony (if the strict requirement is met), a unique all-follower FFF scenario (if the strict requirement is not met), or an unlikely third FFF/LLF option if two actors (e.g. the US and the EC) have sufficiently equal sizes and the third actor (e.g. Japan) has a size sufficiently close to zero.

As the cost c of producing the public good increases beyond c=6, the FFF/LLF area (with the corresponding FFF/LFL and FFF/FLL areas) vanishes, which happens at c=6.6 (since this gives $10(c+c_T(2))/2=45$). Furthermore, the HFF area decreases and the FFF area increases. For c>9 the entire triangle gives a unique FFF equilibrium, which means that the cost of producing the public good is too high. Decreasing the cost c of producing the public good to c=3.6 results in the equilibrium characterization in Fig. 7.4.

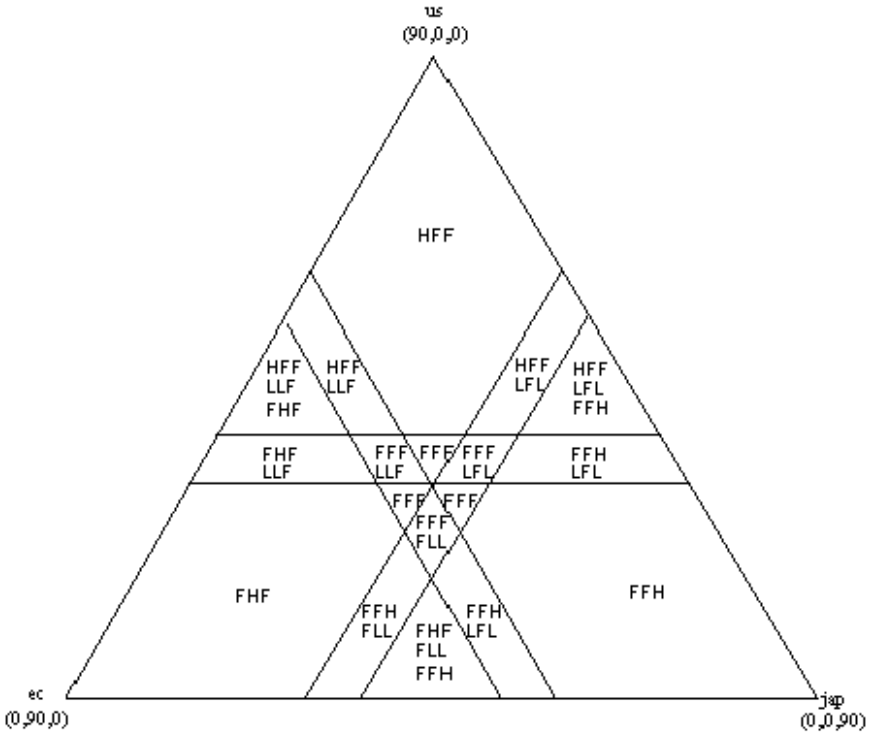


Fig. 7.4 Equilibrium characterization for c=3.6

Fig. 7.4 should be compared with Fig. 7.1 and the description thereafter. The HFF/LLF trapezium gets longer, the HFF/LLF/FHF triangle gets larger, the 'downwardly' directed triangle around the center gets smaller and now extends from us=36 and down to the center (30,30,30) (as $10(c+c_T(2))/2=30$), and the FFF/LLF parallelogram slightly up to the left moves toward the center (30,30,30) and impinges on it.

As c decreases further, given 3<c<3.6, the two trapezia HFF/LLF and FHF/LLF (and their analogs) become narrower and gradually turn into parallelograms, the FFF/LLF parallelogram and the FFF triangle (and their analogs) gradually vanish, and the HFF/LLF/FHF triangle (and its analogs) becomes larger and gradually turns into a trapezium. For c=3 hegemony is possible for all combinations of 0>=us,ec,j<=90, where us+ec+j=90. More specifically, for c=3 the center 'upwardly' directed triangle stretching from us=10(c+c_T(2))/2=27 to the point (36,27,27) consists of three sub-triangles and three sub-parallelograms. All these six areas allow for the three equilibria LLF, LFL, and FLL. Each sub-parallelogram also allows for one hegemonic option, the upper one e.g. for HFF. Each sub-triangle also allows for two hegemonic options, the left one e.g. for HFF and FHF.

