

## POWER AND POLITICAL COORDINATION IN AMERICAN AND GERMAN MULTI-CHAMBER LEGISLATION

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### ABSTRACT

Power in American and German multi-chamber legislation is determined either by an inter-institutional or an internal coalition problem of all inter-linked chambers. Hence, the complexity of multi-chamber systems relies on different subgames, different types of decision rules and different types of actors. Since collective actors such as parliaments or parliamentary chambers may not act as unitary actors, we examine the power distribution in both types of multi-chamber legislation by a game-theoretical method with regard to institutional settings and specific legislative schemes. We argue that the Shapley index is the most appropriate method for the comparative analysis of multi-chamber power. Our 'parallel' research strategy is, thus, based on individual and corporate Shapley power shares which are subsequently added to collective chamber power. Our comparison of American and German legislation starts with an analysis of two-chamber parliamentary bargaining. Whereas this application corresponds to the bicameral parliamentary decision stage of conciliation and amending, our second application of Policy Leadership studies the checks-and-balances of all executive and legislative chamber actors. A third application is related to the situation of unified and divided government, and here we examine the power effects of institutional settings and party-oriented strategies in both types of multi-chamber legislation. In Germany, unified government excludes opposition actors, whereas American unified and divided government refers to the president's role in multi-chamber legislation.

**KEY WORDS** • comparative politics • institutional power analysis • multi-chamber legislatures • game theory • Shapley index

### Introduction

The US congressional elections of November 1994 brought the relatively short period of unified Democratic government under President Clinton to a close. Republican majorities in both Houses have reestablished the more familiar situation of divided government, a party-oriented power configuration that is of significance with respect to the workings of checks-and-balances in the American multi-chamber legislative process. With the new Congress now convened, President Clinton is widely considered to be in a weaker position than before the November elections. His proactive role in American legislation will be affected by the inter-institutional coalition

problem caused by the presence of different party majorities in American multi-chamber legislation. At the same time as the elections in the US Congress, Helmut Kohl was re-elected by the German Parliament to the office of Chancellor. This means that the divided government configuration continues to predominate in German multi-chamber legislation. Different party majorities in the two German chambers, the *Bundestag* and the *Bundesrat*, have been in existence since 1991. Both configurations, divided and unified government, beg the simple question of how to look at power distribution in multi-chamber systems. In this paper we will present a method for the analysis of collective power in the complex systems of both American and German multi-chamber legislation.

For both examples of multi-chamber legislation, unified and divided government describe a party-oriented power configuration concerning the compatibility of legislative majorities. The most prominent approaches are addressed to the study of the causes of American divided government (Jacobson, 1992; Cox and Kernell, 1991; Fiorina, 1992). They feature two compatible interpretations: one focusing on why the Democrats control the House; the other on why the Republicans control the Presidency (Brady, 1993: 191). Compared to research in the causes of divided government little is known about its legislative consequences (Mayhew, 1991). The requirement of majorities in all chambers involved in the passage of multi-chamber legislation extends the internal coalition problem of single-chamber majority-building to an inter-coalition problem between two or more chambers (Sundquist, 1988). On the one hand, the institutional linkage of different chambers balances the voting power concentration within a legislative system, while on the other hand, multi-chamber legislation is also highly vulnerable to the many veto players who may be incorporated in a party-oriented strategy. Thus, multi-chamber legislation depends on coalition power and it is our task to specify the mechanisms of complex intra- and inter-institutional coalition problems in multi-chamber legislation.

This raises a second question, how to transfer different macro-institutional settings to individual actor power shares? Instead of a (somewhat redundant) emphasis on the importance of institutional settings, we will examine the logic of collective decision-making among several types of actors. In this sense, several game-theoretical models have already been developed to produce actors' coalition power shares with regard to macro-institutional settings. Going into more detail, we can distinguish between neo-institutional and game-theoretical approaches. The latter combine formal institutional settings with ideological proximities by generalizing classical power indices in multi-dimensional spaces (Rapoport and Golan, 1985; Grofman et al., 1987). Whereas those game-theoretical studies are focused on a simultaneous analysis of preferences and institutional settings, neo-institutional approaches claim to take into account institutional settings

before attempting any explanation of a political event (Kitschelt, 1989: 54). If the definition of institutional effects is, indeed, to be modelled before proceeding with the explanation of a political event, we should concentrate on an independent analysis of institutional settings and preferences for comparative research.

A neo-institutional approach should give some insight into the impact of institutional settings on the coordination of collective decision-making. Turning to the German case, according to this neo-institutional claim the most prominent game-theoretical indices developed by Banzhaf (1965) and Shapley (1953) attribute half of the a priori voting power to the Christian Democratic (CDU/CSU) parliamentary group, and a sixth of the parliamentary power to three other parties within the German *Bundestag* for the last four legislative terms. These results suggest that neither changes to the party configuration of parliament nor the increase in parliamentary seats as a result of German unification have affected the power relationship in the German first chamber. Since 1983, the CDU/CSU has remained the most powerful parliamentary group, able to attain an absolute parliamentary majority with only one coalition partner. Without the CDU/CSU, the other parties are only able to fulfil the absolute majority criterion by a three-member coalition. Empirical studies on German and American legislative outcomes complement these findings (Pappi et al., 1995; Knoke et al., 1995).

Most game-theoretical power analyses study the internal coalition problem of single chambers (Ordeshook, 1986: 441–84). By contrast, our study will take into account both the internal and the inter-institutional problem of multi-chamber coalitions. We will present a method of tackling the inter-institutional coalition problem in American and German multi-chamber legislation with regard to their specific internal coalition problems. In the past, the numerical calculation of large numbers of actors was limited. The approach presented in this article allows for the calculation of complex legislative systems with different types of actors. The most complicated calculations of American and German Policy Leadership are listed in the Appendix.

#### Legislative Schemes of Individual Entities or Corporate Actors with Weighted Votes

The institutional linkage of American multi-chamber legislation has already been modelled by Shapley and Shubik (1954). However, the increasing number of game-theoretical methods is becoming more of a burden than a blessing. Apart from different combinations of formal institutional settings, multi-chamber legislation also varies in its legislative scheme

which supplements the formal institutional settings of legislations by way of specific characteristics (Luce and Rogow, 1956: 84). The difference in legislative schemes becomes evident when one compares the two second chambers, the American Senate and the German *Bundesrat*. In the American Senate, the senators are directly elected and each senator has an unweighted vote for every legislative proposal. The members of the German *Bundesrat*, on the other hand, represent the governments of the states. In this case, the number of votes allocated to each member of the *Bundesrat* depends approximately on the population size of the respective state. An absolute majority of 21 votes before and 35 after German unification is needed to consent to German bills which directly affect the competences of the states. Furthermore, in German parliamentarism, the parliamentary majority supporting government results from elections and subsequent coalition negotiations among party groups with a high level of party discipline. Coalition contracts, a strong discipline within parliamentary party groups and the organizational power of the Chancellor all facilitate government formation by coalition building within the *Bundestag*. Here, the parliamentary party groups have to be conceptualized as corporate actors of the German *Bundestag*.

