The Dynamics of Information Exchange:
Reevaluating the Strategic Timing of Position Taking in Congress

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Abstract

This paper examines information dissemination within legislatures and its effect on legislative decision making. Specifically, I examine the propensity for "informational cascades" to develop when members of Congress publicly announce positions on legislation. An information cascade is a pattern of conformity that arises when an individual, having observed the behavior of others, disregards his own information and follows the action of those who precede him. The cascade model predicts that legislators sometimes rationally forgo their private (constituency-based) information to "go along with the crowd." I propose that public endorsements of legislation are not simply a reaction to constituency pressures (Box-Steffensmeier, Arnold, and Zorn 1997; Mayhew 1974), but also stands as vehicle by which members of Congress hope to influence one another. The evidence demonstrates that – even on a highly salient issue such as NAFTA – the informative signals of other legislators are sometimes paramount to the preferences of a legislator's constituency.

During the Christmas shopping season of 1975, American consumers flocked to their local toy stores to purchase an unlikely hot-ticket item...the "Pet Rock." The Pet Rock was the creation of a California advertising executive, named Gary Dahl, who billed the small, gray rocks with adhesive black eyes as the ultimate low maintenance pet. In a little less than six months, Dahl sold an estimated five million units. [individuals could have made their own]

Now, imagine if such a process governed the dissemination of information within the United States Congress. Suppose a legislator was provided important policy information by a constituent, interest group, or bureaucratic agency. Determining the information to be of utmost importance to the public welfare, the legislator certainly would attempt to apprize her colleagues of the news. If the dissemination of policy information occurred in a manner similar to that demonstrated by the telephone game, the legislator certainly would not be successful in her attempt to inform her fellow policy makers. More importantly, the public welfare may have become compromised by the lack of clarity created by the flow of information in the legislative arena.

Indeed, if the United States Congress is to be both a *rational and deliberative* body, our representatives must have not only the incentive and ability to acquire new information, they also must possess the means to share that information in an unbiased manner. Over the past decade, theoretical research on information in the legislative arena (Gilligan and Krehbiel 1989; Krehbiel 1991) has suggested that Congress may meet these standards. First, these "[s]ignaling theories of legislative politics postulate that legislators are exclusively outcome oriented and thus care about... lawmaking ends" (Kessler and Krehbiel 1996, 555). Second, these models demonstrate that policy advocates within Congress — typically preference outliers relative to the median legislator — can credibly transmit private information their uninformed colleagues within chamber. Yet, with few exceptions (Kessler and Krehbiel 1996; Bianco 1997), these models do not attempt to capture the dynamics of the individual-level exchange of information within the legislature. Indeed, this class of models is generally composed of

single-shot signaling games between the committee and the floor, forsaking the *individuals* that comprise the legislative body.

This paper attempts to examine the information dissemination process between legislators and its potential effects on public policy making in the United States Congress. In doing so, I argue that a suitable model of information transmission within the legislature must capture the *political dynamics* of the process. That is, the exchange of information must be portrayed as an opportunity for influence. When legislator A provides legislator B within information, he does so in an effort to create a relationship of influence, a relationship which either creates agreement between the actors or solidifies their preexisting concordance (Dahl 1976). Secondly, an appropriate model of information flow in the legislative arena must contribute to our knowledge of public policy making. Is information transmitted in a manner which is conducive to efficient policy making, or does the dynamic process inadvertently corrupt the ability to form coherent legislation?[1]

I propose an examination of economic models of informational cascades" as a suitable blueprint for analyzing information dissemination in legislatures. I argue that the model is sufficiently political in nature and captures the fundamental elements of the transmission process. I then empirically examine the effects of information dissemination by reevaluating the logic behind the strategic timing of position taking by members of Congress. Specifically, I propose that the timing of publicly announced endorsements is not simply a reaction to public pressure to demonstrate representational agreement (Box-Steffensmeier, Arnold, and Zorn 1997). Rather, this behavior also stands as vehicle by which members of Congress hope to influence one another. Indeed, as we shall see, even on matters of foremost public interest, the influential signals of other legislators can sometimes be paramount to the preferences of a legislator's constituency.

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[1] While the telephone game example does serve to illustrate the potential ramifications of an information dissemination process, the output is simply a function of noise and the process is not guided by choice. An appropriate model must also allow the legislator to either follow the signal or not.

Informational Cascades

No single model of information dissemination can capture all of the nuances of communication within the Congress. Just as we are limited in our capacity to predict with exact precision "who speaks to whom." We also are limited, perhaps more so, in our ability to say "when" who will speak to whom. Yet, models clearly provide a foundation for forming general, theoretical expectations. In explaining information exchange within the legislature, a plausible, if not successful, model must capture the political elements of the process. First, as I have argued elsewhere (Gomez 1999), information must be viewed as an instrument for influence. Members of Congress choose to become informed, not simply as a means for decreasing personal uncertainty, but also for its productive value. An informed legislator — in that he or she possesses a fundamental component for persuasion — is a powerful legislator. Second, and perhaps most importantly, a model of information flow in the legislative arena must draw implications for the policy making process as a whole. Specifically, it is incumbent that we are able to determine whether the process allows for the production of coherent legislation or whether the process undermines this desired outcome (Austen-Smith and Riker 1987).

While legislative information theory suggests several hypotheses about the dynamics of information dissemination based upon comparative static derivations, a truly dynamic account of the dissemination process remains to be developed. To do so, I rely on the logic developed in economic models of *informational cascades*. This class of models has been very successful in explaining not only uniform behavior, such as customs, but also drastic changes, such as fads, in informative environments (Welch 1992; Bikhchandani, et al. 1992; Lee 1993; Lohmann 1994; 1998; Bikhchandani and Sharma 1996; and, Moscarini, et al. 1998). Though the informational cascades approach has had only a limited application in the study of politics (Fey 1996), I believe that the theoretical precepts espoused by these models meet the criteria of a political model. The model establishes conditions under which individuals can be persuaded, and it suggests clear implications for the overall efficiency of the dissemination process.

"An informational cascade occurs when it is optimal for an individual, having observed the actions of those ahead of him, to follow the behavior of the preceding individuals without regard to his own information" (Bikhchandani, et al. 1992, 994). Essentially, an informational cascade occurs when, at some state in a sequential choice process, a decision maker bases his choice solely on the information obtained from preceding decision makers. In turn, individuals caught in an informational cascade have no informative value themselves, they are simply unalterable transmitters of a previously communicated signal.

