More Effective Than We Thought: Accounting for Legislative Hitchhikers Reveals a More Inclusive and Productive Lawmaking Process*

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Abstract

For more than half a century, scholars have been studying legislative effectiveness using a single metric—whether the bills a member sponsors progress through the legislative process. We investigate a less orthodox form of effectiveness—bill proposals that become law as provisions of other bills. Counting these "hitchhiker" bills as additional cases of bill sponsorship success reveals a more productive, less hierarchical, and less partisan lawmaking process. We argue that agenda and procedural constraints are central to understanding why lawmakers pursue hitchhiker strategies. We also investigate the legislative vehicles that attract hitchhikers and find, among other things, that more Senate bills are enacted as hitchhikers on House laws than become law on their own.

Replication Materials: The data, code, and any additional materials required to replicate all analyses in this article are available on the American Journal of Political Science Dataverse within the Harvard Dataverse Network, at: [awaiting URL from AJPS]

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1 Introduction

In 2014, a Washington Post article described the legislative record of retiring Representative Robert Andrews (D-NJ) as the worst in Congress: "Andrews proposed 646 bills, passed 0: worst record of past 20 years."[1] In response, Andrews objected that journalists were using the wrong metric: "*I'm just a bill* is not the way it works."

Legislative scholars have also challenged this orthodox view of lawmaking: "The Schoolhouse Rock! cartoon version of the conventional legislative process is dead, if it was ever an accurate description in the first place" (Gluck et al., 2015). Increasingly, a process of considering bills on an individual basis has been replaced by a leader-centered process of constructing larger omnibus bills that combine multiple policy proposals into one (Krutz, 2005; Curry and Lee, 2016; Sinclair, 2016).

Andrews' advice was to also count policy proposals that "germinate in a larger bill." In this paper, we develop an approach for doing that - identifying bills that are enacted into law as provisions of other bills. We then consider the implications of accounting for these "hitchhiker" successes for legislative effectiveness research. The next section reviews the longstanding legislative effectiveness literature and its limitations. We then propose and implement a new text-based methodology for accurately identifying hitchhiker bills. Applying this methodology to two decades of lawmaking (1993-2014), we find that as many bills become law as hitchhikers as become law on their own.

We argue that agenda and procedural constraints are central to understanding why lawmakers pursue hitchhiker strategies. Legislators who sponsor bills that become law on their own are more likely to hold agenda setting positions that allow them to claim credit for bills that succeed for reasons other than their sponsorship (such as legislative reauthorizations). Aside from these agenda setting advantages, the sponsors of successful laws and successful

[1] Farenthold, David A. (2014, February 4), available online: **http://wapo.st/1enI6AC?tid=ss_tw-bottom&utm_term=.7ecc15f01762**

hitchhikers have very similar atributes. We also find that procedural constraints lead the Senate to employ hitchhiker strategies more frequently than the House and that more hitchhikers are adopted under unified governments because those governments are more likely to engage in omnibus lawmaking.

2 Effectiveness Research and its Limits

Studies of legislative effectiveness fit into a broader literature examining legislative influence (see, for example: Meyer, 1980; Hall, 1992; Thomas and Grofman, 1992; Kessler and Krehbiel, 1996; Arnold et al., 2000; Crisp et al., 2004; Fowler, 2006; Miquel and Snyder, 2006; Kirkland, 2011; Sulkin, 2011; Desmarais et al., 2015). They include some of the earliest quantitative analyses of legislative behavior. From then until now, scholars have focused on bill sponsorship success as the central indicator of effectiveness. In *US Senators and their World*, Donald Matthews observed: "To the extent that the concept as used on Capitol hill has any distinct meaning, *effectiveness* seems to mean the ability to get one's bills passed" (Matthews, 1960). Matthews found that senators who adhered to chamber "folkways," such as specializing and spending less time giving floor speeches, were more likely to sponsor successful bills. A decade later, Olson and Nonidez (1972) asked whether members of the House who adhered to similar norms were also more legislatively successful (they weren't). Subsequent research has continued to investigate bill sponsorship success patterns to better understand norms and coalition building (see, for example: Krutz, 2005; Baughman, 2006; Koger and Fowler, 2007; Hasecke and Mycoff, 2007). An equally important body of research seeks to discover (in the words of Anderson et al., 2003) the "remarkable skills" of the lawmakers who are more successful in advancing their bills (Frantzich, 1979; Bratton and Haynie, 1999; Jeydel and Taylor, 2003; Anderson et al., 2003; Cox and Terry, 2008; Volden and Wiseman, 2009, 2014).

The methods employed in these studies have become considerably more sophisticated over time, but the central measure has changed very little. Effectiveness continues to be defined in terms of how far a sponsor's bill progresses through the legislative process. Some define progress by whether a bill receives any committee consideration (Krutz, 2005) whereas others define it by whether a bill passes the chamber. Some focus on "hit rates" — the percentage of a legislator's bills that succeed (Anderson et al., 2003) — whereas others focus on the progress of individual bills. The most recent research also offers the most thoughtful and sophisticated measure. Volden and Wiseman (2014) compute "Legislative Effectiveness Scores" (LES) by summing the number of bills a member introduces, weighted by their progress and importance.

Bill success has also recently attracted the interest of scholars in other disciplines and even entrepreneurs. Rather than trying to understand why some lawmakers are more effective, the objective is to predict bill success as one might predict the winner of a sporting event or election (Yano et al., 2012; Nay, 2017). Several commercial ventures are currently or soon will be offering bill success prediction services.[2]

We contend that an important limitation of these efforts is that bills are vehicles, not policies. The progress of a bill and a policy can be one and the same, but this is not always the case. The Affordable Care Act (HR 3590) started off as a seven page bill proposing a first time home buyer credit for service personnel. It became the Affordable Care Act when the Senate stripped that language and replaced it with a 900 page health care amendment.[3] Current approaches give the original bill's sponsor (Rep. Charles Rangel, D-NY) full credit for the Affordable Care Act, despite the fact that the final law was completely unrelated to the bill he introduced. As we will show, many other lawmakers deserved (but do not receive) credit for what is in the ACA.

[2] See, for example: Skopos Labs, GovTrack, StateHill

[3] https://www.congress.gov/bill/111th-congress/house-bill/3590/text/ih?format=txt

Equally important, policies proposed in bills can progress when the bills themselves do not. The lawmaking process has fundamentally changed since Matthews equated bill passage and effectiveness. A process that used to be driven by largely autonomous committees recommending bills on an individual basis has been replaced, to an increasing extent, by leadership-driven negotiations. These negotiations often produce large "omnibus" bills that combine proposals originating in other bills (Krutz, 2001; Curry and Lee, 2016; Sinclair, 2016). Recent research also finds that lawmakers view "must pass" legislation such as reauthorizations of expiring programs as exceptional opportunities to advance substantively related policy initiatives (Walker, 1977; Adler and Wilkerson, 2012).

We propose an approach to studying effectiveness that gets closer to what scholars (and citizens) ultimately care about — legislators' ability to get their *policy proposals* enacted into law. One implication of more recent developments is that the legislative opportunity structure increasingly favors "hitchhiker" strategies. This suggests that legislative effectiveness research will benefit by crediting lawmakers not only for bills that become law on their own, but also for bills enacted into law as provisions of other bills. We find, for example, that the Affordable Care Act includes almost 50 "complete" hitchhiker bills (cases where the complete substance of a bill was enacted as a hitchhiker).

