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BARGAINING THEORY AND PORTFOLIO PAYOFFS IN EUROPEAN COALITION GOVERNMENTS 1945-1983

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ABSTRACT

The distribution of cabinet posts in multiparty coalition governments in twelve European countries in the period 1945-1983 is considered. The efficacy of three payoff theories, namely Gamson's proportional payoff, the kernel and the bargaining set, as predictors of portfolio distribution, are compared. It is found that the Gamson predictor is superior in five countries which tend to be characterized by a relatively unfragmented political system, while the bargaining set is more appropriate in the highly fragmented political systems. The kernel can be disregarded as a payoff predictor. The results provide some empirical justification for the restricted (B_2) bargaining set as a payoff predictor in simple voting games with transferable value.

BARGAINING THEORY AND PORTFOLIO PAYOFFS IN EUROPEAN COALITION GOVERNMENTS, 1945-1983*

Norman Schofield and Michael Laver

INTRODUCTION

Coalition formation has been the subject of much theoretical and empirical work in the past decade or so. The theories that have been tested all rest, one way or another, upon assumptions about the ways in which the payoff accruing to a particular coalition is distributed among its members. Yet much less empirical work has been done on the process of payoff distribution. Thus some of the fundamental assumptions of coalition theories, at least in terms of their practical application to coalition governments, have been more scantily tested. A number of theories of payoff distribution have been recently developed, however. It is the purpose of this paper to test the application of these theories to the practice of coalition government in Europe.

We begin by looking in more detail at the role of payoff theories in coalition formation. We then review both the theoretical and empirical work on coalition payoffs, especially those payoffs

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denominated in terms of cabinet posts. This sets the scene for a comparative testing of three theories, namely proportional payoffs, the bargaining set and the kernel, in terms of the ability of each theory to predict portfolio payoffs in twelve post-war European systems. This study is conducted both on a general and a country-by-country basis, since past analyses have demonstrated that differences between countries are at least as significant as those between theories.

THEORIES OF COALITION FORMATION

Two rather different kinds of theory have been used to explain the formation of coalition governments in Europe. One theory assumes that the political game is essentially one of policy formation. Thus, suppose that a particular set of parties each has a preferred policy position on a single dimension of policy. Such theories would imply that any successful coalition must contain the party with the median member on that dimension. It is also possible to argue that, as the ideological diversity of a potential coalition increases, then the parties concerned will find it increasingly difficult to find a common policy. On this basis a number of authors have predicted the formation of those coalitions that have the least ideological diversity (see for example Leiserson, 1966, 1968 and Dodd, 1974, 1976). In a similar fashion, de Swaan (1970, 1973) proposed a "policy distance" theory, while Axelrod (1970) suggested that minimal connected winning (MCW) coalitions should form.[1]

From the point of view of such "policy theories," the distribution of cabinet posts within the coalition is not of great importance. In some cases, however, it is perfectly reasonable to suppose that the relevant policy space is multidimensional. When different parties have different policy emphases on such dimensions, the nature of the distribution of portfolios can be highly salient (Browne and Feste, 1975).

In addition, there have also been a number of analyses of coalition formation in a two dimensional policy space that emphasize either the idea of connectedness (Grofman, 1981, 1982) or of policy bargaining (Winer, 1979 and Ordeshook and Winer, 1980). However, if the policy space has _more_ than two dimensions, then every coalition becomes unstable (Schofield, 1978, 1980). This phenomenon is most obvious in a voting game with _transferable value_.

Suppose, for example, that the only concern of each party is to enter government and maximize the number of cabinet posts that it controls. In this case _any_ distribution of cabinet posts to the members of a coalition is unstable. A new coalition may always emerge such that some members of the _old_ coalition can be seduced away with higher potential payoffs. In a transferable value game, any prediction that a particular coalition is most likely must always be extremely tenuous and based on rather indirect reasoning. Using game theoretic arguments Riker (1962) proposed that, in a transferable value game, "minimal winning" (MW) coalitions might be expected. (A minimal winning coalition is one which is winning, but may lose no

member and remain winning.)

There have been several empirical attempts to evaluate Riker's minimal winning hypothesis (see, for example, Browne, 1971, and Taylor and Laver, 1973). Taylor and Laver found that the MCW hypothesis of Axelrod was superior to the MW hypothesis of Riker in the 1945-1971 universe of European coalition governments. However, this result was dominated by the success of the MCW hypothesis in a few countries, particularly Italy. Taylor and Laver also evaluated a number of other hypotheses. These include hypotheses that coalitions should be winning but minimize diversity and that they should be winning but minimize the number of party members.

The final hypothesis considered by Taylor and Laver is due to Gamson (1961). Suppose that there are n parties labeled $\{1,\ldots,n\} = N$ with a distribution $[w(1),\ldots,w(n)]$ of seats. Suppose further that there is a fixed number $p(N)$ of cabinet posts. If a coalition M in N forms, suppose that the _relative reward_ of party i in M is

$$p(i) = \frac{w(i)}{w(M)} \cdot p(N).$$

Here $w(M)$ is the number of seats controlled by coalition M. If j does not belong to M we assume $p(j) = 0$. In other words the number of portfolios or cabinet posts obtained by a coalition member is directly proportional to its contribution to the total weight of the coalition. Consider now two different coalitions M and M′ with $w(M) > w(M')$. For any player i belonging to both M and M′ we find

$$p'(i) = \frac{w(i)}{w(M')} p(N) > \frac{w(i)}{w(M)} p(N) = p(i).$$

Thus player i prefers coalition M' to M. On the other hand if j belongs to M' but not M then $p'(j) > p(j)$. Consequently every member of M' prefers M' to M. In this manner the coalition(s) with the smallest size (measured in seats) can be expected. Taylor and Laver called this hypothesis SW.

Table 1 reports the estimate by Taylor and Laver of success these five hypotheses: MW, SW, number of parties, diversity, and MCW. In five of the twelve countries considered the minimal winning (MW) or size theory (SW) works quite successfully.

[Table 1 here]

As far as coalition <u>formation</u> is concerned, therefore, all of these theories have been comparatively tested. All, as we have seen, rest upon explicit or implicit assumptions about the relative importance of portfolio payoffs and policy bargaining in coalition negotiations. Two features stand out from these results. In the first place, the validity of the initial assumptions can be evaluated only indirectly by looking at empirical coalition <u>formation</u>. In the second place, the specific results vary quite dramatically from country to country. This suggests that different assumptions may well be appropriate in different countries. Thus policy bargaining may well be more important in one system, and portfolio distribution in another, a possibility that certainly seems intuitively quite plausible. The rest of this paper, therefore, concentrates directly on the distribution of portfolios in coalition cabinets. This enables at least one type of coalition theoretical assumption to be put to a

direct empirical test.

PORTFOLIO DISTRIBUTION: DATA AND THEORY

Browne and Franklin (1973) have directly examined Gamson's hypothesis that the PORTFOLIO payoff to a member of a coalition should be directly proportional to its seats. They regressed the <u>actual</u> share of portfolios going to each coalition member (y) with the share predicted by Gamson (g). The data base was 324 individual parties in 114 coalitions in thirteen multiparty democracies for the period 1945 to 1969. The equation that they obtained was:

$$g = -0.01 + 1.07y \ (r^2 = .855).$$

(The model predicted by Gamson is $g = A + By$ where $A = 0$ and $B = 1$.) This is a quite spectacular result, although Browne and Franklin found that there was a tendency for the coefficients A and B to depend on the number of parties in the coalition. For example, in two party coalitions, the regression equation becomes $g = -0.05 + 1.12y$, implying that any party with less than 40 percent of the seats in a two party coalition tends to have a payoff greater than that predicted by Gamson.

Browne and Franklin called this <u>the relative weakness effect</u>: a small coalition partner in a coalition with few members would tend to receive <u>more</u> portfolios than would be expected from the Gamson hypothesis. In large coalitions with many members, however, a small party will tend to receive <u>fewer</u> portfolios than predicted by Gamson[2] (see Table 2).

[Table 2 here]

The empirical result that payoffs tend to be directly proportional to party weights, but that small parties tend to do better than expected in certain situations is extremely provocative. The relative weakness effect suggests strongly that small parties might have greater bargaining power than indicated purely by their size. This suggests the application of more formal bargaining theories.