For expository clarity, I will provide a brief account of the tenets of informational cascade models in the form of an example.[2] Assume that members of Congress are asked to either *adopt* or *reject* a new policy proposal. It is assumed that members arrive at their decision in a sequential manner, wherein some members acquire information and make their decision early in the process.[3] Once a member reaches a decision, a public endorsement or objection to the new policy is made, so that each successive legislator observes the decisions of all that precede them. The cost *C* associated with adopting the new policy is the same for all legislators and is set to ½. Moreover, the gain derived from adoption, *V*, is similarly constant across legislators and is set to ½. Suppose, further, that each legislator privately observes an independent signal, like those from the legislator's constituency, about whether the

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[2] While the formal mathematics associated with information cascade models frequently differs, the essential theoretical mechanism remains the same in all applications. In this explication, I trace the basic assumptions of the models and review the propositions derived in previous applications. Readers who are interested in learning more about the mathematical formalization of the model may wish to consult the appendix of Bikhchandani, Hirshleifer, and Welch (1992). For a Bayesian interpretation, I point the reader to Mark Fey's (1996) examination of informational cascades as an explanation of "momentum" in primary elections.

[3] The assumption of sequentiality is essential to the model, however, the ordering of individuals is generally inconsequential to the behavior of the model, although, perhaps, not to its substantive implications. Generally, it only is assumed that ordering of individuals is exogenous and is known to all. As suggested by previous research (Gomez 1999), the exogenous factors that assign order are, in reality, probably related to the relationship between the policy and members' electoral interest. Members of Congress with a high demand for information are most likely both to acquire information and conclude their decision early in the dissemination process.

policy should be approved or rejected. Each legislator *i*'s binary signal X_i is either *A* (Approve) or *R* (Reject) and is accurate with some probability $p > ½$. Table 1 presents the probabilities associated with the alternative signals.

[Insert Table 1 about here]

Clearly, the first legislator will vote to adopt the new policy if she receives an *A* signal and vote to reject if she receives a *R* signal. The second legislator in the sequence can then infer the first legislator's signal simply by knowing her decision. If the second legislator also receives an *A* signal, the choice is clear: vote to approve the new policy. However, if the signal is *R*, then the second legislator, who now has one *A* signal (from the first legislator) and one *R* signal (from the private source) computes the expected value of adoption and determines it to be ½. Given his indifference, the second legislator chooses randomly between adoption and rejection. (Of course, the example holds when the second legislator's signals are alternated.) A third legislator now faces one of three situations:

1. The first two legislators have voted to adopt, meaning that even an *R* signal will result in legislator 3's adoption (this creates an upward cascade).
2. Both legislators have chosen to reject the new legislation, meaning that even *A* signal will result in legislator 3's rejection (creating a downward cascade).
3. Legislators 1 and 2 have adopted alternative vote choices, thereby placing legislator 3 in the same situation faced by legislator 1 at the beginning of the process.

The example clearly demonstrates the rapidity with which informational cascades can develop — the cascade can develop as early as the third sequential voter. Moreover, the substantive implications drawn from this example also illustrate the political repercussions of information flow in the legislative arena. First, informational cascades suggest an erosion of representational principles. In the example provided, a legislator caught in a cascade eschews the information provided by his constituents in favor of a position that may be directly at odds with his electors' preferences. Second, "when individuals have more precise signals of the value of adoption,... cascades tend to start sooner" (Bikhchandani, et al. 1992,

997). Indeed, Sushil Bikhchandani and colleagues (1992, 997) demonstrate that the closer p is to ½, the later a cascade is likely to start, making a reduction in "p toward ½ the equivalent to adding noise to the signal." For individual legislators looking to influence the policy outcome, the results plainly show the potential productive gains from possessing information and signaling this fact early in the dissemination process. For the legislature as a whole, the prospects for coherent public policy — policy that reflects the preferences of all involved — appear frighteningly low.

Reevaluating Strategic Position Taking

In *Congress: The Electoral Connection*, David R. Mayhew states that electorally oriented congressmen generally engage in three kinds of beneficial activity: advertising, credit claiming, and position taking. The last of these, position taking, is electorally beneficial in that stated positions allow a member of Congress to let constituents or interest groups know that he or she supports their position. In this manner, position taking validates the member's role as a representative. By publicly announcing positions of agreement on issues, the legislator achieves some measure of credibility with those he or she represents.[4] Yet, the information transmitted via announced positions is not focused singly upon the electoral constituency. Position taking also provides legislative colleagues with cues by which to determine their own position.

In a recent study, Janet Box-Steffensmeier and colleagues (1997) examined the strategic benefits associated with the timing of position taking by members of Congress. The authors clearly argued that announced positions are strategically targeted at both constituents and colleagues. Moreover, the authors assert that the *timing* of these announcements can either facilitate or hinder the member's ability to persuade. "Legislators engaged in this process are concerned not only with *how* they vote but also with *when* they announce their position on an issue" (Box-Steffensmeier, et al. 1997, 325).

[4] Of course, position taking may also be electorally damaging when announced positions are counter to the preferences of electoral constituents. See Shepsle (1972) for a discussion of the benefits and strategy of ambiguity.

According to the authors, aspects of timing may carry alternative costs and benefits for the legislator. First, early announcements may facilitate goals. By announcing a position early in the deliberation period, members (1) "can mobilize favorable constituency elements," (2) enhance their role as a policy entrepreneur, and/or (3) provide cues for others to follow (Box-Steffensmeier, et al. 1997, 325). However, an early announcement also may generate some risks. If a member's position does not match the preferences of his constituents, he can either change his position and be charged with "waffling" (Krehbiel 1995); or, the member can choose to maintain his original announced position, thereby running the risk of alienating a portion of his constituency. In either case, by choosing the "wrong" position, the member has placed himself in a lose-lose situation.

In some instances, waiting to announce a position until late into the debate may benefit the legislator. If a member detects a lack of consensus among important constituency elements, the member may wish to delay a decision until she can determine which position may be most electorally beneficial, or she may wait to see if some form of consensus between competing groups can be cultivated. However, the major benefit associated with a strategy of delay results from the possible receipt of side benefits from either the president or other legislative actors. The costs of delay, on the other hand, extend from the member's inability to capitalize upon early announcement benefits.