German multi-chamber actors are, thus, actors with weighted votes. According to our research strategy, however, we still have to conceptualize the American multi-chamber actors. Except for foreign affairs, party affiliation can explain most of the legislative decisions taken within the American committee system (Parker and Parker, 1979: 85–102). Research into the role of congressional parties offers two widely differing interpretations: one that party matters, and the other that party is simply the aggregate of its members. If parties are viewed as more than the aggregate, then one would assume coherent action. If parties are simply the sum of their members, then coherent legislation will be difficult to find (Brady, 1993: 193). Despite the fact that there is a remarkable party affiliation within the American committee system, elections to the American Congress do not entail coalition negotiations among party groups (Shaffer, 1980).

For comparative research, these differences in legislative schemes have favoured an 'additive' research strategy, which organizes the comparative study chaptered by each political system. By contrast, we use a 'parallel' comparative research strategy that presents the different legislative schemes of countries and looks for the appropriate concepts to be applied in a comparative power analysis. Thus, a corporate conceptualization of Republican and Democratic congressional members would either underestimate formal weighted votes of German states and German party discipline, or it would undervalue the individual position of a member of Congress. Looking at another aspect of the legislative scheme reveals a different legislative position for American administration and German gov-

ernment. German government initiates most bills. This proactive role of legislative policy leadership is especially important for the development of policies. In contrast to the proactive role of German government, the veto right of the American president seems to prescribe a more reactive role in this respect. American presidents have no formal right to initiate legislation, and the presidential veto may be overruled by a two-thirds majority in both houses of Congress.

In this sense, American multi-chamber legislation not only differs from German legislation in its formal institutional settings, but also in the more individual position of the 535 members of Congress with regard to a different inter-institutional coalition problem. Parliamentary discipline in the *Bundestag* and block votes in the *Bundesrat* indicate the corporate character of German legislative actors with weighted votes. Moreover, empirical data on parliamentary decision-making clearly supports the assumption that German parliamentary party groups can be conceptualized as unitary actors. Our parallel research strategy obliges us to conceptualize American multi-chamber actors as individual actors, whereas the German legislative scheme presupposes the existence of corporate entities. This initial discussion of input variables is necessary, because game-theoretical power findings depend on these concepts of actors, i.e. individual or corporate entities (Brams, 1975: 175, 177).

With respect to these two types of actors, i.e. the individual unweighted and the corporate weighted multi-chamber actor, ordinary analytical methods are inappropriate for the calculation of inter-institutional voting power. Instead, we will present a game-theoretical method that, for the study of inter-institutional power in multi-chamber legislation, reflects both the formal institutional settings of each component and the different input variables of American and German legislative schemes. In our analysis, we closely examine the different legislative schemes of both countries and seek to model these differences in legislative multi-chamber decision-making. Here, our parallel strategy will shed light on the political coordination and the power relationship in both legislative processes. Consequently, we will distinguish between bicameral bargaining between first and second chambers and a general Policy Leadership application taking into account all types of actors participating in legislation. For the examination of balanced collective chamber power in both federal systems, we will first focus on the bicameral parliamentary power relations of two-chamber decision-making. Apart from this bicameral application, called Bicameral Parliamentarism of first and second chamber collective decision-making, we will, as a second approach to comparing the power distribution in multi-chamber systems, look at additional agenda setting or agenda blocking positions (Tsebelis, 1994: 128). This approach will consider the policy leadership of executive actors with respect to the different forms of legislative linkage of American

administration and German government. Another approach will discuss the coordinating function of government supporting parties. Most additive research studies on American and European party organizations attribute the non-compatibility of American and European legislation to the lack of American party organization. But to some extent, a party-oriented coordination of complex legislation by government supporting parties depends on a unified or divided power configuration within multi-chamber systems. In both federal systems, unified government describes congruent party majorities in all interlinked chambers. We will examine both situations by our Party Government application. We consider their effect on power distribution in German and American legislation, taking into account the different types of actors, i.e. the individual American and the corporate German actor. Our major concern is to present a feasible approach for the comparative analysis of power in different types of multi-chamber legislation. We are confident that our parallel research strategy advances comparative institutional analysis, but we also seek to show that game-theoretical analyses of political power must first identify both the legislative schemes and the formal institutional settings that are subsequently to be translated into a characteristic function (Luce and Raiffa, 1957: 246).

### Voting Power in Multi-chamber Legislation: The Shapley Index Revisited

In political committee systems epitomized by the American Congress, participation rights define the set of political actors that may possibly vary for certain collective decisions within a political system. The election of a government or a president, decisions on a bill or on a constitutional amendment, are all examples of the various types of collective decisions, in which the set of actors participating may differ in each case. Apart from a variation in the participation rights for different types of collective decisions, the set of actors participating may also vary for a single type of collective decision. An example of this would be the right to participate in German legislation. Some German bills are negotiated exclusively within the *Bundestag*, while other proposals also require the consent of the German *Bundesrat*. As we would wish to exclude exogenous power, all empowered actors have to be included in the set of formal deciding actors.

As the second institutional factor of multi-chamber legislation, we must also consider the importance of the specific majority rules. Majority rules determine political power by defining the conditions for all possible winning sets of actors. The opportunities opened to actors participating may be studied by examining all the possible combinations of majority building. In the case of unanimity, the combinations are limited to a single minimum winning coalition. In this case, each participant is able to block a unanimous

collective decision, and the common veto right of all participants reduces the set of winning sets to a single unanimous winning coalition. Because of this limitation, unanimity is often called minority rule, although we can distinguish between a reactive veto power and a proactive production power (McClosky, 1949: 637–54). Compared to unanimity, majority rule may increase the amount of winning sets by the eventual exclusion of some of the actors participating. In (German) voting bodies with weighted votes, two situations are possible: winning coalitions may only be defeated by specific participants; or winning coalitions may be invulnerable to the withdrawal of support by a single participant, because the coalition is sufficiently oversized. Considering this invulnerable maximal winning coalition, formal voting power may not be related to the individual contribution of a single actor. For vulnerable coalitions, one may specify an a priori power share for an actor, due to his ability to either transform a winning coalition into a losing coalition by withdrawal, or to transform a losing coalition into a winner by joining it.

From a methodological standpoint, these situations may be analysed using game-theoretical concepts. The basic elements in game-theoretical studies are individual or corporate actors with payoffs or voting power values with regard to specific rules. Several game-theoretical methods are offered for the calculation of voting power values. We wish to exclude some game-theoretical concepts with regard to the analysis of political power in multi-chamber legislation. First, we reject game-theoretical concepts like the Deegan and Packel index (1978) and the Public Good index (Holler and Packel, 1983). Neither of these concepts, sometimes referred to as minimum winning coalition indices (Holler, 1982), can rule out those cases where actors with a higher weight of votes may have lower power values than actors with a lower weight of votes. Other indices, like the Coleman index (1971) and the Johnston index (1977), are linear transformations of the Banzhaf index (Brams and Affuso, 1976: 33). Beyond these indices, the axiomatic concepts of Banzhaf and Shapley remain applicable for the analysis of political power in multi-chamber legislation (Nurmi, 1987: 186). In the case of the Banzhaf index, we need to distinguish between a non-normalized and a normalized version. Indeed, only the latter is appropriate for a comparison of formal voting power shares which does not necessarily fulfil the Pareto criterion, i.e. by disregarding maximal winning coalitions (Dubey and Shapley, 1979: 102). The axiomatic basis of the Shapley index is that:

- first, an actor who fails to contribute to majority building, as he has few or no votes, is regarded as a dummy player with no voting power;
- second, a permutation that is an interchange of the actors' numbering leaves the actors' power shares unchanged (Owen, 1982: 193, 216).