As c decreases further to c=2.4, in which case 10c=10(c+c_T(2))/2=24, the center triangle gradually increases in size to stretch from us=24 to the point (42,24,24) and gradually changes in content of equilibria to allow for all the six equilibria HFF, FHF, FFH, LLF, LFL, FLL. Simultaneously, the two parallelograms HFF/LLF and FHF/LLF (and their analogs) gradually vanish, being replaced by the HFF/LLF/FHF trapezium (and its analogs), which is increasing in size. The area for each unique hegemonic equilibrium in each corner, e.g. HFF close to the upper point (90,0,0), also gradually decreases in size.

Decreasing the cost c of producing the public good to c=1.8 results in the equilibrium characterization in Fig. 7.5.

Fig. 7.5 is noteworthy since unilateral production of public goods, for c>2.4, is less costly for a single actor than half the cost of bilateral joint production of public goods. This constellation appears if c is smaller than c_T. Nevertheless, joint leadership remains a viable option when two actors are nearly equal in size.

Decreasing c further to c=0 moves the us=10c=18 line in Fig. 7.5 gradually downwards to the us=10c=0 line, while the us=10(c+c_T(2))/2=21 line in Fig. 7.5 is moved gradually downwards to the us=10(c+c_T(2))/2=12 line. As the reader can see, each of the three corner parallelograms allows for all the three hegemonic options HFF, FHF, and FFH. Further, the center triangle gets larger, spanned by the points (66,12,12), (12,66,12), and (12,12,66).

Analyzing the triangles in political terms leads to the following conclusions. The way an international public good will be produced greatly depends on the costs which are necessary to produce it and on the relative size of the actors. Observe that in the discussion from c=3.6 in Fig. 7.4, to c=3, then to c=2.4, then to c=1.8 in Fig. 7.5, and

finally to c=0 in the previous paragraph, there is a gradual increase in the number of multiple equilibria in each of the various areas. The 'cheaper' an international public good is, the easier it is to produce political solutions, but the higher is the political conflict resulting from the free-rider problem. This is the reverse effect, which is consistent with the trend described above that the number of areas with multiple equilibria decreases as the cost c of producing the public good increases. The reason is, conversely, that both the requirements for hegemony and joint leadership are now less strict, as well as that FFF is still an option if c>3 and the sizes of the three actors are sufficiently equal. In other words, for small costs c of producing the public good, there are many possible leadership constellations, viz hegemony (always possible given c<3), or joint leadership, or an all-follower situation (if no single actor is comparably large and c>3). Even if there was a hypothetical international public good that any country in the world was able to produce, it would still be possible for all countries to stay aside. Extremely expensive international public goods can only be provided by a hegemon. The problem stemming from joint leadership in regard to costly provision of the public good is that transaction costs exceed the gains from joint action.