> "By failing to send a validating signal to their constituents, members who wait to announce their vote intention may alienate (rather than mobilize) otherwise supportive groups, resulting in a loss of electoral enthusiasm or even support" (Box-Steffensmeier, et al. 1997, 326).

Furthermore, members who delay also miss the opportunity to influence the decisions of colleagues.

The articulation of the costs and benefits associated with the strategic timing of position taking in Congress identifies an information dissemination process which is fraught with political overtones. Fundamentally, the decision to announce a position is governed by electoral motivations in conjunction with individual rationality. Yet, position taking is also an instrumental step in the republican scheme: constituency preferences and interests effect the legislator's decision to take a position; the announced

position then allows the legislator to influence others.

It is my belief that the dynamics associated with the strategic timing of position taking in Congress also may exhibit some of the characteristics associated with informational cascades. Drawing upon the Box-Steffensmeier, et al. illustration of the dynamics of position taking, the fundamental elements appear to coincide with informational cascade assumptions. First, both processes are sequential in nature, with the order of the sequence being determined by exogenous factors. Second, the articulated decision processes are corollary. The first position taker bases his or her decision upon posterior probabilities and a signal provided by a private informant, in this case, the constituency.[5] Subsequent position takers then base their decisions upon posterior probabilities, a private signal, and the additional signal provided by the preceding position taker(s).

If it can be empirically demonstrated that members of Congress forego the demands of constituency groups in favor of the informative signals provided by their colleagues, the plausibility of the informational cascade model and its ramifications for public policy must be seriously considered. Therefore, I re-analyze the findings of Box-Steffensmeier and her colleagues (1997), while directly incorporating components of the informational cascades model. Like Box-Steffensmeier, et al. before me, I will investigate two aspects of the U.S. House of Representatives' decision making process on the North American Free Trade Agreement (NAFTA) of 1993. First, I will analyze the dynamics of the information dissemination process by examining the timing of members' position announcements on NAFTA. Secondly, I will then examine the effect of the strategic timing of position taking on House member's final roll-call vote for NAFTA implementation.

Labeled as "by far the most comprehensive of all free trade agreements considered by Congress"

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[5] By defining constituencies as private informants, I am restricting the interpretation of "constituency" to be synonymous with each member's "electoral constituency" or district. In this context, the information provided by the constituency is directed solely at the corresponding representative. Since it is not conveyed to other legislators, the information may be deemed as a private signal.

(Box-Steffensmeier, et al. 1997, 326; Quinones 1994), NAFTA provides a difficult test for examining the dynamics of informative signaling by members of Congress. NAFTA was a highly salient issue. The measure elicited the vocal support of President Clinton, Vice President Gore, and business interests, while former third-party presidential candidate H. Ross Perot and most labor unions opposed the legislation. "Because of NAFTA's high salience, all strategic calculations, including timing, should have received more consideration by members of Congress" (Box-Steffensmeier, et al. 1997, 327). Given these conditions, it would reason that members of Congress were very sensitive to constituency groups and less likely to rely on cues provided by colleagues. As such, Congress' consideration of the North American Free Trade Agreement provides a difficult context in which to detect dynamics of information cascade behavior.

Data

The data provide two dependent variables for examination, a measure of the time until the legislator's announced position and the measure of the legislator's vote position on NAFTA.[6] The TIMING variable is a duration measure indicating the number of days after August 11, 1992, the day of the first announced position, until the representative announced whether they were "for" or "against" the NAFTA legislation. The VOTE variable indicates the representative's vote, coded *yea*=1 and *nay*=0, on H.R. 3450, the NAFTA implementation legislation.

Box-Steffensmeier, et al. identify four sets of variables related to the timing of position announcement and vote on NAFTA: constituency factors, interest group factors, individual factors, and institutional factors. The authors identify four constituency factors which are hypothesized to effect both the member's timing of position taking and vote. First, believing that a high rate of UNION MEMBERSHIP

[6] For specific information about the coding of the independent variables, see Appendices A and B of Box-Steffensmeier, Arnold, and Zorn 1997. The original data and STATA documentation necessary for replication are available from the Publication-related Archive at the Inter-university Consortium for Political and Social Research under the names, Box-Steffensmeier, Arnold, and Zorn, or Study #1126 on the world wide web at: www.icpsr.umich.edu.

will stimulate opposition to NAFTA, the authors include a measure of the percentage of all private sector workers who belong to a union in the representative's district. Because of his vocal opposition to NAFTA, supporters of Ross Perot within the district (measured as the mean-centered percentage of the 1992 PEROT VOTE) were expected to have a negative effect on member's NAFTA position. Legislators from congressional districts closest to the MEXICAN BORDER, which were expected to benefit greatly from NAFTA, should be more likely to vote for NAFTA than their non-border counterparts. All three of these variables are expected to stimulate earlier announcements by members of the House. Finally, due to the threat of job loss associated with NAFTA, members from districts with low median HOUSEHOLD INCOME are hypothesized to vote against NAFTA. Consequently, low values of HOUSEHOLD INCOME should be correlated with early position taking by members.

Two interest group factors are identified. Members with a large percentage of total contributions from labor union PACs (LABOR CONTRIBUTIONS) should be more likely to vote against NAFTA. Those legislators who receive a large portion of their electoral war chest from CORPORATE CONTRIBUTIONS should be more likely to favor the bill. In both cases, increased PAC contributions should accelerate the timing of announced position taking.

Among the individual factors included, Box-Steffensmeier, et al. claim that PARTY AFFILIATION (coded 1 for Democrats) traditionally provides an important voting cue for members of Congress, and, therefore, should affect the member's probability of voting for NAFTA. However, the partisan signals associated with NAFTA are, at best, mixed. For Republican representatives, the pro-NAFTA signal was both strong and clear. Hence, Republican legislators should be more likely to support the legislation. Yet, the Democratic party was split on NAFTA. While the Democratic administration supported the passage of NAFTA, the Democratic congressional leadership was divided. Speaker of the House Thomas Foley (D - WA) favored passage of the bill, but Majority Leader Richard Gephardt (D - MO) and Majority Whip David Bonior (D - MI) opposed NAFTA. Therefore, the relationship between Democratic party membership and the vote on NAFTA could be either positive or negative. Partisanship

is not believed to affect the timing of decision.