Accounting for hitchhiker bills constitutes an improvement over current approaches to measuring legislative effectiveness. In this paper we do not attempt to identify cases where only part of a bill became law as an insertion into another bill.[4]. We also do not examine policy proposals that originate as amendments and we continue to inappropriately credit some sponsors for a bill's progress (such as Rep. Charles Rangel in the case of the ACA). Despite these limitations, accounting for hitchhiker successes offers important opportunities to explore how laws are made, and to better understand the distribution and components of

[4]Prior research suggests that the attributes of successful sponsors of partial insertions will be similar to those reported here Wilkerson et al. (2015).

effectiveness in Congress.

3 Why Hitchhikers?

Why would a sponsor advance a bill as a hitchhiker when authoring a stand-alone law would seem to offer more visible credit claiming opportunities? The main reason is that legislators' opportunities to advance stand-alone bills are limited. For the chamber, hitchhiker strategies can be procedurally efficient and, in some cases, procedurally necessary. In this section, we propose three hypotheses about why lawmakers pursue hitchhiker strategies.

Before considering these hypotheses, it is also worth noting that legislators do claim credit for hitchhiker successes. Rep. Carolyn Maloney's (D-NY) official website includes a "Laws Enacted" page.[5] The majority of the enactments listed (40 out of 74) are either sponsored bills that were "included" in other laws, or laws (sponsored by others) that were "versions" of bills she had sponsored. Maloney also highlights hitchhikers in her direct communications with constituents. Her Spring 2010 *Report to Manhattan* newsletter specifically mentions provisions of the recently passed Affordable Care Act that are "based on" bills she sponsored.

We expect that many of the covariates reported to predict bill sponsorship success in prior effectiveness studies will also predict hitchhiker bill successes. However, we also expect two other political considerations — agenda control and procedural constraints — to explain why some lawmakers are more likely to sponsor successful laws, and why some are more likely to sponsor successful hitchhikers.

3.1 Agenda Control

Congressional agenda space is a scarce commodity. It has always been the case that only a small percentage of bills make it beyond introduction. Party polarization and legislators'

[5] https://maloney.house.gov/my-work-in-congress/accomplishments/laws-enacted

increased willingness to engage in obstruction seem to have made passing bills through the regular order increasingly difficult (Sinclair, 2016; Curry and Lee, 2016). As a result, the number of laws enacted by Congress has declined significantly since the 1970s (Taylor, 2013, p.145, Figure 7.1). The policies that do become law also typically endure a lengthy incubation process (Burstein et al., 2005).

Members of the majority party use their control over the agenda to monopolize these limited credit claiming opportunities (Cox and McCubbins, 2005). In the 113th Congress (the most recent of the Congresses we analyze in this study), about 30% of all non-minor laws were sponsored by just 63 House and Senate committee and subcommittee leaders (12% of all lawmakers). Majority party members (constituting 50-60% of the chamber) sponsored about 82% of all non-minor laws. Many of these successes have little to do with effectiveness. Agenda control provides majority party lawmakers with exceptional opportunities to put their names on bills that progress for other reasons. Majority pary leaders also have limited incentives to share the most visible credit claiming opportunities with members of the minority party, especially in the House. We expect to find that these partisan calculations are less applicable to (less visible) hitchhikers. Majority party leaders should be more willing to accept minority party hitchhikers that advance good public policy or increase support for other legislation (Fenno, 1973; Curry and Lee, 2016).

Hypothesis 1 – Agenda Control: *Agenda control (serving as a committee or subcommittee chair or member of the majority party) will be a more important predictor of law success than hitchhiker success.*

3.2 Procedural Constraints

The agenda control hypothesis above suggests that hitchhiker successes may be better indicators of true legislative effectiveness because many bills progress for reasons that have little to do with who sponsors them. In this section we hypothesize that procedural constraints also help to explain why some bills are more likely to advance as hitchhikers.

Revenue bills. The clearest example of a procedural constraint that incentivizes hitchhiking is the "origination" clause of Article I of the Constitution — all laws raising revenue must originate in the House (Rybicki, 2015). The House of Representatives vigorously guards this constitutional prerogative by "blue slipping" (rejecting) Senate bills with revenue implications. The practical result is that Senate proposals with revenue-related provisions can only advance as hitchhikers on House-originating laws.[6] We treat all bills originally referred to the Senate Finance and House Ways and Means committees as revenue-related (because all tax bills must be referred to these committees).

Hypothesis 2 – Revenue Bills : *Revenue-related Senate bills are less likely to become law on their own than House revenue-related bills, but they are not less likely to be enacted as hitchhikers.*

Amendments between chambers. In both chambers of Congress, bills passed over from the other chamber are considered under different procedures than the chamber's own bills (Rybicki, 2015). In the Senate, it can be easier to take up a House passed bill than a bill reported by a Senate committee. This is because House-passed bills are typically placed on the Senate's Calendar of Business, bypassing the committee referral process. To bring up a Senate bill, the majority leader must negotiate a motion to proceed (which is subject to filibuster). In contrast, a referred House bill is already on the calendar, making it an attractive vehicle for Senate hitchhikers (Davis, 2017). This is why Senator Majority Leader (at the time) Harry Reid (D-NV) used H.R. 3590 as the vehicle for the Affordable Care Act (Cannan, 2013).

Another reason to expect amendments between chambers to be important entry points for hitchhikers is the fact that the President can sign only one bill into law when the House and Senate pass separate bills on a policy. Rybicki notes that a common practice in such

[6] In practice, this requirement also extends to appropriations bills, which we exclude from our analysis (Rybicki, 2015, p. 2).

cases is for one chamber to take up the other chamber's bill, "strike all after the enacting clause" and insert its own proposal (Rybicki, 2015, p. 3). We should therefore expect the process of resolving differences to lead to many cross-chamber hitchhikers.

Hypothesis 3 – Amendments Between Chambers: *Cross-chamber hitchhikers will be the most common type of hitchhiker. Senate bills are more likely to be enacted as hitchhikers than House bills.*

4 Finding Hitchhikers: A Supervised, Active Learning Approach

In this section we describe how we use text reuse methods to identify hitchhiker bills. The general goal is to compare the text of every version of every bill that did not become law to the text of every law enacted in that Congress. If any version of a failed bill aligns with a law, we consider that bill to be a hitchhiker. We started with a corpus of 92,677 bills for the 103rd-113th Congresses (1993-2014) collected by Handler et al. (2016). This corpus includes 4,176 bills and joint resolutions that became law and 111,758 versions of bills and resolutions that failed to become law. We excluded non-joint resolutions (because they cannot become law), appropriations bills (because they are quasi-compulsory (Adler and Wilkerson, 2012)), and very minor private and duty suspension bills. After these exclusions, our primary analysis considers 84,913 bill versions. In much of our analysis, we also exclude minor legislation as defined by the Congressional Bills Project (examples include bills naming federal buildings or creating commemorative coins).