THE KERNEL AND THE BARGAINING SET

The bargaining theories that we examine in this paper are the kernel and bargaining set. Consider a winning coalition that divides a fixed prize among its members. For the moment, assume that the prize, $y(M)$ has value 1, and consider any distribution $[y(i) : i \varepsilon M]$ summing to 1. The bargaining set and the kernel concentrate on bargaining between pairs of parties, or groups of parties, in the coalition over the allocation of this prize.

Suppose, for example, that party i pivots in the sense of being able to form a winning coalition with the set of parties N-M outside M. Then if i originally received $y(i)$, the "reward" or "surplus" for i's defection is $1 - y(i)$. It may be the case, however, that i cannot pivot, in which case perhaps two parties i and j in M pivot if they act together. In this case their surplus is $1 - y(i) - y(j)$. Now take a third party r, say, in M, and suppose r's

surplus is $1 - y(r)$. The kernel is that distribution of payoffs $[y(i) : i \varepsilon M]$ such that each party's surplus is identical to that of each other party. In this case if party i, for example, attempts to form a new coalition excluding party r then r may use his surplus to counter bribe i's new partners and form a new winning coalition himself. This process is best explained by taking a set of concrete examples.

Example 1. Finland, 1970

A four party coalition formed in July 1970 in Finland, based upon a seat distribution described in Table 3. The coalition controlled 144 seats, leaving fifty-five outside. Since 100 seats are required to form a majority, any party with forty-five seats pivots. Clearly only the Social Democratic Party (B) pivots. Pivotal groups, however, are DA, DF, AF, and DE.

[Table 3 here]

Table 3 also gives the values of the kernel payoffs, $k(i)$. To see how these are computed, suppose the Social Democrats (B) decide to form a new coalition with the Farmers Party and Conservatives. Its surplus is $1 - k(B) = 1 - 0.33 = .67$. On the other hand if the Center Party (D) attempts to counter this objection, it needs the Liberal Party (E), say, and so its surplus is

$$1 - k(D) - k(E) = 1 - 0.25 - 0.08 = .67.$$

Thus the Center Party and Liberals may together counter-bribe the

Farmers Party and Conservatives. The actual proportional reward $[y(i) : i \varepsilon M]$ is also given in Table 3, together with the Gamson prediction $[g(i) : i \varepsilon M]$. Notice that the relative weakness effect is visible in this case; that is to say the two smallest parties (Liberals and Swedish Peoples Party) receive higher payoffs than would be expected from the Gamson prediction. Moreover, this phenomenon is not accounted for by the "lumpiness" of the payoff. Eighteen portfolios were actually distributed; the Liberal Party should have received one cabinet post according to Gamson, but actually obtained two. The kernel does assign higher payoffs to these small parties than Gamson, and implicitly therefore declares these parties to have greater bargaining power than their weights alone indicate.

In a previous analysis of coalition portfolio distribution in twelve European countries from 1945-1970, the kernel and Gamson predictions were compared (Schofield, 1976). It was found that the Gamson prediction was superior. However, the kernel did catch the <u>direction</u> of most <u>mispredictios</u> made by Gamson, suggesting that the kernel was able to capture <u>aspects</u> bargaining power in coalition situations, but that it tended to exaggerate these effects. For this reason we consider an alternative bargaining notion called the <u>bargaining set</u> which is related to, but more refined than, the kernel.[3] Once more, the easiest method to elaborate this theoretical concept is by using a concrete example, although a formal definition is provided in the Appendix.

<u>Example 2: Belgium, 1958</u>

Table 4 presents the distribution of seats among the parties in Belgium after the election of June 1958. In November 1958 a two party coalition of the Christian Social Party (PSC) and Liberals (PLP) formally came into existence. Although the PSC had 83 percent of the seats within the coalition, they only received thirteen of the nineteen cabinet posts (i.e., 68 percent). The Gamson hypothesis predicts that the PSC would receive sixteen cabinet posts, so that we have another example of the relative weakness effect.

[Table 4 here]

There are eighty-seven seats outside the coalition, and 107 are needed to form a winning coalition. Consequently both the PSC and PLP are pivotal. If the PSC received more portfolios than the PLP, then its surplus would be less. According to the logic of the kernel, the PLP, with a higher surplus, could then force the PSC out of the coalition. However, the kernel prediction of 9.5 cabinet posts for the PLP is clearly counter-intuitive. Indeed, it would appear reasonable that the PSC did in fact have greater bargaining power than the PLP. Using the notion of the bargaining set, however, we can predict that the PLP has sufficient bargaining power to guarantee six posts for itself, but no more.

Suppose the PLP attempts to form a winning coalition, by excluding the PSC. Since there are 212 seats altogether, and the PLP already has twenty-one, it needs a further eighty-six. On the other hand the PSC has 104 and so needs only three seats. If the PLP "objects" to the PSC then the PSC may "retaliate" by forming a coalition either with the Belgian Social Party (BSP) or, at least formally, with the combination of Communists and Flemish Peoples Party.

Imagine that the PLP has five posts in the original coalition with the PSC. We suppose that when the PLP objects, it takes one further post for itself, leaving thirteen posts of the fourteen originally controlled by the PSC. The PLP now forms a coalition with the Belgian Social Party (BSP) and the Communists (PCB), giving the BSP seven posts say and the PCB six.

In the original coalition the PSC had fourteen posts. If it is to form a new winning counter coalition, and to be in an equally attractive situation, it only has five posts with which it can counter-bribe either the BSP and PCB. To attract the BSP away from the coalition with the Liberals it must offer it at least seven posts, leaving only twelve (rather than fourteen) for itself. Consequently the PLP can effectively blackmail the PSC to increase the number of cabinet posts which it controls. On the other hand suppose that the PLP originally has six posts. In the objection the PLP may give six each to the BSP and PCB. But then the PSC can retaliate by forming a coalition with the BSP, giving them six posts as well, thus retaining control of thirteen posts.

With thirteen posts the PSC has no objection to the PLP. Even if the PSC does form a coalition with, say, the BSP, giving the latter five posts, the Liberals may counter this objection by offering the

BSP six posts, the Communists one post, and gaining six posts for itself. Thus, in the bargaining game between the Christian Social Party and Liberals, the bargaining set asserts that the Liberals have greater bargaining power than their relative size alone would indicate, and are justified in claiming six cabinet posts.

Example 3: Finland, 1954

In the previous example the bargaining set provided a theoretical interpretation of the relative weakness effect. In that example a small party in a coalition with only two members received a greater number of portfolios than that predicted by Gamson. We now, however, provide an illustration of why the relative weakness effect need not occur in coalitions with many members.

In Finland a four party coalition (of Social Democrat Party (B), Center Party (D), Swedish Peoples Party (F) and Conservatives (G)) was formed in May 1954. Since there were 200 parliamentary seats altogether, the first two parties with 107 seats between them, could have formed a winning coalition (see Table 5).

[Table 5 here]

The distribution of portfolios that occurred was (6:6:1:1) while the Gamson prediction was (5.25:5.15:1.26:2.34). Suppose that the Social Democrats only have four cabinet posts. Following the logic of the bargaining set, consider an objection by this party to the other three parties. These three control ninety seats and therefore can form a counter coalition with either the Popular

Democrats or Liberals. Consequently the Social Democrats, in forming an objection, take five posts, and distribute four to the Popular Democrats and five to the Liberals. The three previous coalition partners need ten posts but only have four to give to the Liberals. Thus the bargaining power of the Social Democrats require that they have at least five posts. The same calculations show that the Center Party requires five posts for stability. Consider now the small Conservative Party with twenty-four seats. Since there are fifty-six seats outside the coalition, a party needs forty-five seats to be able to bring an objection to bear. Even allied with the Swedish Peoples Party (with thirteen seats) the Conservatives are unable to form an objection against either of the two large parties. Consequently the bargaining power that these two small parties have entitles them to no cabinet posts. The kernel distribution is obviously (7:7:0:0). However, the bargaining set only guarantees five posts for the two larger parties. As a result the actual distribution (6:6:1:1) is stable, according to the logic of the bargaining set.

An important distinction is apparent between the cases discussed in Examples 1 and 3. In the first example, the large size of the coalition (approximately 75 percent of all seats) means that a party needs 25 percent of all seats to pivot. The bargaining game inside the coalition is one of pivotal subgroup against pivotal subgroup. In this case the kernel performs not at all badly. However, in the third example only the two larger parties pivot, and the kernel "over estimates" their bargaining power. Since the

coalition is large (again with 75 percent of the seats) the bargaining power of all members of the coalition is reduced, according to the bargaining set. As a consequence the two larger parties can only guarantee themselves five posts. In this sense, stability is "easier" in large coalitions.