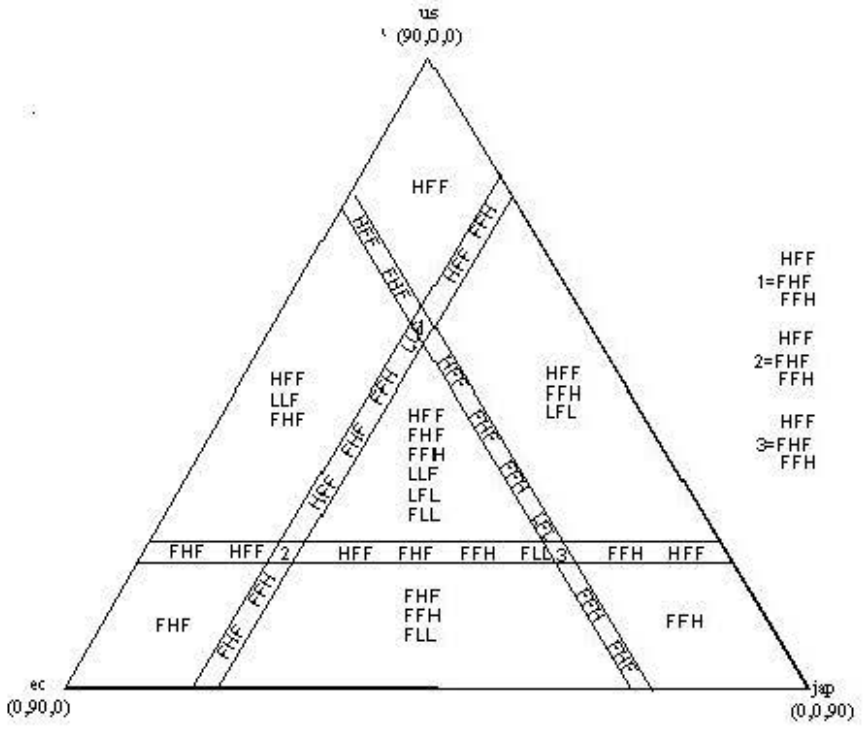


Fig. 7.5 Equilibrium characterization for c=1.8

8 Future Leadership Constellations and the Quest for International Order

Any stylized model has its limitations. This model analyzes the problem of size in collective action. Its limitations mainly stem from the neglect of variations in the cost of providing international public goods. In the case of global economic crises, for instance, the transaction costs needed to reach an agreement may decrease considerably. Having learned the lessons from the disastrous economic consequences of the Great Depression in the 1930s, countries today may, when confronted with an economic threat of collapsing growth rates, increasing inflation and unemployment, more easily opt for joint leadership. On the other hand, the continuing integration of economic affairs leads to an increase in the price of policy changes. Our model allows for parametric changes of the cost c of producing public goods and transaction costs c_T, but it does not treat these as variables; the only variable in our model is size.

The strength of the model presented in this article is that it permits predictions of future leadership constellations in international political relations, given estimates of the sizes of the actors' economies, that is any combination (us,ec,j). It is also possible to assume other actors than us, ec, and j, and it is of course possible to increase the complexity of the model to four or more than four actors, although this will complicate the analysis.

Predictions are necessarily speculative though not without precedent (Kennedy 1987; Gilpin 1987; Thurow 1992). In this concluding section we discuss the relationship between actor size and the costs of providing an international public good. We have assumed (us,ec,j)=(50,35,5) in 1960, (us,ec,j)=(40,35,15) in 1975, and we may assume (us,ec,j)=(38,35,18) in 1995. The relative sizes in 1975 and 1995 are sufficiently similar so as to give no changes in the Nash equilibria. With the possible further size convergence of the three actors we may assume (us,ec,j)=(35,30,25), which would lead to a significant increase in the degree of conflict about leadership. Future development may lead to the emergence of a 'Pacific bloc', pac, agreed upon either by the ASEAN and Japan, by the APEC, or by an other institutional form. Let us assume (us,ec,pac)=(25,25,25), which leads to the game in Table 8.1.

The game in Table 8.1 resembles a three-person prisoners' dilemma. Everyone would benefit and receive a positive payoff 0.1 from LLL. However, each actor has an incentive to deviate unilaterally to F to receive the free-rider payoff 2.5. If everyone deviates to F, however, the unique mutual-defection equilibrium FFF ensues.

		EC							EC					
		F			L				F			L		
US	F	**0**	**0**	**0**	0	-2.4	0	F	0	0	-2.4	2.5	-0.5	-0.5
	L	-2.4	0	0	-0.5	-0.5	2.5	L	-0.5	2.5	-0.5	0.1	0.1	0.1
		'Pacific bloc' follows							'Pacific bloc' leads					

Table 8.1 Prediction of a future game with c=4.8

Table 8.1 Prediction of a future game with c=4.8

With size convergence and a cost c=4.8 of producing the public good, the challenge in international relations is thus to overcome the logic of the prisoners' dilemma. This can be done if the actors can mutually agree to reduce the cost c of producing the public good. Table 8.2 shows the game when c=3.

		EC							EC					
		F			L				F			L		
US	F	**0**	**0**	**0**	0	-3.0	0	F	0	0	-3.0	**2.5**	**0.4**	**0.4**
	L	-3.0	0	0	**0.4**	**0.4**	**2.5**	L	**0.4**	**2.5**	**0.4**	0.7	0.7	0.7
		'Pacific bloc' follows							'Pacific bloc' leads					

Table 8.2 Prediction of a future game with c=3

Table 8.2 illustrates four equilibria, **LLF**, **LFL**, **FLL** and **FFF**, the former three providing the public good. Hence, a low cost c allows for producing the public good since two actors then have an incentive to lead. The game for the low-cost public good, therefore, does not resemble a prisoners' dilemma, but rather a coordination game.

Table 8.2 illustrates the second-order problem of future leadership constellations. All the three actors have a first-mover advantage of committing not to lead, illustrated by the first-mover receiving 2.5 rather than 0.4. Hence, although the actors may possibly be capable of avoiding the mutual defection equilibrium **FFF**, there is conflict regarding which actor constellation should provide the public good, which may easily lead to an 'undersupply' of joint-leadership activity.