The most important axiomatic difference between the Shapley index and other power indices is its Pareto optimality, in that it reconsiders all permutations of any coalition combination, barring any additional profitable coalition opportunity. Harsanyi (1977: 215) calls this property of the Shapley value 'joint efficiency'. Leaving aside formal axiomatic properties, a more important aspect of power indices concerns their different concepts of coalition power. Most power indices may produce significantly different results, and a convincing criterion is needed to prefer the one to the other. Our argument is related to the specific conditions of multi-chamber analysis, based on the probability concept of inter-institutional coalition building. For our purpose of a multi-chamber analysis, the additivity of pivotal positions in different chambers becomes a special problem. Thus, power indices which assume a simultaneous vulnerability of a single winning coalition by more than one actor cannot be accepted (Dubey and Shapley, 1979: 103). In this case, highly vulnerable winning coalitions become more important than winning coalitions that are only made vulnerable by a few or a single actor. Regarding collective chamber power as summing up the members' individual power shares – and here most power indices differ widely – only the Shapley concept of coalition power does not privilege chambers with highly vulnerable coalitions (Straffin, 1977: 109). Furthermore, it does not overestimate the collective power of a chamber by its relatively larger actor size (Shelley, 1986: 260). The Shapley index transforms the formal institutional settings of multi-chamber legislation into a comparable indicator of the individual voting power of actors (see Appendix, Part 1). Having said this, different legislative schemes still oblige us to distinguish between the type of actors, i.e. an individual unweighted or a corporate weighted actor; the type of decision rules, i.e. unanimous or other majority-decision rules; and the type of subgames, i.e. one-chamber or multi-chamber legislation. Shapley and Shubik (1954: 792) applied their model to the analysis of formal voting power in American multi-chamber legislation, reflecting individual unweighted actors and different decision rules. Our power analysis will rely on a comparison of different multi-chamber legislation with individual American actors and corporate German actors. The period under study will start at the beginning of the 1980s and, with German unification, we are also in a position to discuss modifications to institutional settings within a legislative system and their consequences for legislative power distribution. Furthermore, our research focuses on the type of subgame and coordination strategies, defined by different sets of participant actors in each legislative system. By analysing an executive Policy Leadership application, we intend locating the different legislative positions of American and German government with regard to legislative agenda setting or blocking. A Party Government application will shed light on the coordinating function of parties supporting government

Table 1.1. Share of Votes within German Bundestag and Bundesrat grouped along A-states

Term	Share of votes within Bundestag						Share of votes within Bundesrat					
	A-States			B-States			C-States			Government Coalition		
	A	B	C	SPD	FDP	Grüne/B90	PDS	Σ				
March 83	26	15	41	244	193	34	27	498			CDU/CSU/FDP	
Feb. 87	23	18	41	223	186	46	42	497			CDU/CSU/FDP	
Jan. 91	27	14	41	319	239	79	8	662			CDU/CSU/FDP	
Oct. 94	27	14	41	294	252	47	49	672			CDU/CSU/FDP	
Share of votes within Bundestag												
Share of votes within Bundesrat												
Governmental States												
March 83	26	15	41	SWH, BLN, LSA, RPA, BWU, BAV	HAM, BRE, NRW, HES							
April 85	23	18	41	SWH, BLN, LSA, RPA, BWU, BAV	HAM, BRE, NRW, HES, SAA							
April 87	27	14	41	SWH, BLN, LSA, HES, RPA, BWU, BAV	HAM, BRE, NRW, SAA							
May 88	23	15	41	BLN, LSA, HES, RPA, BWU, BAV	SWH, BRE, BLN, NRW, SAA							
June 90	18	24	3	HES, RPA, BWU, BAV	SWH, BRE, LSA, BLN, NRW, SAA							
Nov. 90	35	26	7	HES, RPA, BWU, BAV, MBV, SAN, THU, SAX	SWH, BRE, LSA, BLN, NRW, SAA							
April 91	31	26	11	RPA, BWU, BAV, MBV, SAN, THU, SAX	SWH, BRE, LSA, NRW, HES, SAA							
May 92	21	26	21	BAV, MBV, SAN, THU, SAX	SWH, HAM, LSA, NRW, HES, SAA							
July 1994	17	26	25	BAV, MBV, THU, SAX	SWH, HAM, LSA, NRW, HES, SAA							
Sept 1994	17	30	21	BAV, MBV, THU, SAX	SWH, HAM, LSA, NRW, HES, SAA, BRA							

Source: Schindler, 1994: 854. Until June 1990 without the votes of the Berlin Members of Bundestag and Bundesrat who have been excluded from voting due to the status of Berlin. We use the following abbreviations: BA – Bavaria, BWU – Baden-Württemberg, BRE – Bremen, HAM – Hamburg, HES – Hesse, LSA – Lower Saxony, NRW – North Rhine-Westphalia, RPA – Rheinland-Palatinate, SAA – Saarland, SWH – Schleswig-Holstein, BER – Berlin, BRA – Brandenburg, MBV – Mecklenburg-Vorpommern, SAX – Saxony, SAN – Saxony-Anhalt, THU – Thüringen.

**Table 1.2** Presidencies and Party Majorities within Congress

Time Period	Term	Senate		House		President	
		Demo.	Repub.	Demo.	Repub.	Demo.	Repub.
1983–85	98	46	54	269	166		Reagan
1985–87	99	47	53	253	182		Reagan
1987–89	100	55	45	259	176		Reagan
1989–91	101	56	44	261	174		Bush
1991–93	102	56	44	267	168		Bush
1993–95	103	57	43	259	176	Clinton	
1995–	104	47	53	205	230	Clinton	

Source: *Archiv der Gegenwart* 52: 26106; 54: 28208–9; 56: 30438; 58: 32718; 60: 35016; 62: 37294; 64: 39447. The one non-partisan representative in the 103rd term is counted in the Republican group, the one non-partisan Representative in the 104th term is counted in the Democrats.

with respect to unified and divided government in both types of legislative systems. For each period, the Shapley indices add up to 1, and we will be discussing either the individual power share of actors or the collective power share of each chamber. American legislative terms are listed in 2-year periods, German legislative terms last 4 years for the *Bundestag*, but in the *Bundesrat*, the configuration depends on the legislative terms of each state. American actors are classified as Republicans or Democrats. German party-oriented majorities are distinguished by the A-, B-, and C-categories of the states in Table 1.1. A-states are run by the same political parties in government as support the federal government, whereas B-states are governed by opposition parties. In the C-category we have listed all those states that cannot be classified as being run by parties supporting or opposing federal government (Schindler, 1994: 852). American presidencies and party majorities within the Congress are listed in Table 1.2.