These three examples together illustrate that, while it is possible to find theoretical reasons for the relative weakness effect, the reasons themselves are conditional, not so much on gross quantitative features such as the number of parties in the coalition, but rather on quite precise aspects of the distribution of resources. A second point is that the bargaining set uses as part of its calculus the ability of coalition members to construct new coalitions to be used as bargaining ploys. In computing the payoffs which are stable according to the bargaining set, we have assumed no restrictions on possible coalitions. (This is plausible in the case of Finland, since just about every possible coalition that can form, has formed.) In particular, wide ideological differences between two parties may make them incompatible as coalition parties. This would render potential coalitions containing both parties as effectively impossible. In general, the ideological importance of policy bargaining in some systems may impose quite severe constraints upon the universe of possible coalitions.

Consequently, we might expect the bargaining set to be an accurate predictor in some countries, but not in others. Thus in the next part of the paper we turn to a comparison, across twelve European countries, of the kernel, bargaining set and Gamson predictors of portfolio distribution.

COMPARISON OF THE PAYOFF PREDICTORS OVER ALL CASES

Data was collected on the distribution of cabinet posts in 134 coalition governments (involving 406 individual cases) in twelve European countries for the post-war period (see Table 6).

[Table 6 here]

In a number of these countries (particularly Austria, Denmark, Ireland, Norway, and Sweden) a large number of the governments that formed were single party majority or minority cases. As Table 6 indicates, there were only a small number of multiparty majority governments in these countries. Since all cabinet posts in a single party government go to that party, such cases are not relevant to the analysis here. However, there were six further cases of <u>multiparty</u> but minority governments (see Table 6). In these cases it is possible to calculate the Gamson prediction of the parties in the minority coalition. However, a presumption underlying the bargaining set is that the coalition in question is winning. For this reason, these six cases were not included in the analysis.

The distribution of portfolios predicted by each of the three theories under consideration was calculated along the lines described in the previous section. The <u>actual number</u> (rather than the <u>proportion</u>) of portfolios was used to enable us to investigate the possible impact of the inevitable "lumpiness" of the payoffs involved.

(In the real world, of course, it is just not possible for a party to receive, say, 1.87 cabinet seats, <u>whatever</u> a theory might predict). The Gamson, Bargaining set, and kernel predictions for case i are referred to as G(i), B(i) and K(i) respectively.

In a particular parliamentary situation, the actual distribution of weights and the knowledge of which coalition has formed uniquely determines both the Gamson and the kernel predictions. On the other hand the bargaining set specifies a minimum allocation of posts to the various coalition members. Generally this results in a unique allocation; when a <u>set</u> of allocations is predicted in a particular situation, we used a centrally located prediction.[4]

Consequently, as Figure 1 illustrates, the distribution of weights can be said to determine the three predictors G, B, K.

[Figure 1 here]

In analyzing the relationship $Y = \beta X$, where X is one of our three predictors and Y the actual portfolio payoff, we must thus be aware that the three predictors are themselves dependent on each other, because of the manner of their definition. Figure 2 illustrates the empirical relationship between the Gamson and Bargaining set predictors for the particular set of coalitions that we studied. Table 7 gives r^2 (explained variance) in the dependent variable (actual cabinet posts allocated to each coalition member in our universe) given by our three predictors, together with the beta weights in the multiple regression

$$Y = \beta_G G + \beta_B B + \beta_K K.$$

[Figure 2 and Table 7 here]

Figures 3, 4, 5 illustrate in scattergram form the simple relationships between the dependent variable and the three predictors. These results are obtained using all 406 cases in the analysis, and contain a number of striking features. While each of the theoretical predictors bears a quite definite relationship with the actual payoffs, Gamson is obviously the most effective and the kernel the least. The <u>relative</u> efficacy of each predictor is quite clearly illustrated by the beta weights, with Gamson by far the most successful. All of the raw predictive power of the kernel, and most of that of the bargaining set appears to be a product of their interrelationship with the Gamson predictors, at least when all cases are taken together.

[Figures 3, 4, and 5 here]

We are not, of course, simply testing the proposition that there is <u>some</u> linear relationship between predictors. We are testing the much more precise proposition that payoffs and predictors are identical. The model is not just that:

$$Y = a + bX$$

(where Y is the observed payoff and X the predicted payoff) but also that $a = 0$ and $b = 1$. The coefficients a,b produced by the simple regressions for the three predictors are presented in Table 8. The t-test shows that each constant differs from zero and each slope differs from one at a significance level of 0.001.

[Table 8 here]

The values of these coefficients thus show that each theory <u>systematically</u> mispredicts payoffs, though this effect is greatest for the kernel and least for the bargaining set. Furthermore, this systematic misprediction takes the same form for each theory. Each regression has a positive constant and a slope of less than unity.

Consider the regression equation $Y = (1.18) + (0.79)G$ for the Gamson predictor. The mean number of portfolios distributed to each party in this universe is 5.63 (see Table 9). Consequently any player receiving less than approximately the mean number of portfolios will tend to actually receive more portfolios than predicted by Gamson. This relative weakness effect noted by Browne and Franklin with respect to the Gamson predictor, in fact, is valid both for the kernel and bargaining set predictors as well.[5] However, Table 8 provides some indication that the distortion of the bargaining set is somewhat less than the Gamson predictor.

To summarize the conclusions that can be drawn from the analysis of all cases up to this point, the kernel is clearly inferior to the other two theories in all respects. Choosing between Gamson and the bargaining set depends upon whether we are more concerned with the <u>strength</u> or the <u>nature</u> of the relationship between predicted and observed payoffs. Gamson is a rather better simple predictor, though its predictions have more <u>systematic</u> distortion on the basis of these results. A relative evaluation of these <u>deductive</u> theories, therefore, is ambiguous on the basis of these results. Further light can be thrown on this matter, however, by an analysis of mispredictions.

[Table 9 here]

In order to do this, the "notional" residuals were calculated reflecting discrepancies, not between observations and the regression lines, but between observations and the Y = X line, for the three predictors G, B and K. That is to say for each theory, X, and observation we compute the error $E_X = Y - X$.

A notional "variance explained" for theory X is then given by

$$r^2 = 1 - \frac{\text{variance}(E_X)}{\text{variance}(Y)}.$$

The results are reported in Table 9. As we should expect, the mean level of misprediction for all theories is effectively zero, since overprediction within a coalition is matched by corresponding underpredictions. The variances of the theoretical mispredictions, however, are instructive. These values combine in a single figure the consequences of the scatter of observed payoffs around the line of best fit and of the systematic distortion in the payoff predictions. From these it can be immediately seen that, overall, the kernel is the least effective theory and Gamson the most.

The "notional r^2" summarizes the proportion of variance in the actual payoffs explained, <u>not by the regression line, but by the original theories</u>. Comparing these figures with those in Table 7, we get a more realistic evaluation of the performance of the theories. We see that the gap between Gamson and the Bargaining set has narrowed

a little, by virtue of the latter's slightly lesser distortion, and the the kernel looks even worse than it did at first sight, since it is both a poor, and a distorted, predictor.

There can be little doubt that the Gamson theory is the best of the three theories as an inductive predictor of coalition portfolio payoffs over all cases. Not only does the kernel perform relatively poorly, but such success as it does have depends almost entirely on the interrelationship of its predictions with those of the more successful theories. It is also clear that all theories make systematic mispredictions, overestimating big payoffs and underestimating small ones.[6]

Table 10 presents information on the regression equations of Y on the three predictors taken singly and together, but this time on data sets associated with parties of varying rank. With the largest parties (rank 1) in each coalition, the Gamson prediction is clearly the best whereas the Bargaining set tends to underpredict (a = 2.56 and b = .74). However, for parties ranking third or below in their coalition, Gamson's theory breaks down completely (r^2 = .19), whereas the distortion of the bargaining set is much less pronounced. Thus while the bargaining set predictions are slightly less distorted than those of Gamson, they are noticeably more erratic. This reflects the fact that, when the bargaining set does badly, it does <u>very</u> badly, while Gamson is better in general, a factor that will become much clearer in our discussion, below, of the country-by-country analysis.