The legislator's IDEOLOGY should affect both the vote and timing of position taking on NAFTA. Specifically, conservative representatives should be most likely to support the NAFTA legislation. With regard to timing, the most ideological members of the House should be among the early position takers. Ideologues possess strong policy preferences and, consequently, are most likely to reach a decision early.

Finally, Box-Steffensmeier, et al. identify three institutional factors that should effect the timing of position taking on NAFTA. Legislators who served one or more of the NAFTA jurisdictional committees (NAFTA COMMITTEE) should be more likely to announce their positions early.[7] Similarly, members of both the Democratic and Republican congressional leadership (DEMOCRATIC LEADERSHIP and REPUBLICAN LEADERSHIP respectively) should be more likely to declare their positions early in an attempt to demonstrate policy leadership.

While the Box-Steffensmeier, et al. variables capture most of the theoretical factors that effect the timing and vote decisions, especially constituency demand, I believe that none of the variables truly capture the dynamic elements of the information dissemination process. Let us examine the timing model first. The static variables included in the model do not allow us to examine how one legislator's endorsement might affect another's position or their timing to position taking. With regard to the voting model, none of the variables capture the effect of the timing of position taking on a legislator's vote choice. Specifically, we would expect that, as the number of announced positions increases, uncertainty within the legislative environment decreases, affecting the variance associated with each legislator's vote choice.

In order to account for the dynamic factors associated with the dissemination of information, I create a series of variables directly based upon the information provided when a legislator announces a position. First, each time an individual announces his/her position on a piece of legislation, an updated

[7] Three committees took action on NAFTA: the House Ways and Means, Banking, and Energy and Commerce committees.

HEADCOUNT of yeas and nays is recorded. For instance, if Legislator 1 declares that he is pro-NAFTA, the entire legislature becomes aware that the current headcount is pro-NAFTA = 1, anti-NAFTA = 0, meaning that the next legislator to take a position is able to update his information based upon Legislator 1's announced position. The HEADCOUNT measure updates the vote margin with every announcement period, so that if Legislator's 2, 3, and 4 announce on the same day that they are against NAFTA, HEADCOUNT will equal -2 when the next announcement is made. Figure 1 displays the headcount margin of victory as updated over announcement periods. As is evident from the figure, the balance of votes greatly disfavored NAFTA until the very last days of the debate. With only days remaining, NAFTA supporters were behind by 27 votes. The measure then passed the House by 31 votes. I hypothesize that as the headcount *margin* (HEADCOUNT^2) increases, legislators will be persuaded to vote in the headcount's direction. Headcount margin should also stimulate position taking activity.

[Figure 1 about here]

The cumulative number of legislators who have made announcements (ANNOUNCED) is also incorporated into the models of voting and timing. This variable is a proxy measure of the degree of uncertainty within the legislative arena. As the number of position announcements increases, legislators should be better able to determine their position on the issue. The variable should also increase the rapidity with which members take positions.

Duration Model of Strategic Position Taking

The model of strategic timing of position taking on NAFTA proposed by Box-Steffensmeier and her colleagues examined the time at which a House member announced a position for or against the bill. In conducting their analysis, the authors employed duration analysis techniques as a means of predicting the time until a position was taken. Specifically, Cox's proportional hazards model is applied (Cox 1972; Box-Steffensmeier and Jones 1997). "The proportional hazards model allows one to estimate the effects of individual characteristics on a duration without having to assume a specific parametric form for the distribution of the time until a position is taken, thus imposing fewer restrictive assumptions than do

parametric duration models" (Box-Steffensmeier, et al 1997, 331).[8] For a member of Congress with an associated vector of characteristics, **X**, the proportional hazards model assumes a hazard rate,

$$h(t|x) = h_0(t)e^{(\beta_i x_i)}$$

where $h_0(t)$ represents the baseline hazard function, which is estimated nonparametrically.

In order to extend their model, I use the exact variables employed by Box-Steffensmeier, et al. in their original analysis but include two additional variables which examine the dynamic effects of information dissemination. Both the original Box-Steffensmeier, et al. and extended proportional hazards models are presented in Table 2, and a comparison of the models is quite telling. While both models independently provide statistically significant fits, the inclusion of the dynamic factors contributing to timing of position taking makes a clear difference in model performance. As demonstrated by the likelihood ratio test, the additional goodness of fit attributable to the extended model is significantly greater than Box-Steffensmeier, et al. model, which underperforms in comparison.

[Insert Table 2 about here]

Perhaps, more dramatic is the comparative performance of the independent variables associated with the models. In the original model, six of the twelve hypothesized effects attained statistical significance. The coefficients from the Cox proportional hazards model indicate both the magnitude of the effect and whether the variable increased or decreased the hazard rate. Since the hazard rate represents "the rate at which a duration or episode ends in the interval $[t, t + \Delta t]$" (Box-Steffensmeier and

[8] As stated by Box-Steffensmeier and Jones (1997, 1433), "The term 'proportional hazards' refers to the effect of any covariate having a proportional and constant effect that is invariant to when in the process the values of the covariate changes. That is, each individual's hazard function follows exactly the same pattern over time, but there is no restriction on what this pattern can be." Alternative model specifications, such as Weibull regression, allow for the existence of non-constant, time-varying effects. In the attached Appendix, I present the findings from Weibull estimations of both the Box-Steffensmeier, et al. and my extended models. The findings clearly demonstrate the existence of time dependence, while attesting to the robustness of my findings. However, in order to offer the most direct replication and extension of the Box-Steffensmeier, et al. model, I only present the Cox proportional hazard estimates in the text.

Jones 1997, 1418), an increase in the coefficient indicates that the variable increases the likelihood that a member will announce a position earlier. From the independent variables, change in duration until position announcement seems to be affected, in part, by all four theorized factors. Among those factors associated with the member's constituency, two variables, UNION MEMBERSHIP and MEXICAN BORDER significantly altered the timing of position taking. As can be gleaned from Table 3, which presents the percent change in the hazard rate, an increase in the proportion of union labor within a member's district increases the hazard rate by 3.3 percent. This means that a member from a district composed of 32 percent union workers (the observed maximum) is sixteen and half times more likely to announce his position before a member with a 2 percent composition of union labor (the observed minimum). The MEXICAN BORDER variable is even more dramatic, since a districts location on the Mexican border increased the hazard rate by 528%.[9]

Considering the interest group factors, both CORPORATE CONTRIBUTIONS and LABOR CONTRIBUTIONS are associated with the timing of the House member's announced position. However, contrary to the hypothesis, only LABOR CONTRIBUTIONS are associated with earlier announcements (% change in hazard = 1.1). In fact, an unit increase in campaign contributions from business PACs is associated with an increase in the probability of delay (% change in hazard = -1.4). Among the institutional factors, only Republican leaders were more likely to announce early. The increased likelihood of announcing early for Members of the REPUBLICAN LEADERSHIP was nearly 75% according to the Box-Steffensmeier, et al. model. Finally, the original model indicated that some conservative members of the House were cross-pressured. For House conservatives with higher levels of union membership in their district, the percent change in the hazard rate is -1.18, indicating that these members were more likely to apply a strategy of delay when deciding when to announce their position on NAFTA.