### Bicameral Parliamentarism, Policy Leadership and Party Government

#### Two-chamber Power in Bicameral Parliamentarism

Our first approach to comparing the power distribution in both legislative systems starts with the inter-coalition problem of two-chamber decision-making, where we analyse the power relationship in both federal systems, i.e. in American and German Bicameral Parliamentarism.

In Congress a successful bill has to have been passed by an absolute majority in both congressional chambers. For more than half of all German bills the consent of the second chamber, the *Bundesrat*, is also required. In American and German multi-chamber legislation, first and second chambers differ with respect to their institutional settings, so that the relative

share of votes is not an appropriate measure for a common voting power solution. As a consequence, ordinary calculation methods of voting power fail for multi-chamber legislation. The relative share of votes in one chamber is not comparable to the share of votes in another chamber. For example, the 1/100 share of an American senator is not comparable to the 1/435 share of a member of the House of Representatives. Another aspect of two-chamber bargaining is the similarity of collective power status of their first and second chambers, which means a balanced power distribution between first and second chamber.

In order to achieve this objective, the success of a bill is defined as an inter-coalition problem of both chambers requiring an absolute majority in the American Senate and House of Representatives, and likewise in the German *Bundestag* and *Bundesrat*. This linkage of legislative competence extends the coalition problem of legislation to two or more chambers, which may differ in their institutional efficiency in terms of membership size and type of decision rule. Institutional efficiency can be disregarded in one-chamber legislation with unweighted actors, as all individual one-chamber actors will be equally affected by institutional settings and modifications. In multi-chamber legislation, the different levels of institutional efficiency at which the interlinked chambers operate may have an impact on legislative power distribution. In general, the institutional efficiency of a chamber is lower if its decision rule is increased, i.e. by increasing from absolute majority to unanimity.

In most federal systems, the inter-institutional coalition problem of legislation is defined by an absolute majority in both houses, and both German corporate actors with weighted votes have to form coalitions to overcome the absolute majority setting. For a two-chamber system, like German federal parliamentary legislation, the Shapley index transforms each internal coalition problem of two different types of actors into a common power solution. Before unification, both former German chambers were decisive, so that each chamber's collective voting power adds up to one-half of all collective voting power.

Before German unification (10th and 11th legislative terms), four parliamentary groups shared the voting power with 10 states of the *Bundesrat*. In the *Bundesrat*, the absolute majority was defined by 21 of 41 votes. The Shapley voting power in our calculation provides states with a weighted vote of five votes with 0.064 voting power (Bavaria, Baden-Württemberg, Lower Saxony and North Rhine-Westphalia), states with four votes had 0.050 voting power (Hesse, Rheinland-Palatine and Schleswig-Holstein) and states with three votes had 0.031 voting power (Bremen, Hamburg and Saarland). Against this, the CDU/CSU parliamentary group had 0.250 voting power and each of the other three parliamentary groups had 0.083 of a priori voting power in German bicameral legislation. After unification,

Table 2.1. Voting Power, German Bicameral Parliamentarism

	Term Time Period	10 3.83-4.85	10/11 4.85-4.87	11 4.87-5.88	11 5.88-6.90	12 1.91-4.91	12 4.91-10.94	13 10.94-
Government								
Bundestag:								
CDU		.2500	.2500	.2500	.2500	.2446	.2446	.2446
SPD		.0833	.0833	.0833	.0833	.0815	.0815	.0815
FDP		.0833	.0833	.0833	.0833	.0815	.0815	.0815
Grüne/B90		.0833	.0833	.0833	.0833	0	0	.0815
PDS		.5000	.5000	.5000	.5000	.0815	.0815	0
Total Bundestag						.4892	.4892	.4892
Bundesrat:						.0455	.0455	.0455
6-vote states (0/4)								
5-vote states (4/0)		.0643	.0643	.0643	.0643			
4-vote states (3/8)		.0500	.0500	.0500	.0500	.0302	.0302	.0302
3-vote states (3/4)		.0310	.0310	.0310	.0310	.0218	.0218	.0218
Total Bundesrat		.5000	.5000	.5000	.5000	.5108	.5108	.5108
TOTAL		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 2.2. Voting Power, American Bicameral Parliamentarism

Term Time Period	98 83-85	99 85-87	100 87-89	101 89-91	102 91-93	103 93-95	104 95-
President	-	-	-	-	-	-	-
Vice-President	.0050	.0050	.0050	.0050	.0050	.0050	.0050
Senate: Democrats	.2277	.2326	.2723	.2772	.2772	.2822	.2326
Republicans	.2673	.2624	.2227	.2178	.2178	.2128	.2624
Total Senate	.4950	.4950	.4950	.4950	.4950	.4950	.4950
House: Democrats	.3092	.2908	.2977	.3000	.3069	.2977	.2356
Republicans	.1908	.2092	.2023	.2000	.1931	.2023	.2644
Total House	.5000	.5000	.5000	.5000	.5000	.5000	.5000
TOTAL	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Berlin and five new states entered the *Bundesrat* which consequently changed the relative weighting of votes. Since unification, states which previously had five votes now have a weight of six votes. Today, most states have four votes, with four states given only three votes (Bremen, Hamburg, Saarland and Mecklenburg-Vorpommern). Due to this institutional modification, states which prior to unification had a total of four votes have lost a higher amount of relative voting power than the others. At the same time, the *Bundestag* was enlarged to 662 members. Due to the specifics of residual mandate allocation in the German electoral system, the *Bundestag* of 1994 has 672 members.

These institutional modifications extend our cross-national comparison to include a unification dimension, and we will see how German unification changed the collective power relationship in German multi-chamber legislation. Unlike in the *Bundesrat*, the game-theoretical power configuration of the German *Bundestag* remains approximately the same: in 1990 and 1994, the Greens and the former East German Communists, the PDS, exchanged their dummy player position of having no formal voting power. The Christian Democrats (CDU/CSU) are still the only parliamentary group able to form a winning coalition with a single coalition partner. For bicameral legislative power distribution, the most important institutional change to emerge from German unification was the loss of the *Bundesrat*'s decisiveness, while the parliamentary party group constellation in the *Bundestag* empirically excludes a deadlock configuration. The effect is a narrow shift in the collective formal voting power relationship between the *Bundestag* and the *Bundesrat*. Here, the less efficient *Bundesrat* benefits in cases where its consent is required.