[Table 10 here]

COMPARISON OF THE PREDICTORS ACROSS COUNTRIES

As we mentioned in the first part of this paper, empirical analyses of coalition formation have shown that different theories perform quite differently in different countries. Since the basis for coalition bargaining appears to vary across countries, there are good reasons to suppose that theories that predict coalition payoffs will also have different applications in different systems. For example, it might well be the case that ideology is not a particularly significant determinant of coalition formation in some countries. In this case the emphasis could well be on party control of cabinet positions. Such a situation more closely resembles the bargaining game over a fixed resource that is modeled by the theory of games with transferable value. Coalitions that occur in such situations might then tend to be minimal winning.

On the other hand if ideology is paramount, then one would expect to see coalitions that satisfied one of the ideological criteria, such as diversity or the MCW property. A looser indication would be whether or not the party with the median seat tended to belong to government coalitions. In these cases, cabinet posts might very well be distributed according to a normative criterion, which is essentially what the Gamson hypothesis stipulates.

Country-by-country variations in the predictive success of the various theories are reported in Table 11. For each of the twelve countries studied, this table shows the simple regression of the observed payoff on the theoretical prediction, as well as the multiple

regression including all predictors. This table also indicates those cases in which the coefficient b is not significantly different from 1 and those in which the coefficient a is not significantly different from 0. Table 11 clearly shows considerble country-by-country variation. Bearing in mind that we are looking both for high correlations and appropriate coefficients, we can immediately see that the kernel meets with little success throughout. Comparing Gamson with the bargaining set, it is clear that one model or the other fits very well for most countries. Table 12 summarizes these findings, which are also reflected in the relative sizes of the beta weights in the appropriate multiple regressions. They are, for the most part, quite unambiguous, with Gamson performing clearly better in Austria, Germany, Ireland, Luxemburg and Norway, while the bargaining set is superior for Belgium, Denmark, Finland, Iceland and Sweden. The only ambiguity can be found in Italy, where both theories do equally well on all counts, and the Netherlands where Gamson is slightly better (with a higher β coefficient in the multiple regression) but has more distortion (the simple regression coefficients differ more from predicted values).

[Tables 11 and 12 here]

The task that remains, of course, is to provide some explanation of the country-by-country variations in the apparent nature of coalition bargaining. We have already indicated the possibility that this is dependent on the balance between the ideological and distributional features of the parliamentary game for these countries. A full investigation of such matters is properly the subject of another paper, although Table 13 does summarize what seem to us to be some salient differences between systems.

[Table 13 here]

In this table we present data on the durability and type of coalitions that form, together with the size of the party system (defined as the "effective number" of parties or the reciprocal of the Herfindahl fragmentation measure; see Schofield, 1981). We notice straight away that the Gamson predictor tends to work better in countries (such as Austria, Germany and Ireland) with small party systems and stable governments. Conversely the Bargaining Set tends to be associated with countries, such as Belgium, Denmark and Finland, with larger party systems and less durable coalitions.

The difference in the sizes of the party systems associated with the two theories is particularly striking. Where Gamson works best, we are effectively dealing with two/three party systems. In such simple bargaining systems, the fact that <u>any two</u> parties can form a majority is patently obvious. The notorious instability of three actor zero-sum bargaining games will be intuitively appreciated, and the temptation to resort to some normative criterion, such as direct proportionality, might seem overwhelming. That way at least <u>some</u> stability is introduced. A norm may even emerge that this is how things "should" be done in the knowledge that, if they are not done this way, instability will reign. Conversely, as we showed in our discussion of Example 3, bargaining stability can be "easier" in large

coalitions. Bargaining will inevitably be more complex, of course, but out of this complex process a clearer indication of differences in the <u>effective</u> bargaining weight of various parties may emerge, and be reflected in payoffs. Thus the <u>qualitative nature</u> of the distributional game may well vary with the complexity of the bargaining system.

The role of ideology in the system can be indicated, as we have suggested, by the frequency of ideologically compact or connected coalitions, and this information can also be found in Table 13. The evidence here is also quite strong, with a much clearer tendency for the countries predicted best by Gamson to show more signs of ideological bargaining. There is a noticeably higher proportion of connected coalitions in this group, reflecting the possibility that more of the bargaining action concerns coalition policy, with parties resorting to some form of normative criterion such as Gamson to settle the distribution of portfolios.

CONCLUSION

It would be unwise to set too much store by these speculations, which clearly merit further investigation. In future papers, we will be reporting on direct tests of the role of <u>policy</u> payoffs in the same systems, but meanwhile we can draw some tentative conclusions about the relative impact of portfolios and ideology. It seems to be the case that Gamson works best in a set of systems characterized both by small party systems and connected coalitions.

Small party systems may produce more unstable zero-sum bargaining games (and hence a need for some distributional norm) but they also, of course, are more likely to produce connected coalitions (the scope for unconnected coalitions is much less). We must thus offer two alternative interpretations of the relative success of Gamson and the bargaining set. The success of Gamson may reflect a desire for stability in unstable situations, while that of the bargaining set reflects a recognition of the complexities of bargaining power in more complicated situations. Alternatively, it may be that in some countries it is the ideological nature of the game that is more important, and this is reflected in the incidence of connected coalitions and the consequently lesser importance of portfolio payoffs, whose distribution is determined by Gamson's normative proportionality criterion.

APPENDIX

THE BARGAINING SET

Here we give a brief formal definition of the bargaining set and kernel.

A game with transferable value for a society $N = \{1,\ldots,n\}$ is a function $v : 2^N \rightarrow \mathbb{R}$ where 2^N is the power set of N (i.e., the class of all subsets, or coalitions, of N).

The number, v(M), is the <u>value</u> associated with coalition M. We assume for any individual i in N that $v(\{i\}) \geq 0$.

The game v is <u>simple</u> if and only if there exists a class, $\mathcal{D}$, of <u>winning</u> coalitions such that

$$v(M) = 1 \quad \text{iff } M \in \mathcal{D}$$
$$v(M) = 0 \quad \text{iff } M \notin \mathcal{D}.$$

The simple game v is <u>proper</u> iff whenever $M_1, M_2 \in \mathcal{D}$ then $M_1 \cap M_2$ is nonempty. In other words only one winning coalition may form at any one time. For the voting games considered in this paper each party, i, in N has weight w(i) and a coalition M is <u>winning</u> iff

$$w(M) = \sum_{i \in M} w(i) > \frac{w(N)}{2},$$

where

$$w(N) = \sum_{i \in N} w(i).$$

Such a weighted voting game is clearly proper.

For coalition $M \in \mathcal{D}$ let $V(M)$ be the subset of $\mathbb{R}^n$ defined as follows:

$x \in V(M)$ iff (i) $x_j = 0$ for all $j \notin M$.

(ii) $x_i \geq 0$ for all $i \in M$.

(iii) $\sum_{i \in M} x_i = v(M)$.

A <u>payoff configuration</u> (p.c.) is a pair (x,M) where $M \in$ and $x = (x_1,\dots,x_n)$ belongs to $V(M)$.

One payoff configuration (y,C) <u>dominates</u> another (x,M) iff $y_i > x_i$ for each $i \in C$. In this case write $(y,C)\text{dom}(x,M)$. The <u>core</u> is the set of payoff configurations which are undominated. For a typical (proper simple) voting game the core will be empty. However, the core will be nonempty if there exists a <u>veto player</u>; a veto player is a player (or party) that belongs to every winning coalition. In the case considered here a veto player, i, is one with half the weight, i.e., $w(i) \geq \frac{1}{2}w(N)$. When the core is empty, every payoff configuration will be unstable (i.e., dominated by another). We therefore look for a solution theory to select those payoff configurations that might be "less unstable" in some sense.

Consider a p.c., (x,M), dominated by another, (y,C). The latter may be considered a "threat" by any player i in $C \cap M$ to a player j in $M \setminus C$. On the other hand suppose that there exists a p.c., (z,D), dominating (y,C), where $j \in D$, such that $z_j \geq x_j$. Then the threat by i to j may be countered by j without loss.

We make this more formal.

If L,J are two subsets of N, let T_{LJ} be the family of supersets of L which do not intersect J. Thus

$$T_{LJ} = \{A \subset N : L \subset A \text{ and } J \cap A = \Phi\}$$

<u>Definition 1</u>

Let (x,M) be a p.c. and L,J two disjoint subsets of the coalition M.