Based upon the original formulation of the model, the Box-Steffensmeier, et al. findings confirm

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[9] For dichotomous variables, the percentage change in the hazard rate is calculated as: $100[e^{(\beta_k * 1)} - e^{(\beta_k * 0)}] / e^{(\beta_k * 0)}$. For continuous variables: $100[e^{(\beta_k * (x+z))} - e^{(\beta_k * x)}] / e^{(\beta_k * x)}$.

the relationship between exogenous pressures and the timing of a legislator's position taking. However, once the dynamic factors, HEADCOUNT^2 and ANNOUNCED, are included in the duration model, *none* of the original independent variables approach statistical significance. In fact, if we were to discount statistical significance all together, the marginal effects of the original variables are diminished: MEXICAN BORDER, for instance, is only one-eleventh of its original size!

Both of the dynamic factors included in the duration models of the timing of position taking reach statistical significance. However, this is not to say that they performed as hypothesized. Indeed, both HEADCOUNT^2 (% change in hazard = -53.7) and ANNOUNCED (% change in hazard = -6.0) contribute to a reduction in hazard rate, indicating that as these variables increase the timing to announcement also increases. For instance, as the size of the updated headcount increased, members of the House seemingly decided to hold-off on declaring their positions on NAFTA. This, too, appears to be an indication of the cross-pressure faced by members of the House during consideration of this important legislation. Recall from Figure 1 that the early momentum seemed to belong to the NAFTA opposition. This apparently caused NAFTA supporters to follow a "wait and see" strategy. Unfortunately, the data do not speak directly to the nature of this strategic consideration. Perhaps, NAFTA supporters were thrown into a state of ambivalence and simply took the time to reconsider their position. Or, perhaps, as suggested by Box-Steffensmeier, et al., members who declared at a later period of the debate were originally fence sitters, who delayed announcing their position in order to procure side payments from other actors in exchange for their support. On this point, we do not, and may not ever, know for certain.

Despite the alternative directions of the hypothesized effects, the fundamental argument that I have forward is overwhelmingly confirmed. The dynamic elements of information dissemination within the Congress affects the behavior of legislators. Moreover, the disjointed findings between the original model of Box-Steffensmeier, et al. and my extended model highlight the *potentiality* for informational cascades. By all indications, members of the House of Representatives appeared to be more affected by the informative behavior of their colleagues than by the information provided to them by their electoral

constituencies or interest groups.

Information Aggregation and the Congressional Vote

To this point, I have demonstrated that the flow of information within the Congress can influence the behavior of members, perhaps even more than the informative signals they receive from their constituents. Yet, it remains to be seen whether these internal signals actually effect the decisions that legislators make. In order to examine this question, I, again, turn to the work of Box-Steffensmeier, Arnold, and Zorn (1997), who also examined the nature of the vote decisions made by House members on NAFTA. Working from within the same theoretical framework used for their model of strategic timing, the authors link the vote choice to constituency, interest group, and individual specific factors. However, inexplicably, after a thorough discussion of the strategy of position taking, the Box-Steffensmeier and colleagues provide no linkage between the dynamic process and the vote on NAFTA.

Clearly, the dissemination of information within the Congress should affect the vote choices of members. In some cases, the informative behavior of fellow members of Congress is a determinative factor for a legislator's decision. In fact, Kingdon (1989, 19) reports that 5% of the House members with whom he spoke stated that fellow congressmen were "determinative" when making decisions; only 7% stated that constituency was determinative. The information provided by members effects the vote decision in one of two ways: 1) direct interaction between members results in a relationship of influence whereby one member convinces the other to vote for or against a specific measure; or, 2) the information provided by other members clarifies differences between alternatives allowing the legislator to decrease her uncertainty and make a decision. While the first method is direct, the second may be diffuse. When a member makes a public announcement of his position, the information conveyed by the declaration can provide other members with a reference point by which to decide. For example, when a legislator, such as Senator Jesse Helms (R - NC), a staunch conservative and consistent recipient of a "zero" in the liberal organization American's for Democratic Action vote ratings, takes a position favoring or opposing a bill,

he clearly helps to mark the right end of the spatial dimension for other legislators. Essentially, an extremely liberal member of the Senate simply needs to know whether Sen. Helms supports a bill or not in order to determine his position.

Unfortunately for this analysis, I am without any data regarding specific interactions between members of the House during NAFTA deliberations. However, the utilization of alternative headcount measures should allow me to examine the diffuse effects of information dissemination within the legislative arena. The announced positions of members of the Congress should effect the votes of colleagues in the following manner. First, both the HEADCOUNT[2] and ANNOUNCED variables employed in the duration analysis of announcement timing should help to decrease the uncertainty for members as the deliberation period proceeds. Second, the HEADCOUNT DIRECTION, that is, whether the updated headcount majority is "for" or "against" the bill, should provide some members with an indication of how to vote. If a legislator is uncertain of her position on a particular measure, the member may look to see what her colleagues have to say and then follow their cue.