Compared to German bicameralism, our application of American Bicameral Parliamentarism of two-chamber bargaining differs in two important ways. First, the 535 members of Congress must be considered as in-

dividual actors. Second, we should not ignore what was referred to above as the third legislative component. Whereas German voting power values are calculated on weighted corporate entities, we use Shapley and Shubik's individual analysis of American tricameralism for our power analysis. In this respect, our power calculation includes 536-faculty permutations of individual American legislative actors. We will also take the American legislative scheme more precisely into account. In contrast to the Shapley and Shubik approach, we will compare our American and German applications of Bicameral Parliamentarism by focusing on the internal institutional coalition problems of their first and second chambers. For the present, we disregard the veto right of the American president. We do not support Shapley and Shubik's 'trick' to model American tricameralism, suggesting a similar collective power share for both congressional chambers. They modified the non-decisiveness of the even number of senators by introducing the vice-president as an additional 'full' senator. Let us first consider the fact that the vice-president may only vote in a senatorial deadlock configuration. So, his tie-breaking position corresponds to an additional dimension of American legislation.

Due to the senatorial tie-breaking position of the American vice-president, our application of American Bicameral Parliamentarism may be widened to include a limited third dimension of power. This third dimension of vice-presidential parliamentary power becomes relevant in those instances where more than half of the members of the House of Representatives and a total of 50 senators voted for a bill.

Our calculation of American two-chamber bargaining shows the less efficient Senate to be less powerful than the House of Representatives. The latter is provided with half the formal voting power, whereas the lower institutional efficiency of the American Senate leads to an additional chamber, resolving a senatorial deadlock configuration. If the senators fail to form an absolute majority, the American Constitution empowers the vice-president to make a decision.

As already mentioned above, our parallel research strategy of legislative schemes favours the corporate concept of German actors, whereas the American system is based on individual actors, who can subsequently be aggregated on party affiliation (see Table 1.2). With the exception of the last elections, the Democrats' voting power has continued to grow in the Senate, and since the 100th Congress, the Democrats have had a power majority either in the House or in the Senate. This Democratic majority would suggest a capacity of the Democrats to shape two-chamber legislation. We should not forget the empirical result that both multi-chamber applications of Bicameral Parliamentarism allocate approximately half of collective voting power to their first and second chamber. Both point to the balanced two-chamber power distribution defined either by German bicameralism or

limited American tricameralism. Moreover, such legislative procedures can be complemented by administrative actors who, thus, can change the formal power distribution. Since the emergence of modern bureaucracies, the political power of administrative actors has been referred to executive policy leadership, and the presidential veto right formally brings the American administration into the legislative procedure. Our applications of Bicameral Parliamentarism concentrated on two-chamber power distributions which correspond to the stage of collective decision-making at which most bills are conciliated and amended. In our following Policy Leadership applications we will include all participants in both multi-chamber systems. In this sense, the power relationship of the executive Policy Leadership applications reflect all stages of both legislative procedures.

### *The Role of Executive Policy Leadership*

The Policy Leadership application supplements our applications of Bicameral Parliamentarism by taking into consideration the potential of administrative actors to block or to set bills on the legislative agenda. This Policy Leadership application of political coordination allows us to combine both the formulation and decision rights, thereby pointing to the legislative position of German ministers and the American president. In both multi-chamber systems, the inter-institutional distribution of power between both chambers is approximately equal, and our parallel research strategy will reveal the role, or the effect, of the executive actors on the power distribution in both federal systems.

The organization of the German government is derived from different principles. Institutionally, political leadership is based on the powerful position of the Chancellor who has the organizational power to create and dismantle portfolios. The Chancellor, as the only member of cabinet elected by parliament, nominates his ministers, who are then responsible for their own departments. Most bills are initiated by government and drafted by a minister. The German application of Policy Leadership includes the government as an additional proactive actor in federal legislation. If the consent of the *Bundesrat* is required, German legislation is characterized by a three-chamber situation comprising government, parliamentary groups of the *Bundestag* and members of the *Bundesrat*.

Compared to the limited tricameralism of our application of American Bicameral Parliamentarism, German government is pivotal if more than half the members of the *Bundestag* and more than an absolute majority of the *Bundesrat* have voted for a bill. German unification changed the size of both *Bundestag* and the *Bundesrat*.

Our calculation of German tricameralism provides German government with approximately 40 percent of the voting power before and after unifi-

Table 3.1. Voting Power, German Policy Leadership

Term Time Period	10 3.83-4.85	10/11 4.85-4.87	11 4.87-5.88	11 5.88-6.90	12 1.91-4.91	12 4.91-10.94	13 10.94-
Government							
<i>Bundesrat:</i>							
CDU	.3899	.3899	.3899	.3899	.3915	.3915	.3915
SPD	.1643	.1643	.1643	.1643	.1640	.1640	.1640
FDP	.0548	.0548	.0548	.0548	.0547	.0547	.0547
Grüne/B90	.0548	.0548	.0548	.0548	.0547	.0547	.0547
PDS	—	—	—	—	0	0	0
Total <i>Bundesrat</i>	.3288	.3288	.3288	.3288	.3280	.3280	.3280
<i>Bundesrat:</i>							
6-vote states (0/4)	—	—	—	—	.0250	.0250	.0250
5-vote states (4/0)	.0362	.0362	.0362	.0362	—	—	—
4-vote states (3/8)	.0282	.0282	.0282	.0282	.0166	.0166	.0166
3-vote states (3/4)	.0174	.0174	.0174	.0174	.0119	.0119	.0119
Total <i>Bundesrat</i>	.2815	.2815	.2815	.2815	.2806	.2806	.2806
TOTAL	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 3.2. Voting Power, American Policy Leadership

Term Time Period	98 83-85	99 85-87	100 87-89	101 89-91	102 91-93	103 93-95	104 95-
President	.1631	.1631	.1631	.1631	.1631	.1631	.1631
Vice-President	.0027	.0027	.0027	.0027	.0027	.0027	.0027
Senate: Democrats	.1905	.1946	.2278	.2319	.2319	.2360	.1946
Republicans	.2236	.2195	.1863	.1822	.1822	.1781	.2195
Total Senate	.4141	.4141	.4141	.4141	.4141	.4141	.4141
House: Democrats	.2598	.2443	.2501	.2521	.2579	.2501	.1980
Republicans	.1603	.1758	.1700	.1680	.1622	.1700	.2221
Total House	.4201	.4201	.4201	.4201	.4201	.4201	.4201
TOTAL	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

cation. In German multi-chamber legislation the unitary governmental actor shares voting power with parliamentary groups and members of the *Bundesrat*. In cases where the consent of the *Bundesrat* is required, the collective share of the *Bundesrat* has remained less than 30 percent, even after unification. In this respect, the German government and its coalition parliamentary majority have enough formal voting power to continue to dominate German legislation.

Although the American president is responsible for American policy, his policy leadership position is not exactly comparable to the role of German government. On the one hand, his veto right establishes a powerful presidential legislative position. On the other hand, his executive competence is somewhat restricted. The president shares organizational power with Congress, and for most of his senior appointments he needs the consent of the Senate. Because leadership of the Congress is considered to be fragmented through the committee system, congressmen have informally conferred on the president both the authority and the responsibility to propose legislation (Lindblom, 1968: 72). The American legislative process includes a series of checks-and-balances which interlock executive and legislative competences with the president able to either veto a bill or refuse his signature. The pocket veto, refusing signature, was used by Ronald Reagan to the same degree as his direct veto (Davidson and Oleszek, 1990: 235).