(a) An <u>objection</u> by L against J with respect to (x,M) is a p.c., (y,C) such that

(i) $C \in T_{LJ}$

(ii) $y_i > x_i$ for all $i \in L$

(iii) $y_i \geq x_i$ for all $i \in C$.

(b) A <u>counter objection</u> by J against L's objection, (y,C), is a p.c., (z,D), such that

(i) $D \in T_{JL}$

(ii) $z_j \geq x_j$ for all $j \in J$

(iii) $z_j \geq y_j$ for all $j \in D$.

(c) An objection (y,C) by L again J is said to be <u>justified</u> if there is no counter objection by J to (y,C). If L has a justified objection against J with respect to the p.c., (x,M), then write $LP(x)J$.

<u>Definition 2</u>

(a) A p.c., (x,M), is called B_1-stable if to any objection by an <u>individual</u> i against an <u>individual</u> $j \in M \setminus \{i\}$, there is a counter objection by j. Let $B_1(M)$ be the set of B_1-stable payoff vectors for M, and call $B_1(M)$ the B_1-bargaining set for M. Thus

$B_1(M) = \{x \in V(M) : (x,M) \text{ is } B_1\text{-stable}\}$

(b) A p.c., (x,M), is called B_2-stable if to any objection by an individual i against any <u>subgroup</u> $J \subset M \backslash \{i\}$, there is a counter objection by J. Let $B_2(M)$ be the set of B_2-stable payoff vector for M. Thus $B_2(M) = \{x \in V(M) : (x,M) \text{ is } B_2\text{-stable}\}$.

Suppose we write $iP_2(x)j$ when individual i has a justified objection against a subgroup $J \subset M \backslash \{i\}$ which contains j. Clearly $iP(x)j$ implies that $iP_2(x)j$.

Moreover,

$$B_1(M) = \{x \in V(M) : iP(x)j \text{ for no } i,j \in M\}$$

and

$$B_2(M) = \{x \in V(M) : iP_2(x)j \text{ for no } i,j \in M\}$$

and so $B_2(M) \subset B_1(M)$.

Note that if i objects with (y,C) then this may be regarded as an objection against the subgroup $M\backslash C$. For B_1-stability each individual j in $M\backslash C$ must be able to counter object by (z(j), D(j)), say. For B_2-stability the whole group $M\backslash C$ must be able to form a counter objection (z,D) such that $M\backslash C \subset D$ and $z_j \geq x_j$ for all $j \in M\backslash C$. Clearly a B_2 counter objection will be more difficult to effect than a B_1 counter objection. From results by Peleg (1967) and Davis and Maschler (1967) it is known for simple voting games that for <u>any</u>

winning coalition, M, the B_1-bargaining set $B_1(M)$ is nonempty. This is not the case for B_2. On the other hand there will exist <u>some</u> winning coalition, M, such that $B_2(M)$ is nonempty. In this paper we computed $B_2(M)$, when nonempty, for each winning coalition that formed. When $B_2(M)$ was empty we computed an approximation to $B_2(M)$ called $B_*(M)$. The definition and motivation behind B_* can be found in Schofield (1979, 1982).

To define the <u>kernel</u> we proceed as follows. Let (x,M) be a p.c. For any other coalition C, define the <u>excess</u> of C over x to be

$$e_x(C) = v(C) - x(C)$$

where

$$x(C) = \sum_{i \in C} x_i.$$

This excess is the amount the members of C stand to gain if they can form this coalition. Suppose now that i,j are two players in the coalition M.

Define the <u>surplus</u> of i over j to be

$S_{ij} = \max_C \{e_x(C) : C \in T_{ij}\}$. Thus i's surplus over j is the maximum excess of i over x, across all coalitions that include i but exclude j.

Say that i <u>outweighs</u> j (with respect to (x,M)) iff

(i) $x_j > 0$

(ii) $S_{ij} > S_{ji}$,

and in this case write $i\,Q(x)j$.

Define the <u>Kernel</u>, K(M), of M to be:

$$K(M) = \{x \in V(M) : i\ Q(x) j \text{ for no } i, j \in M\}.$$

It is well known that if (x,M) is a p.c. and i, j ε M, then

$$i\ P(x) j \Rightarrow i\ Q(x) j$$

(see Schofield, 1979).

Thus $K(M) \subset B_1(M)$.

The proof of this remark is obtained by showing that if i objects to another player, j, but i's excess over j does not exceed j's, then j may counter object. Thus the excess of one player over another is in some sense a measure of how much one player is underprivileged vis à vis another.

Although the kernel gives, in a general, a unique vector in V(M), it does not use all information about the bargaining possibilities. In particular, as we have seen, if two players both pivot then for their excesses to be identical, they must receive identical payoffs. This can, on occasion, lead to counter intuitive predictions. In general it is not the case that K(M) belongs to $B_2(M)$. Indeed it is precisely when K(M) appears counter intuitive that it does not belong to $B_2(M)$. It is for this reason that we make use of $B_2(M)$ in the paper.

FOOTNOTES

1. A minimal connected winning coalition is one that is <u>winning</u> (i.e., has a parliamentary majority) and <u>connected</u> (all parties in the coalition have adjacent preferred policy positions) and may lose no party yet preserve these properties.

2. In a later analysis of the data Browne and Frendreis (1980) verified that this phenomenon was not purely an artifact of the lumpiness of the data.

3. For a fuller discussion of theses bargaining notions, see Schofield (1979).

4. See Schofield (1982) for further details of the methodology involved in computing the bargaining set.

5. In comparing our results with those of Browne and Franklin, of course, account must be taken of the fact that <u>they</u> predict <u>proportion</u>, while <u>we</u> predict <u>numbers</u>, of cabinet seats. This should not affect the slopes much, but our constant of about one portfolio reflects, given a mean cabinet size of about 20 portfolios, a <u>proportionate</u> constant of about 0.05.

6. We also verified that this systematic misprediction was not purely a result of the lumpy nature of the dependent variable.

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TABLE 1

COALITION FORMATION PREDICTORS
(Taylor and Laver, 1945-1971)

Belgium	MW
Luxemburg	MW/no. parties
Ireland	MW
Iceland	diversity/SW
Norway	SW
Germany	diversity/MCW
Austria	MCW/diversity
Sweden	MCW/SW
Netherlands	MCW/MW
Denmark	MCW
Finland	MCW/MW
Italy	MCW

TABLE 2

Number of parties in coalition	Number of coalitions	Number of cases	r^2	A	B
2	54	114	.78	-0.05	1.12
3	24	72	.88	-0.07	1.26
4	26	104	.81	0.02	0.98
≥ 5	7	34	.97	0.02	0.92

Regression equations $g = A + By$ for coalitions containing different number of parties. Taken from Browne and Franklin (1973).

TABLE 3

(Finland 1970)

Parties	Seats	g(i)	y(i)	k(i)
A: Popular Democrats	36	0.25	0.22	0.17
B: Social Democratic Party	51	0.35	0.28	0.33
C: Small Farmers Party	18	--	--	--
D: Center Party	37	0.26	0.28	0.25
E: Liberal Party	8	0.06	0.11	0.08
F: Swedish Peoples Party	12	0.08	0.11	0.17
G: Conservatives	37	--	--	--
TOTAL	199	1.00	1.00	1.00

Comparison of the Gamson (g) and kernel (k) predictors of actual portfolio distribution (y).

TABLE 4

(Belgium 1958)

Parties	Seats	%	Portfolios	%	Gamson	%	B_2	%	Kernel	%
A: Communists (PCB)	2									
B: Belgian Social Party (BSP)	84									
C: Christian Social Party (PSC)	104	83	13	68	15.8	83	13	68	9.5	50
D: Liberals (PLP)	21	17	6	32	3.2	17	6	32	9.5	50
E: Flemish Peoples Party (FFP)	1									
TOTAL	212									

Comparison of the Bargaining Set, Gamson and Kernel predictions of actual portfolio distribution.