Although the model used in this article has shown a multiplicity of equilibria allowing for hegemonic or joint leadership, the all-follower FFF equilibrium is also a prevalent option for c>3. Comparable to a hegemonic era where international public goods are produced with a high degree of certainty, our model predicts an increasing likelihood of international public goods not being produced if the sizes of the various actors converge. Thus, the most salient problem of contemporary and future world politics seems not to be hegemonic decline but rather the emergence and existence of multiple joint-leadership equilibria. If multiple constellations of joint leaders are able to produce international public goods, the increasing number of available strategies for each actor easily leads to situations where international public goods turn out not to be producible. That is, the probability increases that the actors find themselves in a deadlock. The possibility of agreeing upon tripartite leadership does not necessarily resolve the deadlock, both because that leads to rising transaction costs and because one actor will have an incentive to free-ride in the sense of not contributing to the production of the public goods.

It is typically the case that expensive public goods are much more likely to be provided by a hegemon than by a group of leaders. This is illustrated, for example, by Fig. 7.3, which suggests that international public goods will be provided with probability one if the size of an actor is larger than 60 (e.g. the HFF area), whereas both the all-follower FFF and the joint leadership LLF options are realizable equilibria if the US and the EC are equally large and Japan is very small in size, say (us,ec,j)=(45,45,0).

Furthermore, given hegemonic decline and the emergence of joint leadership, the probability increases that the largest actor may be too small to provide costly international public goods unilaterally, while the followers are too small to join in the production. This is illustrated by the center portion of Fig. 7.4. This is a plausible constellation if the second- and third-ranked actors are almost equal in size. The increasing difficulty in producing expensive public goods may lead to a situation where the actors become less likely to agree upon the establishment of international regimes which are broad in scope. One should expect, therefore, that the international regimes agreed upon by countries in the foreseeable future are more limited or sectorial in scope.

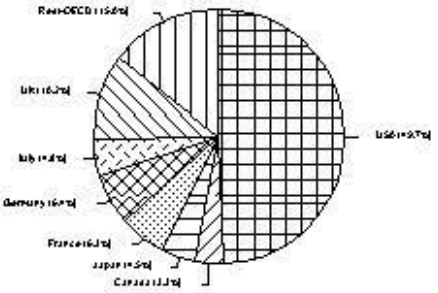
Most important, however, the article shows that 'after hegemony' international regimes *can* be established, and international stability and openness *can* be provided. A joint-leadership system does not lead to anarchy and chaos, but it does require more cooperation among countries. However, a joint-leadership system leads to a different

international order than the hegemonic system we have been accustomed to over the last half century.

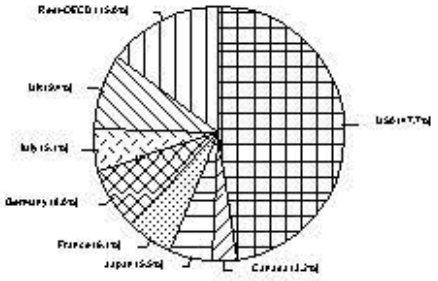
Appendix: The Relative Size of OECD Actors

(To see each graphic up-close and in color, click on it.)