The standard supervised learning approach to matching bill content and law content is to manually label a large, random sample of bill-law pairings for whether the law contains the substance of the bill, train a classifier on part of this sample, and test its performance on a held out set of labeled cases. Prediction accuracy is then assessed, and if it is high enough, the trained classifier is used to predict (label) bill-law pairs in the broader corpus.

The first problem with this standard approach for the current study is that hitchhikers are probably rare. If they are as rare as laws (about 3% of bills become law), we would have to visually examine and label about 10,000 bill-law pairs to obtain a sizable sample of true hitchhiker cases (3-400). One alternative solution from the machine learning literature is to use "active learning" to iteratively assemble a training sample of sufficient size (Olsson, 2009). In the first iteration, a small number of likely hitchhiker cases is identified and labeled. This initial sample is then used to train a classifier to predict additional likely cases. These cases are then labeled and added to the training corpus and the process is repeated. Using this method, we were able to identify substantial number of true hitchhikers after labeling less than than 1,000 bill-law pairings (for a detailed explanation of the active learning method, see: Supporting Information C).

A second challenge, discovered during the labeling process, is that, even for true hitchhiker cases, the bill and law texts can be quite different. One common reason was that a bill often contains non-substantive front matter (such as the title and date of introduction) and even sections (e.g. Findings and Definitions) that are removed when its substance is incorporated into another law. To address this concern, we developed a pre-processing protocol that removed common non-substantive language from both the bill and law texts (see Supporting Information A for a full description of the pre-processing steps).

Even after this pre-processing, however, the substantive language of the law and hitchhiker bill could still differ due to relatively minor edits in the law language. We initially trained and tested several algorithms widely used in computational linguistics and information retrieval.[7] All of them predicted the cleaner bill-law comparisons quite well, but none did a good job of predicting the somewhat messier cases that included reordered, deleted or

[7] `diff`, `wdiff`, Dice coefficients (Dice, 1945), Cosine similarity, and the Smith-Waterman algorithm (Waterman et al., 1976)

inserted text or sentences. This common shortcoming inspired us to develop an entirely new approach. Below, we describe the basic intuition. A detailed description of the methodology can be found in Supporting Information B.

4.1 A New Sequence-Based Algorithm for Characterizing Document Similarity

Hitchhikers are similar to cases of plagiarism. They are characterized by lengthy sequences of matching text (between the bill and law), sometimes interspersed with shorter sequences of mismatched text. "Bag of words" approaches (e.g. Cosine similarity, Dice coefficients) do not value word sequence or proximity. Alignment algorithms do (e.g. Smith-Waterman), but they require that the researcher specify, in advance, the penalties for mismatches in scoring the similarity of two documents. These *ex ante* decisions can have important consequences for prediction.

Our approach accounts for word proximity without committing to a single parameterization (as Smith-Waterman requires). We propose a "sequence-based" algorithm that (like other alignment algorithms) uses only information about patterns of matching and non-matching text. It does not consider (for example) the frequency of co-occurring words as do many bag of words approaches. However, it differs from other alignment algorithms in important ways. To illustrate, below are two versions of the same section of the Dodd-Frank Wall Street Reform and Consumer Protection Act. The first (version A) is from the bill as introduced in the House:

```
SEC. 1008. OVERSIGHT BY GAO.

    (a) Authority to Audit.--The Comptroller General of the United
States may audit the activities and financial transactions of--
            (1) the Council; and
            (2) any person or entity acting on behalf of or under the
        authority of the Council, to the extent such activities and
```

```
        financial transactions relate to such person's or entity's work
        for the Council.
```

The second (version B) is from the version signed into law by President Obama:

```
SEC. 122. GAO AUDIT OF COUNCIL.

    (a) Authority To Audit.--The Comptroller General of the United
States may audit the activities of--
            (1) the Council; and
            (2) any person or entity acting on behalf of or under the
        authority of the Council, to the extent that such activities
        relate to work for the Council by such person or entity.
```

These two versions clearly have the same intent, but they are not identical (e.g. the section titles are different). We first characterize each text as a set of overlapping or "shingled" n-grams. An n-gram is a contiguous sequence of n words. Overlap means that adjacent n-grams share words. Here we use 5-grams that overlap by n-1 words. In version A, two 5 grams that overlap by n-1 are "to work for the Council" and "work for the Council by." We then compare each n-gram in version A to each of those in version B, recording whether there is a match as a vector entry. Figure 1 displays the results for this example comparison. Black rectangles indicate the version A 5-grams that have a match in version B, whereas grey rectangles indicate version A 5-grams that do not match any n-grams in version B. Thus, a sequence of black rectangles indicates a longer block of shared text, etc.

The key benefit of this approach is that this match/non-match information can be used to construct many sequence-based similarity statistics (e.g. longest matching sequence, average matching sequence length, number of unique matching blocks, etc.). These statistics can then be introduced as features of supervised learning models. These models can be trained to predict known hitchhiker cases, and the best of them can be selected and used to predict hitchhikers in the broader corpus.

We tested over 1,500 models using different combinations of 21 different statistics calculated on these sequences of matching and non-matching n-grams. We started with a small

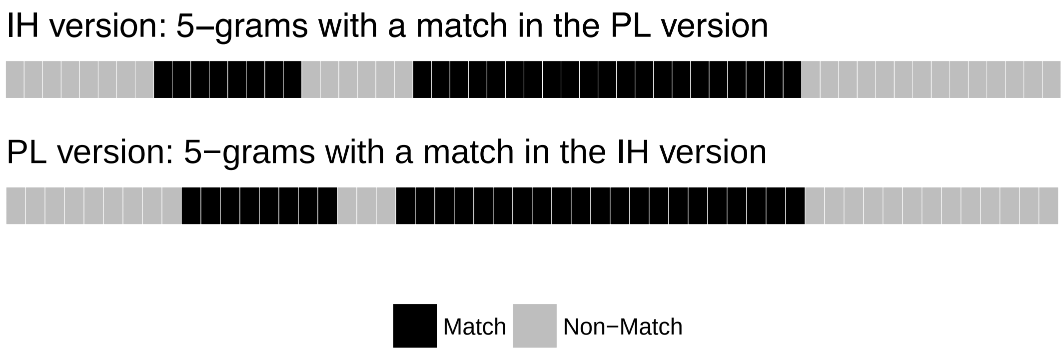

Figure 1: A comparison of two versions of a section of the Dodd-Frank Wall Street Reform and Consumer Protection Act. Black rectangles indicate where a 5-gram in the section of the introduced version of the bill exactly matches a 5-gram in version that became law, and vice-versa in the bottom plot.

number of previously labeled examples (that included about 80 true hitchhikers) and used them to identify an initial set of high performing models. We then applied these models to the broader corpus (bill-law pairings of the 111th Congress) to predict additional hitchhiker cases. After manually labeling these newly identified cases and adding them to the training set, we repeated the process (until the best performing models stopped predicting new hitchhikers). We then used the majority vote of an ensemble of 22 high performing models to predict hitchhikers across 20 years of lawmaking. This approach proved to be much more accurate than earlier experiments with other algorithms.[8]

5 Findings

We begin by examining hitchhiker patterns across eleven recent Congresses. We then test the hypotheses proposed earlier by comparing multivariate regression models predicting whether a bill becomes law on its own, and whether a bill is enacted as a hitchhiker. These models

[8]Specifically, the majority vote of this ensemble had 95% precision (5% false positive rate) and 92% recall (8% false negative rate) based on 300-fold cross validation. The off the shelf algorithms had higher recall on average (99%), but much lower precision (75%). In this respect our approach is more likely to underestimate than overestimate the true number of hitchhikers.

include indicators of standard explanations of legislative effectiveness as well as indicators of the agenda control and procedural constraints hypotheses presented earlier. We then explore how accounting for hitchhikers alters conclusions about legislative effectiveness in Congress. Finally, we shift our attention from effectiveness to exploring hitchhiker strategies more generally. What types of bills are particularly attractive vehicles for hitchhikers? Where in the lawmaking process do hitchhikers tend to be incorporated? Do broader political conditions help to explain more frequent use of hitchhikers?