TABLE 5

(Finland 1954)

Parties	Seats	%	Portfolios	%	Gamson	%	B_2	%	Guaranteed
A: Popular Democrats	43								
B: Social Democratic Party	54	38	6	43	5.25	38	6	43	5
D: Center Party	53	37	6	43	5.15	37	6	43	5
E: Liberal Peoples Party	13								
F: Swedish Peoples Party	13	9	1	7	1.26	9	1	7	0
G: Conservatives	24	16	1	7	2.34	16	1	7	0
TOTAL	200		14						

The number of cabinet posts guaranteed by the bargaining set

TABLE 6

DESCRIPTION OF THE DATA

Country	Number	Period	Number Coalitions	Number Cases
Austria	1	Nov. 1945-Nov. 1962	8	17
Belgium	2	Feb. 1946-Nov. 1981	23	58
Denmark	3	May 1957-Jan. 1968	3	8
Finland	4	April 1945-May 1979	21	89
Germany	5	Sept. 1949-Oct. 1982	14	32
Iceland	6	June 1946-Dec. 1979	11	27
Ireland	7	Feb. 1948-Feb. 1973	3	11
Italy	8	July 1946-June 1981	22	75
Luxemburg	9	Nov. 1946-June 1979	10	22
Netherlands	10	July 1946-Sept. 1981	12	47
Norway	11	Sept. 1961-Sept. 1965	2	8
Sweden	12	Sept. 1952-Sept. 1979	5	12
		TOTAL	134	406

Multiparty but minority governments.

Country	Period	Duration (months)
Belgium	April-June 1974	2
Denmark	Sept.-Oct. 1978	1
Ireland	June 1981-Feb. 1982	8
Italy	May-Dec. 1947	7
	Nov. 1975-July 1976	8
Norway	Oct. 1972-Sept. 1973	11

TABLE 7

SIMPLE AND MULTIPLE REGRESSIONS OF OBSERVED PAYOFFS ON PAYOFF PREDICTORS (ALL CASES)

Predictor	r^2 for simple regression of predictor on payoff	Beta weight in multiple regression
Gamson	.90*	+0.73*
Bargaining set	.77*	+0.27*
Kernel	.53*	0.00

*Significant at .00001 level. Overall r^2 for multiple regression = .92.

TABLE 8

SIMPLE REGRESSION COEFFICIENTS FOR THE THREE PREDICTORS

Predictor	Slope(b)	Constant(a)
Gamson	+0.79	1.18
Bargaining set	+0.82	0.98
Kernel	+0.67	1.84

NB b = 1 a = 0 if theory is correct.

TABLE 9

ANALYSIS OF MISPREDICTIONS (ALL CASES)

Errors in Theory	Mispredictions in Portfolios Mean	Mispredictions in Portfolios Variance	Notional "r^2"
Gamson	-0.019	2.46	.84
Bargaining set	-0.012	3.95	.74
Kernel	-0.022	9.00	.40
Actual(Y)	5.63	15.00	

TABLE 10

PREDICTORS BY PARTY RANK

		Party Rank		
Simple Regression		1	2	≥ 3
Gamson	r^2	.90	.69	.19
	b	.77	.86	.40
	a	1.29	1.21	1.91
Bargaining set	r^2	.67	.57	.58
	b	.74	.62	.65
	a	2.56	1.91	.96
Kernel	r^2	.41	.36	.14
	b	.63	.41	.19
	a	4.06	2.63	2.35
Multiple Regression	r^2	.91	.79	.58
	β_G	.84	.59	--
	β_B	.14	.40	.76
	β_K	--	--	--

TABLE 11

PREDICTORS BY COUNTRY

Country		AUS	BEL*	DEN*	FIN*	GER	ICE*	IRE	ITA	LUX	NET	NOR	SWE*
Simple Regression													
Gamson	r^2	.85	.78	.88	.83	.96	.71	.98	.93	.88	.93	.56	.99
	b	$.81^x$	.74	.56	$.92^x$	$.80^x$	.62	$.94^x$	.72	$.96^x$	.85	$.72^x$	.74
	a	$.87^+$	2.04	2.63	$.30^+$	1.55^+	1.72	$.24^+$	1.77	$.29^+$	.66	1.13^+	1.86
Bargaining Set	r^2	.46	.94	.95	.95	.39	.85	.49	.92	.23	.83	--	1.0
	b	.25	1.05^x	1.09^x	$.99^x$	$.68^x$	$.85^x$	1.12^x	.89	.33	$.97^x$	--	1.0^x
	a	4.22	0.36^+	0.56^+	$.05^+$	2.41^+	$.65^+$	-0.46^+	.73	4.84	$.13^+$	--	0.0^+
Kernel	r^2	.44	.59	--	.56	.33	.49	.35	.52	.16	.52	--	--
	b	.25	$.79^x$	--	.65	$.62^x$	$.80^x$	1.0^x	.66	.29	.61	--	--
	a	4.24	1.65^+	--	1.23	2.84^+	$.89^+$	0.01^+	2.20	5.12	1.6	--	--
Multiple Regression													
	r^2	.90	.95	.95	.96	.96	.85	.98	.96	.88	.94	.56	1.0
	β_G	.77	.18	--	.20	.97	--	.99	.51	.94	.79	.79	--
	β_B	.28	.81	.98	.87	--	.92	--	.48	--	.19	--	1.0
	β_K	--	--	--	--	--	--	--	--	--	--	--	--
No. Cases		17	58	8	89	32	27	11	75	22	47	8	12

* ≡ Bargaining set predictor clearly superior.

x = not significantly different from 1 using a two tailed T test at the 0.01 level.

+ = not significantly different from 0 using a two tailed T test at the 0.01 level.

TABLE 12

RELATIVE PERFORMANCE OF GAMSON AND BARGAINING SET, BY COUNTRY

	CRITERION		
Country	Theory with Higher Simple r^2	Theory with Better Simple Coefficients	Theory with Higher beta Weight
Austria	Gamson	Gamson	Gamson
Belgium	Bargaining Set	Bargaining Set	Bargaining Set
Denmark	Bargaining Set	Bargaining Set	Bargaining Set
Finland	Bargaining Set	Bargaining Set	Bargaining Set
Germany	Gamson	Gamson	Gamson
Iceland	Bargaining Set	Bargaining Set	Bargaining Set
Ireland	Gamson	Gamson	Gamson
Italy	Equal	Bargaining Set	Equal
Luxemburg	Gamson	Gamson	Gamson
Netherlands	Gamson	Bargaining Set	Gamson
Norway	Gamson	Gamson	Gamson
Sweden	Equal	Bargaining Set	Bargaining Set

TABLE 13

COALITION CHARACTERISTICS IN THE TWELVE COUNTRIES, 1945-1983

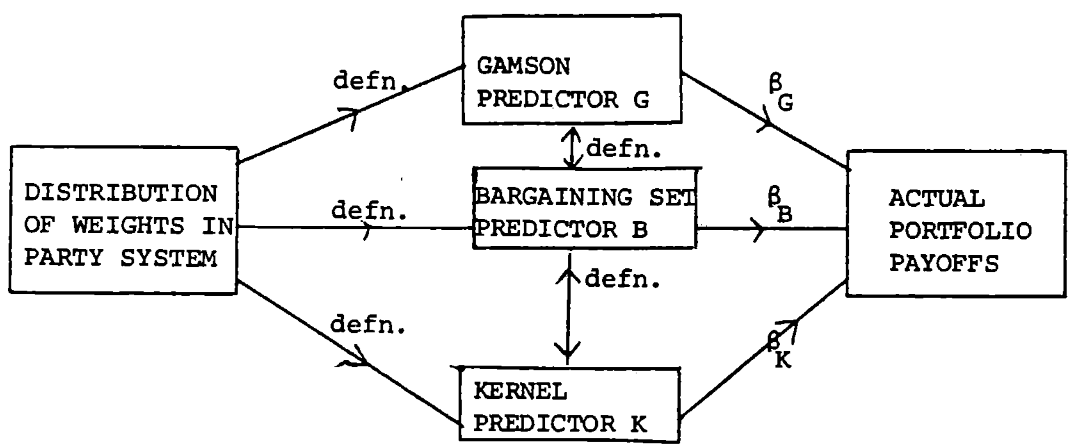
Group	Best Predictor	Country	Effective No. Parties in 1971-1983	Average Duration of Government 1945-1983	Proportion (%) of Period of Coalition Type*					Does Median Party Belong to Coalition
					MW	Connected	Unconnected	Minority	Majority	
1	Bargaining Set	Belgium	5.8	21	80	34	53	2	11	No
		Denmark	5.7	26	20	20		80		No
		Finland	5.4	14	23	36	41	33		Yes
		Iceland	4.0	34	83	51	7			No
		Sweden	3.4	27	30	--	--	64		Yes
2	Ambiguous	Italy	3.4	13	12	47	10	31	--	Yes
		Netherlands	5.4	29	36	77	17	1	--	Yes
3	Gamson	Austria	2.2	40	45	56	--	15	29	Yes
		Germany	2.5	40	74	90	10	--	--	Nearly always
		Ireland	2.5	38	30	--	30	33	37	Nearly always
		Luxemburg	3.8	43	99	86	14	--	--	No
		Norway	3.3	36	20	20	--	36	44	Yes, until 1981

Data taken from Schofield (1983).