Considering the president as an additional administrative actor, American four-chamber legislation is further complicated by a congressional overruling of the president's veto. The overrule requires a two-thirds majority in the House of Representatives and in the Senate to pass bills lacking presidential consent. In other words, if a bill is to be passed it has to obtain presidential consent and either at least 218 members of the House of Representatives and at least 51 members of the Senate or 50 senators and the vice-president; or a qualified majority in both houses. In the first

case, the vice-president will not resolve a deadlock situation in the Senate for a bill that will be vetoed by the president. In the second case, that is, a qualified majority in both houses, the president has no pivot position. In the first case, however, the president is pivotal in any permutation, if absolute majorities in both chambers have already been achieved. If the Senate is not in a deadlock situation, the first pivot set is composed of the president, at least 218 representatives and at least 51 senators. If the vice-president is a senatorial tie-breaker, the first pivot set consists of the president, at least 218 representatives and 50 senators and the vice-president. For these sets, another link has to be mentioned: the vice-president acts as a tie-breaker only in a senatorial deadlock situation, if the president will not go on to veto the congressional position. The second pivot set is composed of the qualified majority in the Senate and the House. Our American Policy Leadership findings are based on four-chamber legislation with 537 actors participating (see Appendix, Part 2). According to Shapley and Shubik (1964: 146), formal voting power in multi-chamber legislation is distributed among the components in reciprocal relation to their membership size, where the smallest component is the most powerful and so on. No chamber is powerless and no chamber obtains more than 50 percent of formal voting power.

Our Policy Leadership results still support the latter assumption, but the power ranking may, nevertheless, be seen as corroborating evidence. If vice-presidential power plays a role, the Senate loses some collective voting power. Similarly, while the institutional efficiency of the Senate is increased from outside, the larger House of Representatives becomes more powerful than the smaller Senate. In senatorial deadlock situations, the additional power excess of a non-decisive Senate is transferred to an external actor who strengthens the presidential position rather than the Senate. Thus, one may add the vice-presidential power share to that of the president. However, it is inappropriate to model and count the vice-president as a full senator. The individual formal voting power of 537 American Policy Leadership actors may be subsequently aggregated according to their Republican or Democratic party affiliation (see Table 1.2). The Democratic majority in the House of Representatives was provided with approximately 0.25 of voting power during the period under study. Since the 100th Congress, the Democratic majority in both chambers was confronted by 1/6 Republican presidential voting power. Unified government was achieved under the Democratic presidency of Clinton, elected in 1992.

Before 1992, two kinds of divided government can be discerned. In the early 1980s, the Republican majority in the Senate still guaranteed Republican policy leadership, since it enjoyed 60 percent of voting power. However, when Republicans lost the senatorial majority, the policy leadership of the Republican president was still able to hold on to 50 percent of

Republican formal voting power. Nevertheless, American unified government does not mean a strong presidential policy leadership. The 'plurality' President Clinton could only build on a 65 percent Democratic power share.

Compared to the narrow nature of American policy leadership power, German government already enjoys approximately 40 percent of voting power. The higher asymmetry in German power distribution is further strengthened by the power shares of both coalition parties, which guarantees a comfortable advantage for administrative legislative coordination. The power asymmetry between German governmental majority and opposition was not changed by German unification. During the 1980s, the collective voting power share of the *Bundesrat* did not change, and so the congruent party majority of the governmental coalition partners remained intact, thereby facilitating the passage of German legislation.

Our Policy Leadership applications as well as our applications of Bicameral Parliamentarism still refer strictly to the specific institutional settings for both forms of multi-chamber legislation. By the 1960s, political science had developed a dominating theory as to how complex multi-chamber legislation works. The political parties can unify the separate branches of government and bring coherence to the policy-making process (Sundquist, 1988: 624). Power configurations of party-oriented majorities, in terms of divided and unified government, can be compared for both systems. Here, parties are used either as actor concepts or as the aggregation of collective power resulting from internal and inter-institutional coalition problems. By contrast, we are able to deduce a more active role of parties in the coordination of complex multi-chamber legislation. In our following application of Party Government, we will examine the different role of parties with regard to unified and divided government in both systems.

### Power in Divided or Unified Party Government

Another prominent approach used in the analysis of legislative power focuses, instead, on the strategies of parties supporting government. This party government strategy approach is related to party-oriented bargaining and assumes a coordination of legislation within majority parties. Two- or multi-chamber systems are established with the specific intention of avoiding a concentration of power. However, the decentralization of power imposes higher institutional costs on legislative decision-making. In terms of multi-chamber legislation, each chamber needs to form majorities, and usually, conference or conciliation committees are required to coordinate these decentralized majorities. The proposals made by these conciliation committees do not have to be accepted by German chambers, and the commitments of American conference committees have again to be accepted

Table 4.1. Voting Power, German Party Government

Term Time Period	10 3.83-4.85	10/11 4.85-4.87	11 4.87-5.88	11 5.88-6.90	12 1.91-4.91	12 4.91-10.94	13 10.94-
Government							
Bundestag:							
CDU	.1944	.1250	.1944	.1250	.0909		
FDP	.1944	.1250	.1944	.1250	.0909		
Total Bundestag	.3889	.2500	.3889	.2500	.1818		
Bundesrat:							
6-vote states (0/4)	-	-	-	-	-		
5-vote states (4/0)	.0694	.1250	.0694	.1250	.0909		
4-vote states (3/8)	.0694	.1250	.0694	.1250	.0909		
3-vote states (3/4)	.0694	.1250	.0694	.1250	.0909		
Total Bundesrat	.4167	.6250	.4167	.6250	.7273		
TOTAL	1.0000	1.0000	1.0000	1.0000	1.0000		

single majority

Table 4.2. Voting Power, American Party Government

Term Time Period	98 83-85	99 85-87	100 87-89	101 89-91	102 91-93	103 93-95	104 95-
President	.6850	.6850	.6850	.6850	.6850	.4781	.6850
Vice-President	-	-	-	-	-	.0027	-
Senate: Democrats	.0686	.0701	.0820	.0835	.0835	.1511	.0701
Republicans	.0805	.0790	.0671	.0656	.0656	.1140	.0790
Total Senate	.1491	.1491	.1491	.1491	.1491	.2651	.1491
House: Democrats	.1026	.0965	.0988	.0995	.0995	.1513	.0782
Republicans	.0633	.0694	.0671	.0664	.0664	.1028	.0877
Total House	.1659	.1659	.1659	.1659	.1659	.2541	.1659
TOTAL	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

without modification by each chamber (Davidson and Oleszek, 1990: 330-2). These strong institutional restrictions characterizing the American and German legislative negotiations both favour party strategies which transfer legislative negotiations from the parliamentary platform to the party or coalition arena. For types of both legislative systems, we present a Party Government application from an executive perspective. On the one hand, both multi-chamber systems are studied with regard to unified and divided government. On the other hand, our parallel approach also shows the different coordination strategies of party-oriented bargaining, taking into account the institutional settings of both types of multi-chamber legislation.