5.1 Hitchhiker Bills in Congress, 1993-2014

Figure 2 confirms the importance of this type of unorthodox lawmaking. The figure compares the number of non-minor (left) and minor (right) bills that became law on their own and that became law as hitchhikers for each Congress.[9] For the 1993-2014 time period, our method indicates that more non-minor bills became law as hitchhikers (2,997) than became law on their own (2,905).[10] Thus, focusing only on bills that become law on their own misses about half of all legislative enactments.

Interestingly, minor bills are much more likely to be enacted as stand alone laws than as hitchhikers. We view this as consistent with the agenda control argument proposed earlier. Minor bills (e.g. naming federal buildings in the district) do not consume limited agenda space. They do not go through the markup process and typically pass under expedited procedures (Suspension of the Rules in the House and Unanimous Consent in the Senate). They are unrelated to the majority's agenda. For all of these reasons, there is probably less need to pursue hitchhiker strategies in these cases.

[9] As discussed earlier, we use the "Important Bill" filter of the Congressional Bills Project to distinguish minor bills.

[10] A list of all hitchhiker bills and their target laws will be made available with the replication materials for this paper. Two example target laws and their hitchhikers can be found in Supporting Information E. As noted earlier, Appropriations bills, private bills, and duty suspension/tariff bills are not included in these counts - see Supporting Information A.

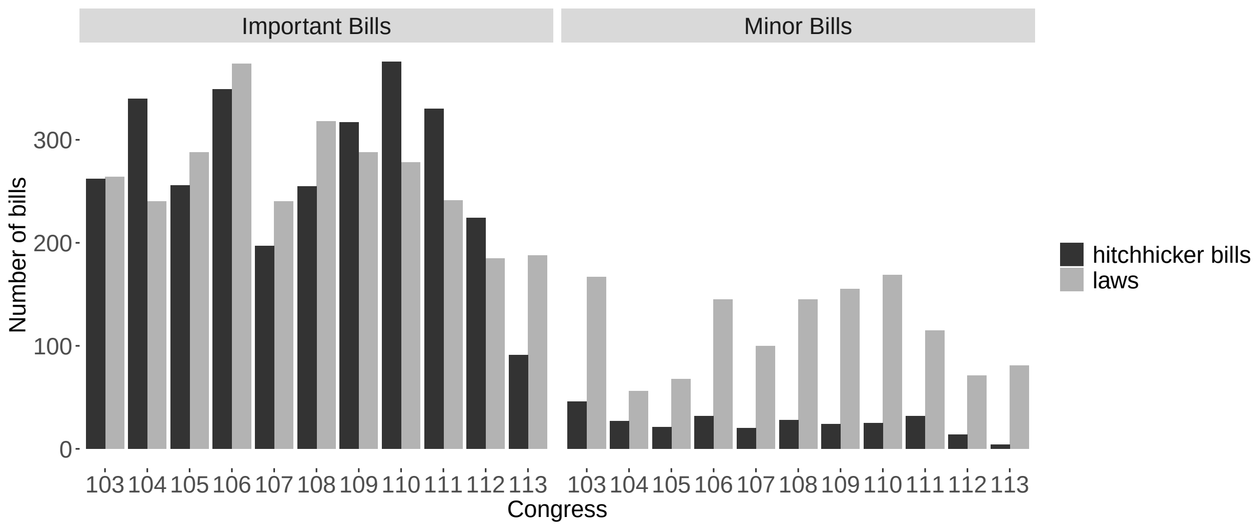

Figure 2: Counts of laws *versus* Hitchhiker bills (103rd-113th Congresses).

5.2 Sponsor and Procedural Predictors of Bill Success

Does accounting for hitchhikers alter current understandings of who is effective in Congress? Prior studies measure effectiveness using either a single threshold of success (e.g. was the bill taken up in committee or passed by the chamber? Krutz, 2005; Frantzich, 1979), or by weighting bills by how far they advance in the process (e.g. the LES scores of Volden and Wiseman, 2014). We would not expect much difference if the bills that become law as hitchhikers also tend to advance most of the way through the process on their own. However, Figure 3 indicates that this is not usually the case. Most non-minor hitchhiker bills do not even make it out of committee on their own. This gives us reason to think that accounting for hitchhikers may lead to different conclusions about who is effective in Congress.

To test this expectation, we estimate two logistic regression models predicting whether a bill becomes law on its own and whether it becomes law as a hitchhiker.[11] We test the same sponsor characteristics commonly found to be important in prior effectiveness research (such

[11]Non-minor bills only. The second regression considers only bills that did not become law on their own; following a sequential logit logic. The results of a multinomial logistic regression model predicting a three-class outcome (a bill does not become law, becomes law as hitchhiker, or becomes law on its own) show very similar results.

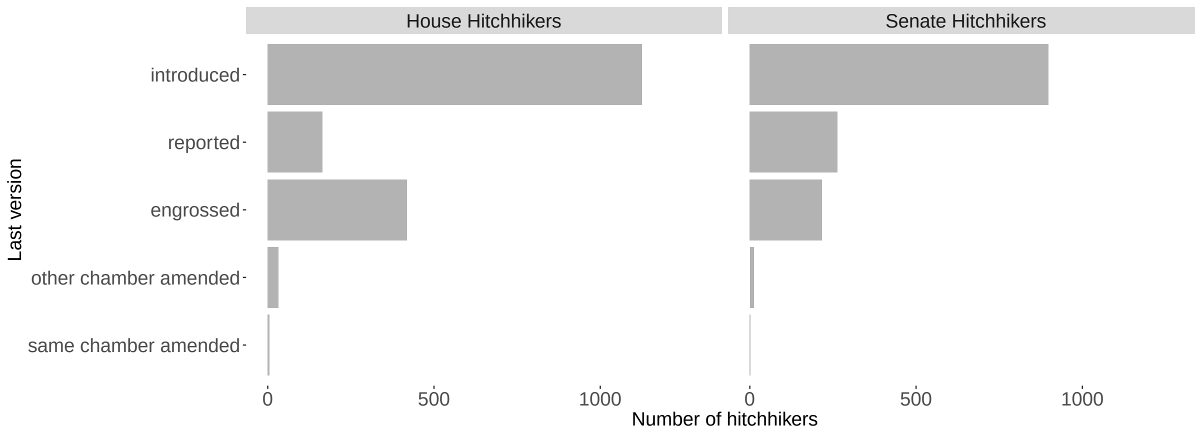

Figure 3: How far do hitchhiker bills advance on their own?

as seniority, ideology, gender, etc.). However, our committee-related variables differ from prior research. Whereas prior studies only ask whether the sponsor leads *any* committee, we ask whether they lead the committee responsible for the bill (or a subcommittee of that committee).[12] We view these measures as better indicators of the effectiveness benefits of agenda control than more general committee leadership measures.