Minority and Majority represent single party governments. Note that a minimal winning (MW) coalition may possibly be connected or unconnected.

FIGURE 1

THE A PRIORI RELATIONSHIP BETWEEN SEATS, PAYOFF PREDICTORS AND ACTUAL PAYOFFS



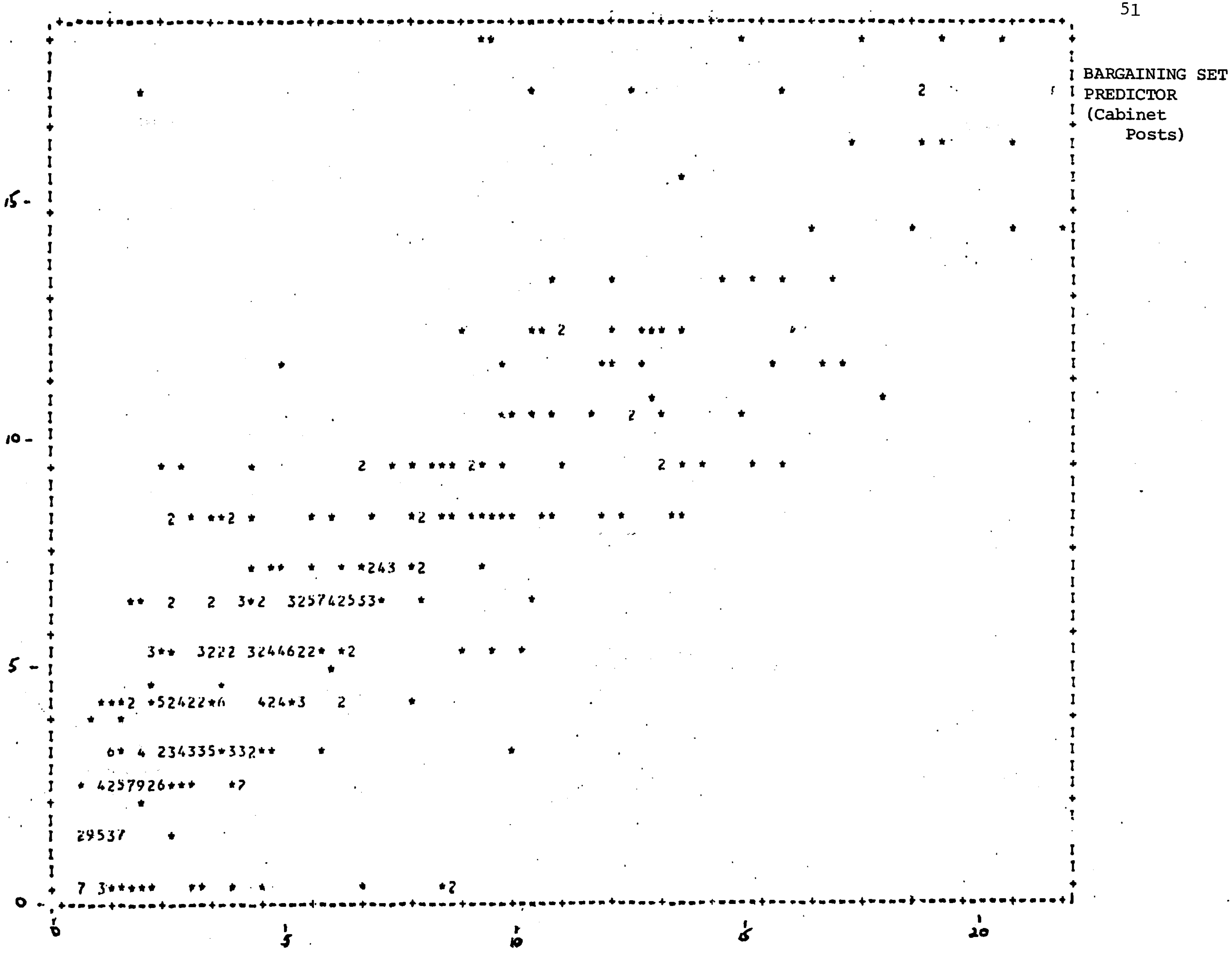
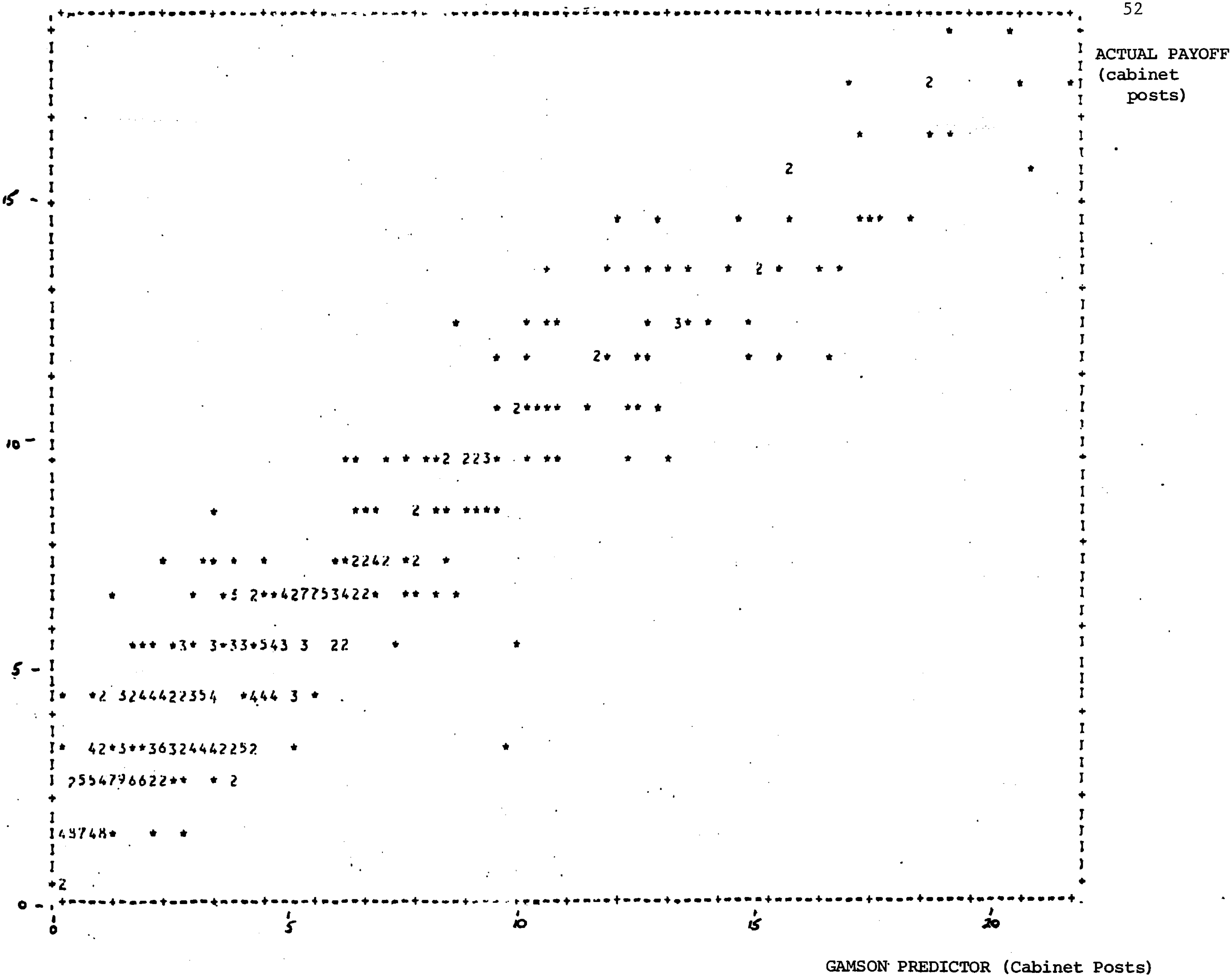