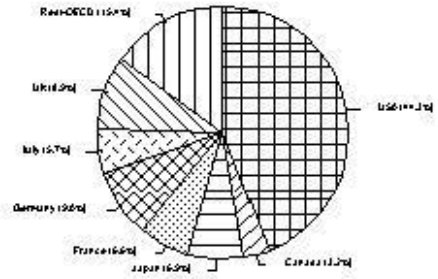
1950



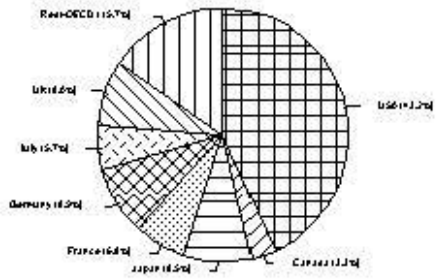
1955



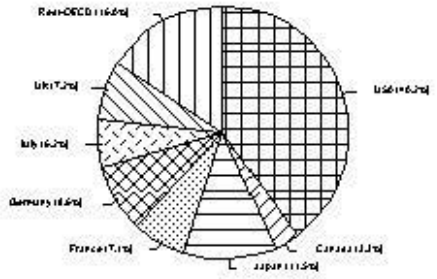
1960



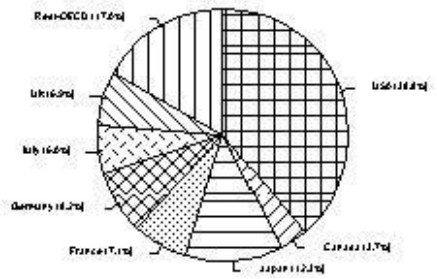
1965



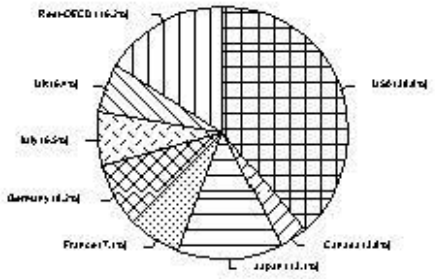
1970



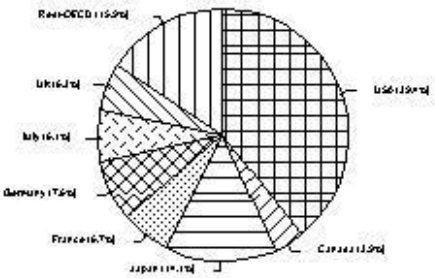
1975



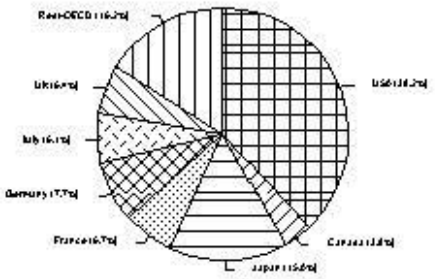
1980



1985



1990



Endnotes

1. We would like to thank the National Bureau of Economic Research, which provides the scientific community with the public good of the Penn World Tables via the Internet. Our thanks go also to Matthias Kenter, Institut der deutschen Wirtschaft, Cologne, for helpful hints concerning the data. For their various constructive comments we are indebted to Margaret Levi, Matthias Mohr and Fritz W. Scharpf.

2. It is much disputed whether stabilized exchange rates are to be considered a public good or public bad. We are not concerned with this question, but in general we agree with the economic mainstream that fixed exchange rates are a public bad while stable and stabilized exchange rates are a public good.

3. Confusingly, economists define this role as leadership, while international relations scholars distinguish between a single leader, called hegemon, and a group of leaders. These differences are mainly ignored in economic theory. However, as we show later, the analytical separation of hegemons and leaders does make sense. Therefore, we rigidly differentiate between a single leader, referred to as a hegemon, and multiple joint leaders.

4. For the suggestion that there is a continuum between pure public and pure private goods rather than a dichotomy, see Bruce Russett (1987: 225).

5. We will discuss and amend this assumption in sections 5 and 7.

6. We have experimented with logistic functions of arbitrary complexity for the transaction costs, which do not change the nature of the results.

7. We acknowledge the critique of John Ruggie (1982) and David Lake (1984) that relative size can explain only the necessary, but not the sufficient, conditions for the emergence of a liberal international economy. We nevertheless think it makes sense to provide international relations scholars with the analytical tools to analyze the political-economic consequences of size within the game-theoretic approach to international politics.

8. The Penn World Tables, also known as the Summers-Heston Tables, display a set of national accounts economic time-series covering a large number of countries. It is an attempt to get closer to a system of real national accounts, and its unique feature is that it allows for international, not just intertemporal, comparisons (Summers/ Heston 1991).

9. It is debatable whether the EC (or an equivalent thereof) had the strategic capability of acting as an actor in the 1950s and early 1960s. An interesting discussion of whether corporate actors, coalitions, collective actors, and aggregate actors can be treated as unitary players applicable for game-theoretic analysis is provided by Scharpf (1991). It might be argued that the EC until the early 1960s was an aggregate actor without strategic capability and thus only capable of choosing the strategy of following, which provides further support for the early [H,F,F] equilibrium. However, the early EC consisted of certain dominant subactors such as Germany, France, and the UK, which either alone or through some mechanism of tacit self-coordination could engage in

strategic action. This justifies considering the EC as an actor in its own right as early as the 1950s.

10. See also James Morrow (1994a) for an integration of coercive and benevolent leadership. Note that our model differs from Morrow's model, even though we agree that leaders need not be superior. We assume that they must have a minimum size, which is determined by the cost of the public good. Therefore, actors can be leaders in one issue-area while they fail to lead in another.

11. For a more general discussion of whether actors have the incentives to punish deviators to ensure cooperation or rule compliance, see Boyd and Richerson (1985, 1992).

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