With respect to Germany, two situations can be identified and distinguished. In the first situation, divided government of a simple majority does not favour a party-oriented strategy. In the second, a party-oriented congruent majority in both chambers, the *Bundestag* and the *Bundesrat*, was characteristic of German legislation during the 1980s. The government, the coalition partners in the *Bundestag* and, if necessary, the corresponding states in the *Bundesrat*, all profited from stable party majorities, whereas German opposition actors were excluded from legislative decision-making. The exclusion of opposition actors reduced the actor set, and, by referring to the same decision rule of absolute majority, a minimum winning coalition existed before unification between all federal coalition partners in those cases where the consent of the *Bundesrat* was not required. In this case, where actors were unanimous, the government and both parliamentary party groups had an indispensable pivot position. This simple situation of German party unanimity could only be changed where the consent of the *Bundesrat* was required. With regard to this second case of multi-chamber legislation, the amount of the states' voting power depends on the variance of their weighted votes in relation to the decision rule.

From 1983 to 1985, the six states corresponding to the governmental majority commanded over 26 votes, and in relation to the decision rule of 21 votes, the successful passage of a governmental bill did not depend on the unanimous consent of all these states. From 1985 to 1987, after the Social Democrats had won the Saarland elections, the weighted votes share of states corresponding to the parties supporting federal government was reduced to 23 votes in the *Bundesrat*. This narrow majority transformed the inter-institutional coalition problem of the *Bundesrat*, the *Bundestag* and the government to one which required the consent of all party actors. Thus, the collective formal voting power of the corresponding members of the *Bundesrat* was raised, as they had a relatively higher number of actors participating. As a result of the elections in Hesse, from 1987 to 1988 the situation in the *Bundesrat* changed again.

During the process of unification, the unanimity situation was re-established after the breakdown of the CDU majority in Schleswig-Holstein. The institutional modification with respect to the number of *Bundesrat* members and the electoral success of those parties supporting government in the new states provided the governmental parties with 35 of the 68 votes in the new enlarged *Bundesrat*. Under these circumstances, no corresponding state vote was indispensable and the collective formal voting power of the *Bundesrat* was higher than before or during German unification. In spring 1991, the Social Democrats won the elections in Hesse and Rheinland-Palatine. As a result, the congruent majority of the parties supporting government in both German chambers broke down. In Germany, a simple majority of divided government can establish a situation of federal legislative counter-government in those cases where the *Bundesrat's* consent is required to get legislation passed. Where there are two simple majorities, a German party government strategy will not be applied to coordinate German multi-chamber legislation.

The application of a Party Government strategy in the United States is hindered by the low degree of organizational cohesion typical of American parties. All the same, an American Party Government strategy may be in a position to overcome high institutional restrictions on American legislation. Those restrictions, referred to as the system of legislative checks-and-balances, are also reflected in a fairly independent majority formation in each chamber. Moreover, due to the brevity of 2-year legislative terms, time for cohesive group formation is limited. Despite these differences from the German system, an application of the American Party Government strategy may still be used to illustrate the coalition problem of divided and unified government in American legislation. In his review of literature on American political parties, Ranney (1954: 36) found that President Wilson was the first to attack the principle of separation of powers by accepting the political party as the unifier of the separate

powers. Truman (1971: 531–2) observed American political parties as the sole efficient means of producing union between the executive and the legislative branches of the government, and for Cummings and Wise (1985: 248) parties perform vital functions in the American political system, because they link various branches and levels of government. We will examine how unified and divided government will affect the Party Government strategy in American politics. In the past, unified government offered few Democratic presidents a proactive legislative role. This proactive role corresponds especially to the intention of changing the legislative status quo. A proactive change of American legislative status quo is institutionally determined by the inherent difficulty of forming party-oriented majorities in both houses.

When considering proactivism, the matter of congressional overrule may be ignored because the executive is interested in the passage of a bill. By contrast, divided government almost forced Republican presidents to follow a reactive party strategy. Reactivism in this sense refers to the intention of blocking Democratic legislation and sustaining congressional overrule. Thus, divided government emphasized the right to the presidential veto where Republican presidents could use their veto to block legislation, initiated by Democratic majorities in Congress. The reactive party-oriented strategy of a Republican president is operational when either one-third of representatives or one-third of senators upholds his presidential veto. The blocking of congressional overrule was the main goal of a reactive Republican strategy. The pivot position of a president is only removed in the small block of one-third of the senators and one-third of the representatives. The pivot set of members of Congress is, as a consequence, limited, and representatives or senators only have pivotal positions with regard to their opportunity of overruling a presidential veto.

Although the reactive role of the president is restricted to a blocking power, a Republican party strategy can increase the formal voting power of the president to 0.685. The Senate is provided with 0.149 and the House of Representatives with 0.166 of a priori voting power in American legislation. During the period under study, a reactive strategy was always possible in cases of divided government. For 2 years, the unified government scenario rendered possible a proactive role for President Clinton. Compared to a reactive strategy, in this period the proactive president lost 1/3 of formal voting power and still had to mobilize his congressional party allies. President Clinton has now lost his proactive legislative power position for the 104th Congress. Nevertheless, his position will be more powerful with regard to his blocking capacity. Whereas a Party Government strategy in Germany excludes opposition actors in times of unified government, an American Party Government strategy reflects unified and divided government by changing the presidential legislative role. This distinction

between reactive and proactive power corroborates the second assumption of Shapley and Shubik (1964: 146), who restricted the voting power of a single chamber in multi-chamber legislation to a maximum of 50 percent.

### Conclusion

What can we conclude from this look at the distribution of power in American and German multi-chamber legislation? First and foremost, we are able to transform complex macro-institutional settings into micro-scale power shares for legislative actors. For this part of the analysis, we relied on the Shapley index to calculate formal voting power in multi-chamber legislation, and presented a feasible approach as to how to compute power values even in complex individual or corporate multi-chamber systems. But multi-chamber systems can also be examined with respect to their legislative schemes. We outlined our criteria for the type of actor, the type of decision rule and the combination of subgames. Thus, game-theoretical analyses can be applied to different concepts of legislative schemes and our parallel research strategy compares both types of multi-chamber legislation. Our three applications, first of Bicameral Parliamentarism, second of Policy Leadership and third of Party Government, are based on different combinations of formal settings and legislative schemes which also reflect different approaches to political coordination in both types of multi-chamber legislation.

As an empirical result, both applications of Bicameral Parliamentarism underline a balanced power relationship between first and second chambers, which can be altered by a change in their relative levels of institutional efficiency. In Germany, institutional efficiency was partially modified by German unification, whereas the American bicameral balance of power may be changed in terms of a senatorial deadlock situation.

Our American Policy Leadership application emphasizes the different positions of executive actors in both legislative systems. Here, we presented a four-dimensional solution that is best suited to reflect the formal institutional settings of American checks-and-balances. In Germany, the government holds a powerful Policy Leadership position concerning legislative agenda setting. In contrast to this, a narrower sharing of legislative blocking power is characteristic of American administrations.