In order to incorporate these information variables into a model of voting, I employ the heteroskedastic probit estimation technique (Alvarez and Brehm 1995). The heteroskedastic probit is an appropriate functional form because it is a model of binary choice which allows for the systematic estimation of the model variance:

$$y_i^* = \mathbf{X}_i\beta + \varepsilon_i$$
$$\text{var}(\varepsilon_i) = \exp(\mathbf{Z}_i\gamma)^2$$

where y_i^* is an unobserved index of the probability of voting for NAFTA, $\mathbf{X}_i$ and $\mathbf{Z}_i$ are matrices of independent variables, β and γ are coefficient vectors, and ε_i is an error term. The first equation represents a model of the vote choice, whereas the second equation is a model of the error variance. Incorporating the error variance into the probit model as a systematic component leads to following log likelihood:

$$\log L = \sum_i \left(y_i \log \Phi\left(\frac{\mathbf{X}_i \beta}{\exp \mathbf{Z}_i \gamma} \right) - (1 - y_i) \log \left[1 - \Phi\left(\frac{\mathbf{X}_i \beta}{\exp \mathbf{Z}_i \gamma} \right) \right] \right)$$

Table 4 provides the results of the heteroskedastic probit model of House members' vote on NAFTA. Again, to facilitate comparison, the replicated results from the Box-Steffensmeier, et al. probit model of vote choice are also presented. As indicated in Table 4, both the original probit and my heteroskedastic probit models perform very well. However, as was the case with the extended duration model, the incorporation of dynamic elements significantly increases the performance of the model (LR test ($\chi^2_{df=2}$) = 149.22).

Unlike the duration models, the findings of the Box-Steffensmeier, et al. choice model retain their predictive power. In both models, increased proportions of UNION MEMBERSHIP and LABOR CONTRIBUTIONS significantly decrease the probability of the member voting for NAFTA. It should be noted, however, that the heteroskedastic probit model does suggest that the marginal effects associated with the variables may be greater than originally estimated. According to the new estimates, marginal shifts in the two variables would increase the probability of voting against NAFTA by 13 percent more than first estimated. Similarly, the heteroskedastic model suggests that the marginal effects associated with HOUSEHOLD INCOME and CORPORATE CONTRIBUTIONS also are greater — increased effects of 7 and 9 percent respectively — than those estimated by Box-Steffensmeier and colleagues. In both models, increases in these variables are associated with higher probabilities of voting for NAFTA.

Of course, the most important findings are associated with the information variables. First, the inclusion of the HEADCOUNT DIRECTION variable in the choice model is statistically significantly and in the hypothesized direction. As expected, positive headcount majorities are associated with an increased probability of voting "for" NAFTA. In fact, the informative signal provided by the updated headcount contributes to a 27% shift in the vote choice probability, providing further evidence to the substantive import of legislative colleagues on the congressional vote choice. Moreover, unlike previous accounts of

roll call voting (Kingdon 1989), which emphasize direct interpersonal exchanges of information, the evidence provided by the present model demonstrates the diffuse power of information dissemination within the legislative.

When we examine the variance model associated with the heteroskedastic probit, we find that while an increase in the number of previously ANNOUNCED position does decrease the error variance as hypothesize the result is not statistically significant ($p = .56$). On the other hand, the size of the headcount majority, as measured by HEADCOUNT^2, does attain statistical significance, but not in the hypothesized direction. Headcounts that appeared to be "close call" were hypothesized to lead to greater uncertainty among members about how to vote, but, as illustrated in Figure 2, as the size of the headcount majority increases the error variance also increases. Consider, for instance, the case when a large bloc of legislators who oppose a bill decide to announce their position early in order to persuade others that the proposed legislation should be voted down. According to the findings associated with the HEADCOUNT^2 variable, if these members strategically have tried to make the vote look as though it will be one sided, their actions may have led to additional confusion or ambivalence among unannounced members. From the perspective of the unannounced member, a large, one-sided announced majority may signal that an issue is potentially important, leading him to be more uncertain about how he will vote on this important legislation. Alternatively, a member who favors one side of an issue may wish to rethink his policy stance if he notices that a large portion of his colleagues are voting the opposite way. If the latter is the case, the bloc may have increased their chances at influence by causing some members to reevaluate their position.

[Insert Figure 2 about here]

Discussion

In this paper, I have examined the dynamic effects of information dissemination between members of Congress, and I have shown its potential effects on both legislative behavior and voting. Most importantly, I have demonstrated that this dynamic process can sometimes have greater influence

on the actions of legislators than the demands of those they represent. Previous theorists of congressional behavior and voting have rarely, if ever, incorporated the dynamic properties of information dissemination directly into their models. The research presented in this paper hopefully should stimulate wider consideration of this neglected aspect of legislative decision making.

In an attempt to capture the dynamic properties of information exchange, I have argued that economic models of information cascades, which possess both rational and political foundations, may provide insight into the nature of information dissemination within the Congress. I believe that the informational cascade model is particularly appropriate for examining the dynamics of information transmission within the Congress. The application of the model establishes the legislator as the fundamental actor, allowing the individual to choose between information provided by constituents or the publicly declared information of other legislative actors. The model also suits the political nature of the information dissemination process within the Congress. Information is a valuable commodity, and those that possess it are frequently in a position to influence the decisions of other actors and, in the end, public policy.

Yet, while the microfoundations associated with the informational cascades models provide a good fit with the reality of the legislative arena, the ramifications attributable to informational cascades is at odds with our conception of the U.S. Congress as a rational and deliberative body. Specifically, the informational cascades model suggests that the information provided through the revealed signals of other actors can frequently outweigh an individual's consideration of private information. As such, the existence of informational cascades may contribute to an erosion of the republican foundation of the United States Congress, whereby legislators eschew the voice of the people in favor of other oligarchs.

The evidence presented in this paper suggests that the conditions may be ripe for informational cascades, if they do not exist already. Examining one of the most important pieces of legislation to come out of the 103rd Congress, the North American Free Trade Agreement, I found considerable evidence to suggest that members are greatly affected by the informative signals disseminated by colleagues. In

examining the strategic timing of position taking by members of the House on NAFTA, the evidence clearly indicates that the legislators' position taking behavior was guided mainly by public announcements of other members. Indeed, constituency and interest group explanations no longer seem to apply once the dynamic elements of announcement process are incorporated into the model. The finding dramatically shows the attention paid by members of Congress to their legislative colleagues. Further evidence of this awareness is given by the fact that previously announced positions significantly determine the vote choices of members. In the end, this is the best evidence for further examination of the properties and power of the information dissemination process within the Congress.

Appendix: Weibull Regression Model of Strategic Timing

In Table 2, I replicate and extend the model proposed by Box-Steffensmeier, Arnold, and Zorn (1997) as an explanation of the strategic timing of congressional position taking. In their analysis, Box-Steffensmeier, et al. use Cox's proportional hazards model in order to examine the duration of time that elapsed until a member of Congress announced a position on NAFTA. However, the extension of the strategic timing model that I propose in this paper suggests the possible need for an alternative model specification.