We also include several bill type and institution-related predictors. The first is whether a bill enjoys bicameral support. We measure this by whether the bill has an identical or nearly identical "companion" bill in the other chamber (Oleszek, 2017; Kirkland and Kroeger, 2017).[13] We also expect certain types of bills to be more likely to advance regardless of sponsor. The first type are administration-initiated bills introduced "by request."[14] The second are legislative reauthorizations that reflect impending or past program expirations or "sunsets." (Adler and Wilkerson, 2012).[15]

[12]For bills referred to multiple committees, this variable indicates if the sponsor led at least one of them.

[13]Defined by whether the text of an introduced bill in the other chamber is at least 95% similar (after preprocessing) to the bill in question.

[14]Clause 7 of House Rule XXII prohibits the requesting party from being named, but House rules specify the types of bills that must be initiated by request. Most are trade or international agreements. Annual defense authorizations are also frequently introduced by request. We therefore designate, as administration bills, any "by request" bill that is primarily about defense, trade or international affairs.

[15]We search for bills that have "reauth" in their titles. This approach overlooks many cases (such as the reauthorization of the Elementary and Secondary Education Act in 2001 ("No Child Left Behind Act of 2001"). These omissions have the effect of making committee and subcommittee chairs (who typically

Finally, we test two indicators of political conditions that may encourage hitchhiker strategies. The first is partisan gridlock. Lawmakers may turn to hitchhiker strategies as it becomes more difficult to pass laws in general. We use the gridlock interval ("the ideological space between the members who represent the cloture and veto-override pivots, respectively" (Gray and Jenkins, 2017)) to control for this possibility. However it should be noted that prior empirical research does not generally find that larger gridlock intervals predict lower legislative productivity (Woon and Cook, 2015; Gray and Jenkins, 2017). The second political condition is unified government. Whereas partisan gridlock hypothesis is that legislators turn to hitchhiker strategies when the lawmaking process is not working, the expectation here is that actors in unified governments are better able to coordinate their lawmaking activities. More specifically, we expect to find that hitchhikers are more common under unified government because unified governments are more likely to engage in omnibus lawmaking.

Figure 4 presents the effects of the different independent variables as marginal probabilities of a bill becoming law on its own (LAWS), or as a hitchhiker (HITCHHIKER).[16] Each set of results includes two scales because the marginal effects for two variables at the bottom (administration bills and companion bills) are much larger than those of other variables. For the upper variables, the black line indicates a null effect (on the x0-5 scale). For the bottom two variables, the dashed vertical line indicates a null effect (on the x0-20 scale).

Overall, the models indicate that sponsors of successful hitchhikers possess characteristics that are very similar to successful law sponsors. As expected, however, committee leaders and majority party members are much more likely to sponsor the bills that become law on their own. In addition, legislative reauthorizations are about are 2.5 times more likely to be

sponsor them) appear more effective.

[16]The full results are presented in in Table Supporting Information D in Supporting Information D. The estimates are based on min-max values because many of the independent variables are dummies where a one standard deviation change is meaningless.

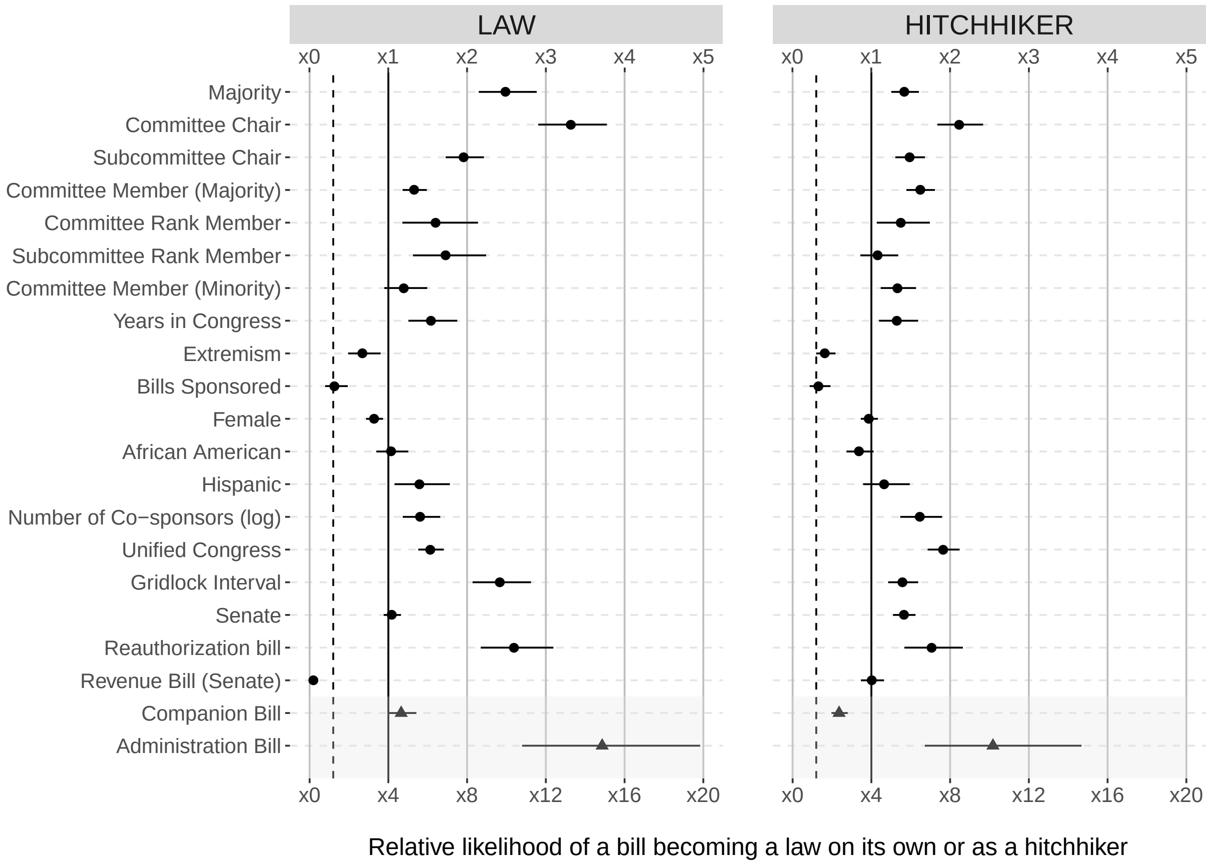

Figure 4: Marginal effects of sponsor and bill characteristics on law *versus* hitchhiker success.

enacted into law than other bills, and administration bills about 15 times more likely.[17] Bills that have companions in the other chamber (an indicator of bicameral support) are about 5 times more likely to become law. As expected, revenue-related bills that originate in the Senate, have virtually no chance of becoming law on their own. However, they are as likely as other bills to become law as hitchhikers.[18]

[17]When these compulsory bill indicators are omitted from the law success model, the marginal effects of the agenda control variables (committee leader and majority party) are about 15% larger. This confirms that the effectiveness of lawmakers in these positions is overstated in studies that do not control for compulsory legislation. The limitations of efforts to identify compulsory legislation further suggest that even our models exaggerate the relative effectiveness of these lawmakers.