FIGURE 2

THE EMPIRICAL RELATIONSHIP BETWEEN THE GAMSON AND BARGAINING SET PREDICTORS

FIGURE 3

THE EMPIRICAL RELATIONSHIP BETWEEN ACTUAL PAYOFF AND THE GAMSON PREDICTOR



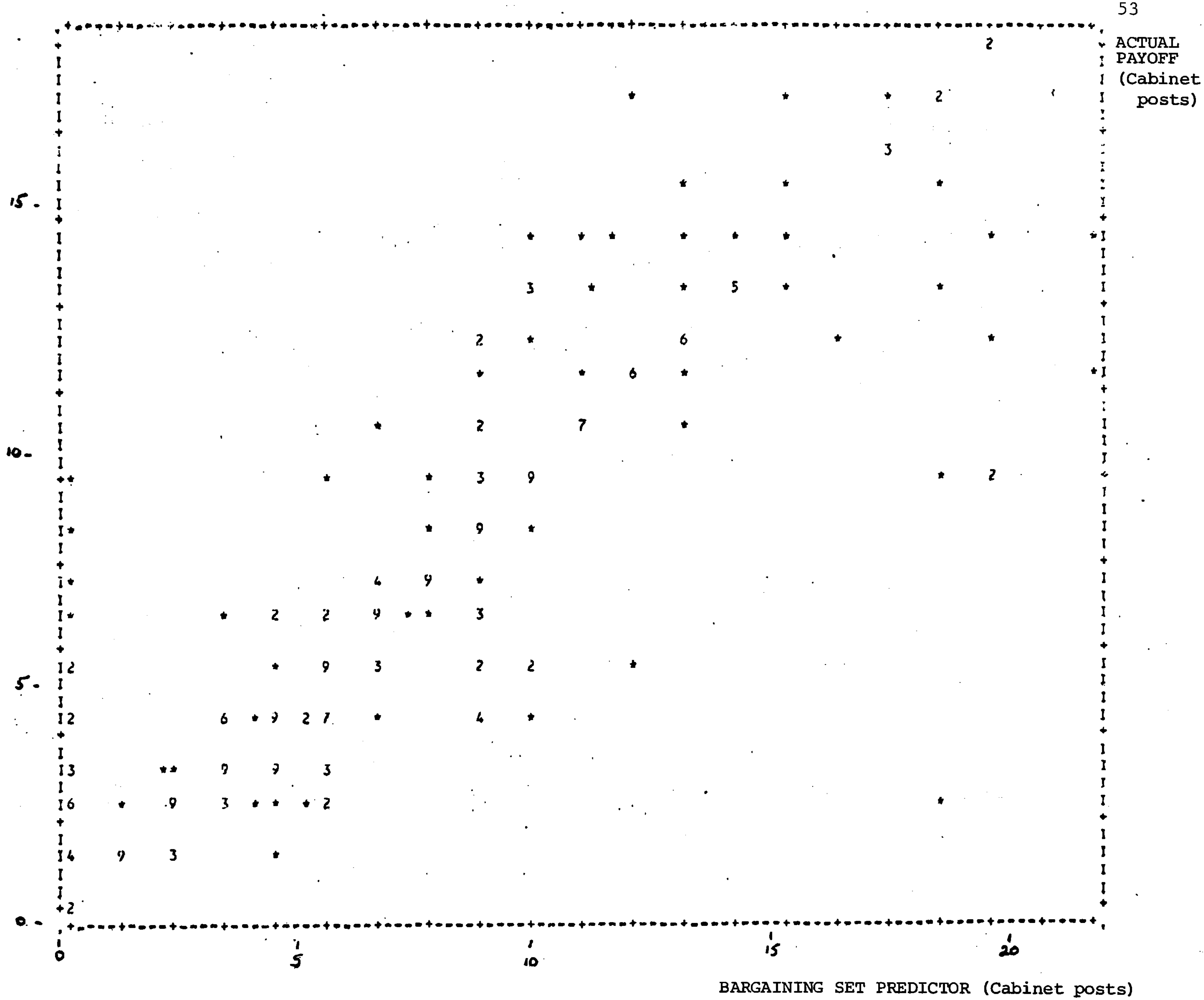


FIGURE 4

THE EMPIRICAL RELATIONSHIP BETWEEN ACTUAL PAYOFF AND THE BARGAINING SET PREDICTOR

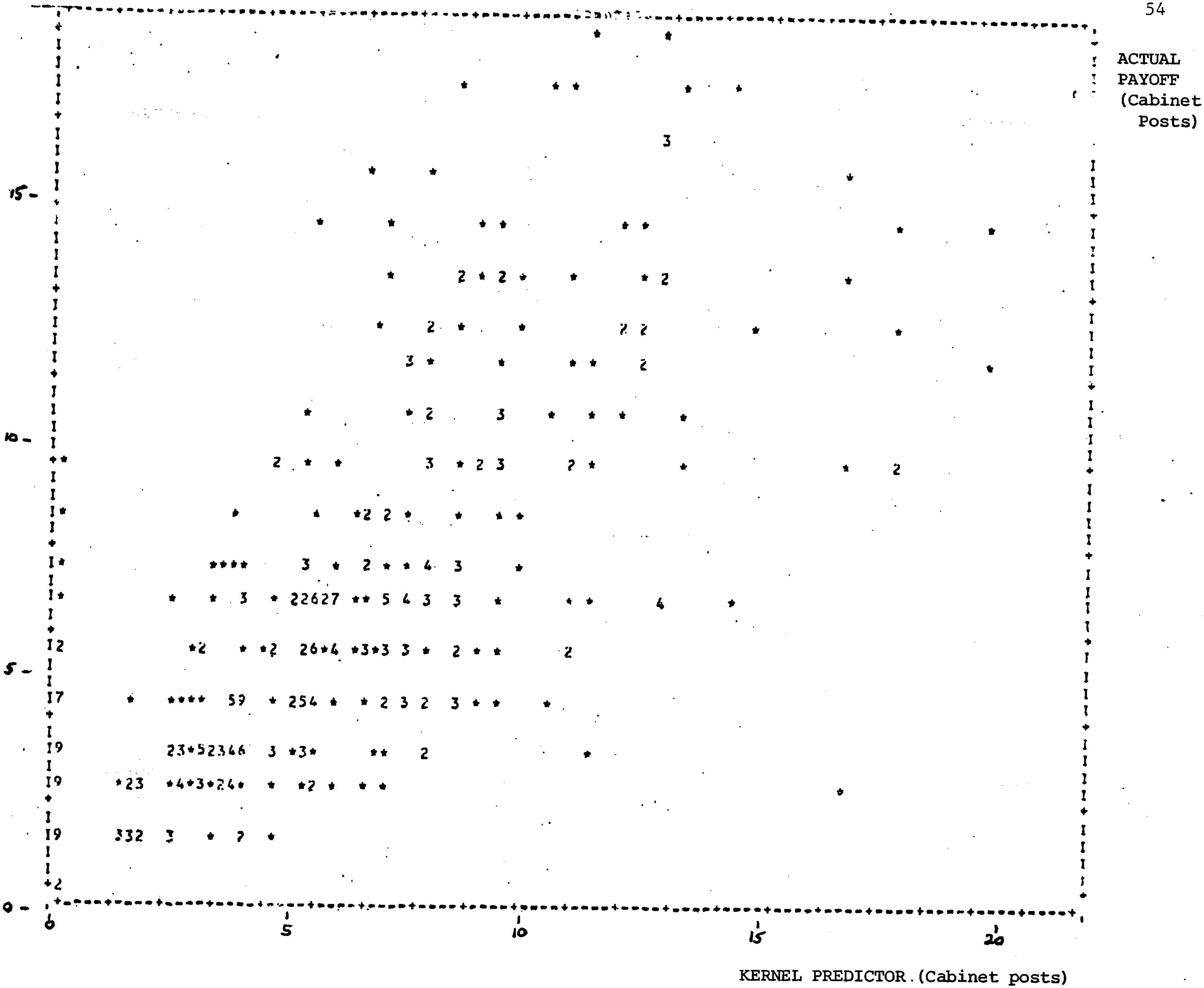


FIGURE 5

THE EMPIRICAL RELATIONSHIP BETWEEN ACTUAL PAYOFF AND THE KERNEL PREDICTOR