The Cox proportional hazards model allows one to estimate the effects of $\beta_k'\mathbf{X}_i$ on survival time without having to assume a specific parametric form for the distribution of time between durations. Thus, the Cox proportional hazards model does not account for time dependence unless the dynamic process is systematically modeled as part of $\beta_k'\mathbf{X}_i$, — as is done in this paper. Indeed, "[t]he term 'proportional hazards' refers to the effect of any covariate having a proportional and constant effect that is invariant to when in the process the values of the covariate changes" (Box-Steffensmeier and Jones 1997, 1433). As an alternative, one could specify the duration model using time-dependent techniques, such as Weibull regression.[10]

Table A.1 presents the Weibull estimates for both the Box-Steffensmeier, et al. model and my extended model of the strategic timing of congresssional position taking. The reported estimates are "relative hazard" parameters, and should be interpreted as either an increase or decrease in the hazard function. As is demonstrated in Table A.1, the directions of the coefficients produced by the Weibull estimations are relatively consistent with the Cox proportional hazard models with a few exceptions on variables that do not reach statistical significance.

[Insert Table A.1 about here]

The results of the Weibull model indicate that the assumption of constant proportionality found

[10] For details on the specification and estimation of the Weibull regression, see Box-Steffensmeier and Jones (1997).

in the Cox model may be an unnecessary restriction. In both the Box-Steffensmeier, et al. specification and in my extended model, duration dependence is statistically significant, indicating that position taking *is* a dynamic, time-dependent process. Of course, this finding simply confirms the suspicions that led to the extension of the original model in the first place. However, it is notable that even when the systematic components of the time-dependent process are accounted for (evident by the significance of both HEADCOUNT^2 and ANNOUNCED), duration dependence remains statistically significant. This indicates that an unexplained aspect of the time-dependent process still exists.

Of course, of utmost interest is the performance of the models in comparison with one another. Consistent with findings in Table 2, my extended model outperforms the Box-Steffensmeier, et al. model (LR test $\chi^2_{df=2} = 282.10$). Again, the bulk of original model is no longer significant once my dynamic elements are incorporated.[11] On the basis of both the Cox proportional hazards and Weibull models, my dynamic model of the strategic timing of congressional position taking appears to be a clear advancement over previous research.

[11] The exception being the MEXICAN BORDER variable which retains statistical significance.

TABLE 1. Signal Probabilities (Adapted from Bikhchandani, et al. 1992)

	$\Pr(X_i = A \mid V)$	$\Pr(X_i = R \mid V)$
$V = 1$	p_i	$1 - p_i$
$V = 2$	$1 - p_i$	p_i

TABLE 2. Duration Models of the Timing of Position Taking by Members of the House of Representatives on the North American Free Trade Agreement.

	Original		**Extended Model**	
Independent Variables	β	S.E.	β	S.E.
Constituency Factors				
Union Membership	3.21	1.19***	- 0.22	1.15
Perot Vote, Percent	- 4.91	4.27	- 1.24	4.25
Perot Vote, Percent Squared	15.64	11.72	4.66	11.86
Mexican Border	1.84	0.32***	0.37	0.33
Household Income	0.01	0.09	0.03	0.09
Interest Group Factors				
Corporate Contributions	- 1.44	0.52***	0.11	0.54
Labor Contributions	1.09	0.50**	0.17	0.50
Institutional Factors				
NAFTA Committee	0.04	0.11	0.01	0.11
Republican Leadership	0.56	0.26**	0.11	0.25
Democratic Leadership	0.08	0.23	0.10	0.23
Individual Factors				
Ideology × Union Membership	- 4.39	1.78**	- 0.33	1.87
Ideology × Household Income	0.16	0.16	0.01	0.13
Dynamic Factors				
Headcount^2			- 0.01	0.00***
Announced			- 0.06	0.00***
n =	433		433	
Log Likelihood =	- 2233.96***		- 1760.77***	
	$\chi^2(12) = 53.95$		$\chi^2(14) = 1000.34$	
Likelihood Ratio Test	1892.78(2)***			

Original model refers to that found in Table 2 of Box-Steffensmeier, et al. (1997, 331)

*** $p < .01$
** $p < .05$
* $p < .10$

TABLE 3. Marginal Effects Estimated by Duration Models of the Timing of Position Taking by Members of the House of Representatives on NAFTA.

	% Change in the Hazard Rate	
Independent Variables	**Original**	**Extended Model**
Constituency Factors		
Union Membership	3.3	- 0.2
Perot Vote, Percent	- 4.8	- 1.2
Perot Vote, Percent Squared	1.6	0.7
Mexican Border	527.9	45.3
Household Income	1.0	1.3
Interest Group Factors		
Corporate Contributions	- 1.4	0.1
Labor Contributions	1.1	0.2
Institutional Factors		
NAFTA Committee	3.7	1.3
Republican Leadership	74.5	11.7
Democratic Leadership	8.6	11.0
Dynamic Factors		
Headcount^2		- 53.7
Announced		- 6.0

Marginal Effects for interaction effects are not presented in the table. See Footnote #9 for calculation of marginal effects.

TABLE 4. Factors Influencing the Vote by Members of the House of Representatives on the North American Free Trade Agreement.

	Original		Extended Model	
Choice Model	β (S.E.)	Δ	β (S.E.)	Δ
Constant	0.27 (0.33)		0.34 (0.52)	
Constituency Factors				
Union Membership	- 5.02 (1.29)***	- 0.23	-6.67 (2.03)***	- 0.28
Perot Vote, Percent	0.61 (1.16)	0.03	0.31 (1.67)	0.01
Mexican Border	0.34 (0.43)	0.04	0.34 (0.48)	0.04
Household Income	0.21 (0.09)**	0.14	0.35 (0.14)**	0.21
Interest Group Factors				
Corporate Contributions	1.94 (0.72)**	0.15	3.43 (1.17)***	0.24
Labor Contributions	- 3.84 (0.92)***	- 0.32	- 5.28 (1.42)***	- 0.40
Individual Factors				
Ideology	0.08 (0.31)	0.03	- 0.30 (0.50)	0.11
Party Identification	- 0.20 (0.31)	- 0.08	- 0.14 (0.48)	- 0.05
Dynamic Factors				
Headcount Direction	– – –	– – –	0.46 (0.14)***	0.27
Variance Model				
Headcount^2	– – –	– – –	0.02 (0.00)***	
Announced	– – –	– – –	- 0.01 (0.01)	
Heteroskedasticity Test				
Likelihood Ratio Test =			15.06(2)***	
n =	433		433	
Goodness of Fit =	$\chi^2(8) = 125.16$***		$\chi^2(9) = 50.55$***	
Likelihood Ratio Test =	149.22(2)***			

Probit model refers to that found in Table 3 of Box-Steffensmeier, et al. (1997, 334). ~~First Differences~~, Δ , are based on increases of one standard deviation for continuous variables.