[18]Bills referred to the Senate Finance Committee. The regression models themselves include a House and Senate revenue-related bills and an interaction with chamber. House revenue bills are somewhat less less likely than other bills to become law on their own.

The models also offer some evidence that the broader political context contributes to more hitchhiker lawmaking. As has been reported in prior research, we do not find that larger gridlock intervals predict lower overall productivity (Krehbiel, 1998; Gray and Jenkins, 2017; Woon and Cook, 2015) or more hitchhiking activity.[19] However, unified governments are both more productive and more likely to enact laws that include more hitchhikers. An important reason for this (not shown) is that unified governments are more likely to engage in omnibus lawmaking.[20]

5.3 Consequences for Effectiveness

Figure 5 examines how accounting for hitchhikers alters the proportion of lawmakers in each Congress that can claim at least one legislative success. In every category and in every Congress, hitchhikers add a substantial number of new legislators to the list of effective members. In proportional terms, the largest difference is for members of the minority party. Their list of effective lawmakers doubles from 16% to 32% over the time period.

Another perspective is to compare individual legislators using a measure of effectiveness that incorporates hitchhikers and one that does not. To do this we standardize Representatives' Legislative Effectiveness Scores (Volden and Wiseman, 2014) for the 111th Congress and compare them to a standardized effectiveness score that is based on enactments (laws plus hitchhikers).[21] We then examine differences between members' scores on these two measures.

Figure 6 provides two views of the same results. The figure in the upper right shows the overall distribution of differences. A value of 0.0 indicates that a member was equally effective

[19]Here we use the *Gridlock Interval* from Gray and Jenkins (2017). The results were the same for Binder (2015)'s measure.

[20]By using bill length to detect omnibus legislation, and by considering bills at the 99th length percentile as omnibus, we found that on average unified Congresses pass about 12 omnibus bills whereas non-unified Congresses only pass half as many.

[21]We divide each member's LES by the maximum LES, and each member's enactments by the maximum number of enactments.

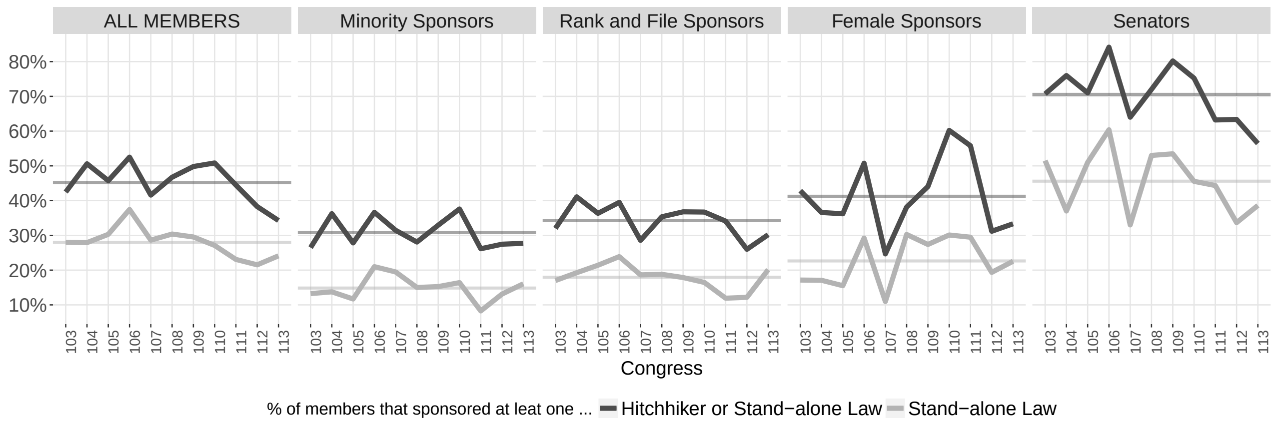

Figure 5: Percentage of legislators sponsoring at least one law (lighter lines) or at least one law or hitchhiker (darker lines)

by both measures while a positive (negative) value indicates that the standardized LES score rates a member as more (less) effective than our enactment measure. The leftmost figure restricts attention to the cases of more extreme difference. Triangles indicate committee leaders whereas dots indicate rank-and-file members. The number on the left indicates the adjusted LES score for that member while the numbers of the right indicate the number of laws and hitchhikers (in parentheses) sponsored by that member.

Consistent with earlier findings, the LES score tends to rate rank and file lawmakers as less effective (those in the upper left of the figure are all rank and file members). For example, none of the bills Rep. John Salazar (D-CO) sponsored became law on their own during the 111th Congress, but five of his laws were enacted as hitchhikers. One of these bills (H.R. 71) established the Sangre de Cristo National Heritage Area in Colorado as a provision of H.R. 146. Another (H.R. 346) provided grants for physicians in rural areas to improve their professional training and was enacted as a provision of the Affordable Care Act.