Our third application focuses on party government strategies with respect to divided and unified government. Both of these party power configurations may transfer legislative negotiations from the parliamentary platform to the party arena of government supporting parties. In German multi-chamber legislation, unified government, as dual majorities for government supporting parties in both chambers, corresponds with the exclu-

sion of opposition actors. The divided government of both chambers may establish a counter-government where the legislative consent of the *Bundesrat* is required. Divided government in the American legislative system is the more prevalent legislative power configuration, which increases the reactive power of American presidents. American divided government practically restricts American presidents to keeping the legislative status quo. In this instance, a reactive president becomes the central veto player in multi-chamber legislation, whereas unified government may offer a proactive role to American presidents. In general, a proactive president is less dominant than a reactive president, and in particular, plurality presidents like President Clinton rely on a narrow legislative power majority with their supporting party allies.

## APPENDIX

### 1. The Shapley Index

Let  $v$  be a simple  $n$ -person game on the player set  $N$ . For any player  $i$  the Shapley index is defined by

$$\phi_i(v) = \sum_{K \subseteq N} \frac{k!(n-k)!}{n!} [v(K) - v(K \setminus \{i\})] \quad (1.1)$$

where  $n$  and  $k$  are the cardinal numbers of  $N$  and  $K$  respectively. Note that the Shapley index can also be expressed by the formula

$$\phi_i(v) = \frac{1}{n!} \sum_{p \in S(N)} [v(K_i(p) \cup \{i\}) - v(K_i(p))] \quad (1.2)$$

where  $S(N)$  is the permutation group of  $N$  and  $K_i(p)$  is the set of players preceding  $i$  in permutation  $p$  of  $S(N)$  (see Vorob'ev, 1977: 159-60).

### 2. The Shapley Index for American and German Policy Leadership

In the following we introduce the mathematical calculus of the Shapley index for German and American multi-chamber legislation. For both applications we present the solutions of the most complex legislative schemes, the German and the American Policy Leadership application.

American four-chamber legislation consists of  $n = 537$  actors. Since every senator and every representative makes an equal contribution to the success of a voting sequence within their chamber, the number of 'different' permutations is decreased from the cardinal number  $\#S(N)$  of the permutation group to

$$\#S'(N) = \frac{537!}{100! 435!} \quad (2.1)$$

The president is pivotal if there have voted:

	before him			after him		
	VP*	S	R	VP	S	R
	0-1	51-66	218-435	1-0	49-34	217-0
or	0-1	67-100	218-289	1-0	33-0	217-146
or	1	50	218-435	0	50	217-0

and with regard to equation (1.2) the president's voting power is calculated by:

$$\begin{aligned} \phi_p(\nu) = & \frac{1}{\#S'(N)} \left[ \sum_{m=218}^{435} \sum_{n=51}^{66} \sum_{p=0}^1 \frac{(m+n+p)! (435+100+1-m-n-p)!}{m! n! (435-m)! (100-n)!} \right. \\ & + \sum_{m=218}^{289} \sum_{n=67}^{100} \sum_{p=0}^1 \frac{(m+n+p)! (435+100+1-m-n-p)!}{m! n! (435-m)! (100-n)!} \\ & \left. + \sum_{m=218}^{435} \frac{(m+50+1)! (435+50-m)!}{m! 50! (435-m)! 50!} \right] \quad (2.2) \end{aligned}$$

A representative is pivotal if either the president, 217 representatives and at least 51 senators, or, without the president, 289 representatives and at least 67 senators, or 50 senators, the president, the vice-president and 217 representatives voted before him:

	before him				after him			
	P	VP	S	R	P	S	VP	R
	1	0-1	51-100	217	0	1-0	49-0	217
or	0	0-1	67-100	289	1	1-0	33-0	145
or	1	1	50	217	0	0	50	217

\* VP = vice-president; S = senators; R = representatives; P = president.

and a representative's voting power is calculated by:

$$\begin{aligned} \phi_R(\nu) = & \frac{1}{\#S'(N) \cdot 435} \left[ \sum_{n=51}^{100} \sum_{p=0}^1 \frac{(217+1+n+p)! (217+100+1-n-p)!}{217! n! 217! (100-n)!} \right. \\ & + \sum_{n=67}^{100} \sum_{p=0}^1 \frac{(289+n+p)! (145+1+100+1-n-p)!}{289! n! 145! (100-n)!} \\ & \left. + \frac{(217+50+1+1)! (217+50)!}{217! 50! 217! 50!} \right] \quad (2.3) \end{aligned}$$

A senator is pivotal if either the president, 50 senators and at least 218 representatives, or 66 senators, more than 290 representatives and not the president have voted before him. Because the vice-president has a tie-breaking position within the Senate, a senator is also pivotal, if the president, the vice-president and 49 senators voted before him:

	before him				after him			
	P	VP	S	R	P	VP	S	R
	1	0	50	218-435	0	1	49	217-0
or	0	0-1	66	290-435	1	1-0	33	145-0
or	1	1	49	218-435	0	0	50	217-0

and the voting power of a senator is calculated by:

$$\begin{aligned} \phi_s(\nu) = & \frac{1}{\#S'(N) \cdot 100} \left[ \sum_{m=218}^{435} \frac{(50+1+m)! (49+435+1-m)!}{50! m! 49! (435-m)!} \right. \\ & + \sum_{m=290}^{435} \sum_{p=0}^1 \frac{(66+m+p)! (33+1+435+1-m-p)!}{66! m! 33! (435-m)!} \\ & \left. + \sum_{m=218}^{435} \frac{(49+1+1+m)! (50+435-m)!}{49! m! 50! (435-m)!} \right] \quad (2.4) \end{aligned}$$

The vice-president is a limited fourth chamber if the president, exactly 50 senators and at least 218 representatives have voted before him: limited because his vote depends on the presidential vote before him and he is only pivotal if there are:

	before him			after him		
	P	S	R	P	S	R
	1	50	218-435	0	50	217-0

The vice-president's power value is calculated as:

$$\phi_{VP}(v) = \frac{1}{\#S'(N)} \sum_{m=218}^{435} \frac{(50+1+m)! (50+435-m)!}{50! m! 50! (435-m)!} \quad (2.5)$$

During the 10th term of the German *Bundestag*, Policy Leadership is defined by a set of  $n = 15$  participating actors. This sample consists of four parliamentary party groups as corporate actors of the *Bundestag* (BT), ten German states (BR) and one administrative actor (A). Thus, German government is pivotal in one of all  $15!$  voting sequences, if there are

before it the (weighted) votes of		after it the (weighted) votes of	
BT	BR	BT	BR
250 to 498	21 to 41	248 to 0	20 to 0

A parliamentary party group with the weighted vote  $w$  is pivotal, if there are

before it the (weighted) votes of			after it the (weighted) votes of		
A	BT	BR	A	BT	BR
1	250- $w$ to 249	21 to 41	0	248 to 249- $w$	20 to 0

Finally, one of the 10 German states with weighted vote  $w$  is pivotal, if there are

before it the (weighted) votes of			after it the (weighted) votes of		
A	BT	BR	A	BT	BR
1	250 to 498	21- $w$ to 20	0	248 to 0	20 to 21- $w$

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