*** $p < .01$

** $p < .05$

* $p < .10$

TABLE A.1. Weibull Regression Models of the Timing of Position Taking by Members of the House of Representatives on the North American Free Trade Agreement.

	Original		**Extended Model**	
Independent Variables	$\beta^{\dagger}$	S.E.	β	S.E.
Duration Dependence (α)	8.514	0.359***	13.142	0.603***
Constant	- 51.848	2.246***	- 77.260	3.599***
Constituency Factors				
Union Membership	2.719	1.163**	0.017	1.154
Perot Vote, Percent	- 1.801	4.270	0.935	4.210
Perot Vote, Percent Squared	6.876	11.703	- 2.304	11.743
Mexican Border	1.756	0.321***	0.718	0.323**
Household Income	- 0.038	0.090	- 0.025	0.093
Interest Group Factors				
Corporate Contributions	- 0.819	0.520	0.348	0.534
Labor Contributions	0.838	0.510*	0.173	0.501
Institutional Factors				
NAFTA Committee	0.025	0.108	0.002	0.107
Republican Leadership	0.450	0.255*	0.069	0.253
Democratic Leadership	0.174	0.231	0.046	0.229
Individual Factors				
Ideology × Union Membership	- 3.997	1.847**	0.103	1.879
Ideology × Household Income	0.141	0.124	- 0.032	0.125
Dynamic Factors				
Headcount^2			- 0.001	0.000*
Announced			- 0.008	0.001***
n =	433		433	
Log Likelihood =	175.87***		316.92***	
	$\chi^2(12) = 36.79$		$\chi^2(14) = 318.90$	
Likelihood Ratio Test	282.10(2)***			

Original model refers to the **X** specification found in Box-Steffensmeier, et al. (1997, 331)

† Estimates are Relative Hazard Estimates.

*** $p < .01$
** $p < .05$
* $p < .10$

Figure 1. Headcount Margin of Victory Updated by Announcements

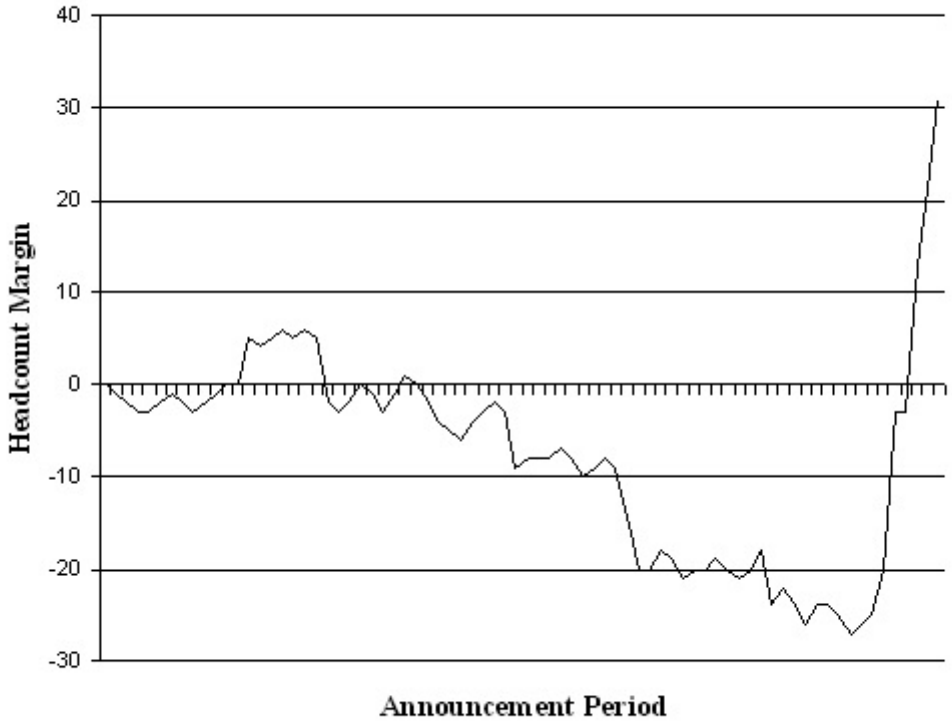
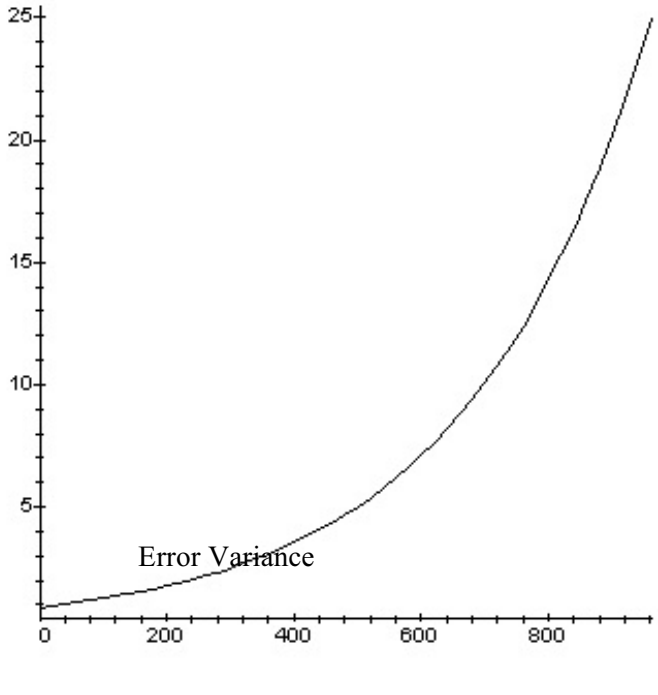


Figure 2. Error Variance Associated with the Squared Headcount Margin



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