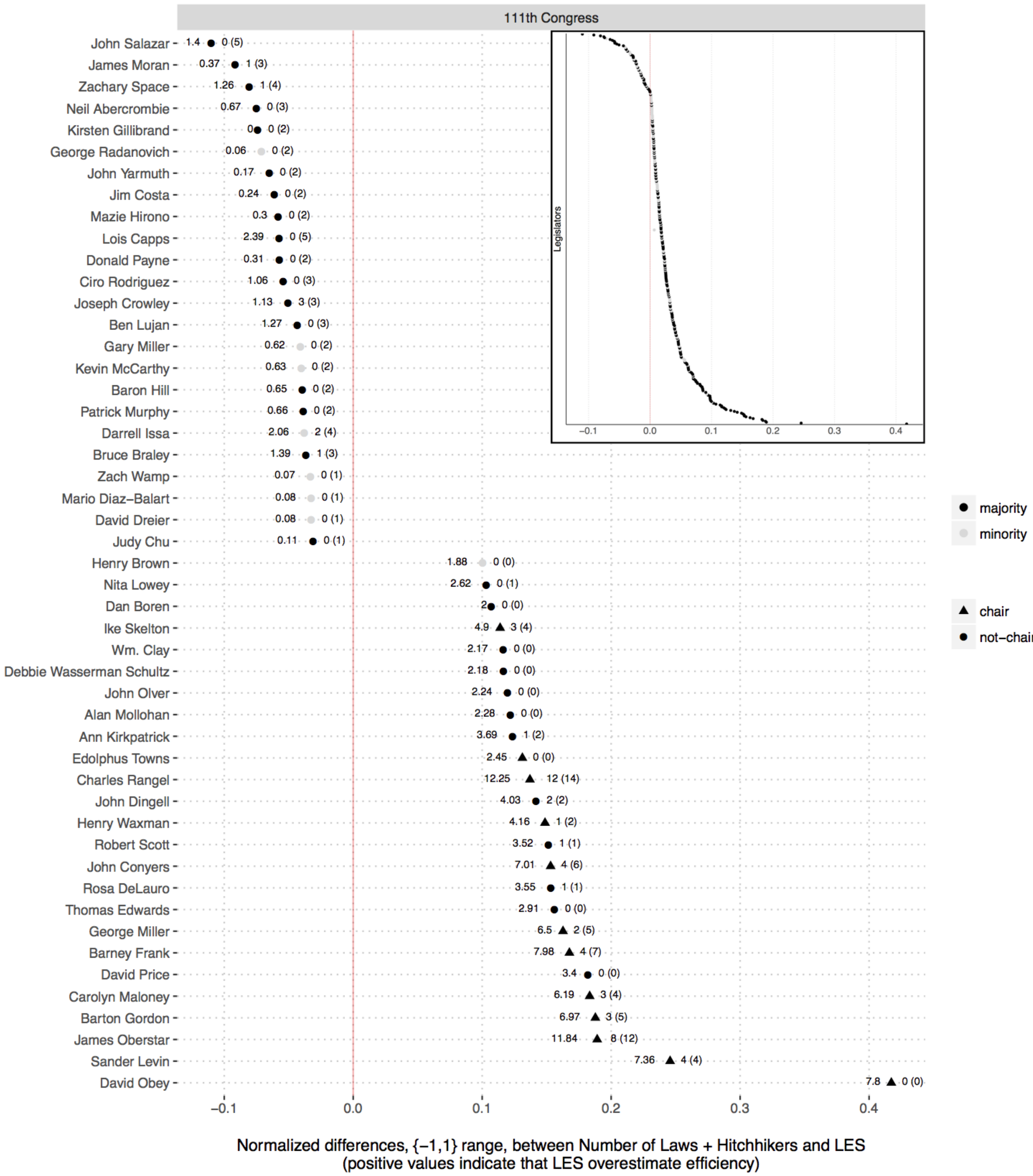

Figure 6: Comparison between the sponsor's enactments and the Legislative Effectiveness Scores (LES) of Volden and Wiseman (2014).

In contrast, the legislators rated as more effective by LES (lower right) are disproportionately committee leaders. The most extreme case is David Obey (at the time, chair of the House Committee on Appropriations). All of Obey's successful bills were appropriations bills. We exclude appropriations from our analysis because they are clearest examples of the kind of compulsory legislation that conflates effectiveness with agenda control. The second most extreme case is Sander Levin (D-MI), who took over as chair of the House Ways and Means Committee in 2010.

5.4 Where Are Hitchhikers Added?

Two final hypotheses to be tested are whether hitchhikers are frequently inserted while one chamber is considering a bill passed by the other, and whether Senate bills are more likely to become law as hitchhikers on House bills. These expectations are based on the fact that the origination clause requires that bills with revenue-related provisions originate in the House, and the fact that it can be easier to take up a House-passed bill in the Senate than a Senate bill recently reported from committee. Figure 7 indicates although hitchhikers get added at every stage of the lawmaking process, the most common stage is when one chamber is amending a bill passed over by the other chamber.[22] Perhaps most striking is that, in the vast majority of cases, the vehicle for Senate as well as House hitchhikers is a House bill (upper figures). In fact, more Senate bills became law as hitchhikers on House laws (1,118) than were enacted on their own (1,037). The largest proportion are revenue bills. In terms of topic, about half of these hitchhikers address the same major topic as the primary topic of the law (black shading), while about half address other topics (grey shading).[23]

[22] To produce this figure we compared the hitchhiker to each successive version of the bill that became law. We assume that it was inserted at the first match.

[23] Using the 20 major topic codes of the Policy Agendas Project.

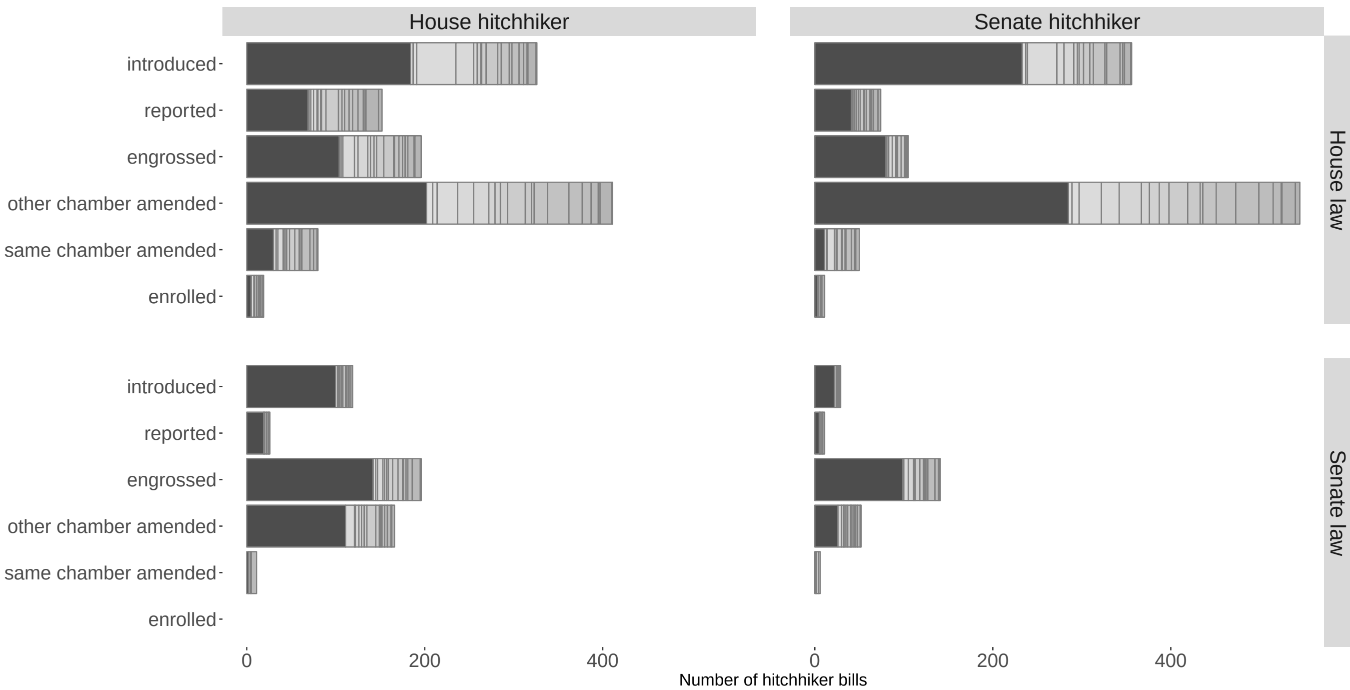

Figure 7: Where hitchhikers bills get picked up during the legislative process. Dark gray indicates hitchhikers that address the same major topic as the law. Light gray indicates the distribution of other topics.

6 Discussion

In this paper we reexamine a longstanding subject of legislative studies. In 1960, Donald Matthews observed that "[t]o the extent that the concept as used on Capitol hill has any distinct meaning, *effectiveness* seems to mean the ability to get one's bills passed." For more than 50 years scholars have defined legislator effectiveness by whether the bills they sponsor advance through the formal stages of the legislative process. We redefine getting "one's bills passed" to include bills enacted into law as provisions of other bills. Hitchhiker bills are just one way that lawmakers are able to exercise policy influence. They are closer to the "ground truth" of effectiveness than approaches that focus on how far bills progress in the legislative process on their own. We have not examined partial bill hitchhikers or successful amendments.[24] We have also excluded a number of issue areas from our analysis where hitchhikers are known to be common, including appropriations (earmarks) and miscellaneous tariff legislation (Lazarus and Steigerwalt, 2009; Jones and Linardi, 2012). Nevertheless, accounting for these hitchhiker successes provides new insights into effectiveness and into the lawmaking process more generally. We find that the congressional opportunity structure is less hierarchical and less partisan. We also observe differences in bill and hitchhiker success across chambers that reflect important procedural differences.

We have also tried to highlight limitations of bill success as a measure of effectiveness. Many bills progress for reasons that have little to do with who sponsors them. This leads to overestimates of the effectiveness of legislators in agenda setting positions (especially committee leaders), although the precise effects are difficult to estimate. But perhaps the best reason to be concerned about bill success as a measure of effectiveness is the fact that most of the bills senators sponsor that become law do so as hitchhikers on laws that originate in the House. Clearly, current approaches overlook many Senate successes and may even lead to misleading conclusions about relative chamber influence.

There is much more about hitchhikers to explore. We have not examined the policy areas that attract the most hitchhikers, or the most off topic hitchhikers. Hitchhikers also offer opportunities to study bicameral negotiations more systematically. Whereas current research examines just one or a very small number of cases (see Monroe (2012) for a summary), the text based methods introduced here provide opportunities to assess the relative influence of the House and Senate in these negotiations across many bills, issues, and partisan circumstances (e.g. unified versus divided government).

Another intriguing question yet to be examined is the extent to which House bills enacted as hitchhikers are added in the Senate and vice versa. The 900 page Senate amendment to

[24] Wilkerson et al. (2015) conduct a cursory examination of section insertions for the 111th Congress and find similar minority party success rates to those reported here.

HR 3590 that was the Affordable Care Act demonstrates that this occurs. It includes a number of hitchhikers that align with House bills that did not become law on their own. Furthermore, which legislators are most effective at advancing their proposal in this non-conventional way and why?

Research on legislative productivity currently measures it in two ways - counts of laws and counts of "major laws" (see, for example: Jones and Baumgartner, 2005). Counting hitchhikers as enactments has a dramatic impact on the former: Congress is about twice as productive. But hitchhikers also offer new opportunities for systematically categorizing laws and examining legislative productivity by defining omnibus laws in terms of the number of hitchhikers they include, the diversity of their topics, as well as the amount of text attention each receives.

More broadly, the similarly algorithm introduced in this paper can be used to investigate how the substance of thousands of individual bills evolves as they move through the lawmaking process. One basic yet to be examined question is — how much do the bills that become law change from one stage of the lawmaking process to the next? Statistical features derived from the algorithm can also be used to study more specific questions such as: Are bill edits mostly additions of new text or deletions? Do they tend to be granular (indicating focused word-smithing) or coarse (indicating the introduction or deletion of new provisions? Are new additions typically on-topic or off-topic? Do editing patterns differ depending on stage of the process (committee vs. floor), chamber, topic, or political context? Can editing patterns predict cosponsorship or whether a bill will progress?

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Supporting Information A Pre-processing

This appendix describes our approach to identifying hitchhiker bills. We propose an original active, supervised-learning methodology that is tailored to studying legislative editing processes. As noted in the discussion, this new method offers research opportunities beyond the identification of hitchhiker bills. Its distinguishing attribute is the ability to create a wide variety of statistical features from a single, comparatively fast, algorithm. Software implementing the algorithm we use in this paper will be made available on publication.

As noted in the main text, we decided to exclude certain types of bills from our analysis. These included: private bills, duty suspension/tariff bills, and continuing appropriations bills. The problem in each case is that bills are very similar in content (often differing by just a word or two), so it is almost impossible to determine if a bill is a hitchhiker in these domains, or which bill was the "original" version of a law. We also exclude larger appropriations legislation because successful appropriations bills are always sponsored by Appropriations Committee leaders.

Research demonstrates that pre-processing decisions can have important consequences for prediction (Denny and Spirling, 2018). Our pre-processing steps are tailored to the task at hand. Early on we discovered that stand-alone bills often contain language that is not retained when its policy provisions are incorporated into a law. To improve the fidelity of our bill-law comparisons, we systematically remove certain non-substantive content from each text:

- Exclude *Private*, *Duty Suspension/Tariff*, and *Appropriations* bills from the analysis.
- Remove the procedural head and tail of the bill (head = bill number, date, sponsors, etc. & tail = date, place of signature, etc.)
- Remove *Table of Contents*
- Remove *Findings, Definitions*, and *Authorization of Appropriations* sections.
- Remove a very frequent sentence: "Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled" from the text.
- Remove common procedural words (the top 100 words across all of the bills). Above this threshold, the word-distribution was essentially flat.
- Transform all text to lowercase.
- Remove all punctuation and numbers.
- Remove standard "stop words" ("the", "and", "it", "we", etc.).

Figures 1 and 2 illustrate the value of pre-processing. In Figure 1, the left side contains the complete text of a bill, The Southern Nevada Limited Transition Area Act (sponsored by Dan Heller (R-NV)) while the right includes a portion of a much larger law, the Omnibus Public Land Management Act of 2009 (sponsored by Rush Holt (D-NJ)). The red text highlights the parts of each bill that match language in the other.[25] There is a lot of common text, but there is also a lot of non-matching text. In addition, some of the matching text (such as the very first part of the bill) does not seem particularly relevant.

HR-408-IH	**HR-146-ENR**
[Congressional Bills 111th Congress] [From the U.S. Government Printing Office] [H.R. 408 Introduced in House (IH)] 111th CONGRESS 1st Session H. R. 408 To direct the Secretary of the Interior to convey to the City of Henderson, Nevada, certain Federal land located in the City, and for other purposes. IN THE HOUSE OF REPRESENTATIVES January 9, 2009 Mr. Heller introduced the following bill; which was referred to the Committee on Natural Resources A BILL To direct the Secretary of the Interior to convey to the City of Henderson, Nevada, certain Federal land located in the City, and for other purposes. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, SECTION 1. SHORT TITLE. This Act may be cited as the "Southern Nevada Limited Transition Area Act". SEC. 2. DEFINITIONS. In this Act: (1) City.–The term "City" means the City of Henderson, Nevada. (2) Secretary.–The term "Secretary" means the Secretary of the Interior. (3) State.–The term "State" means the State of Nevada. (4) Transition area.–The term "Transition Area" means the approximately 502 acres of Federal land located in Henderson, Nevada, and identified as "Limited Transition Area" on the map entitled "Southern Nevada Limited Transition Area Act" and dated March 20, 2006. SEC. 3. SOUTHERN NEVADA LIMITED TRANSITION AREA. (a) Conveyance.–Notwithstanding the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.), on request of the City, the Secretary shall, without consideration and subject to all valid existing rights, convey to the City all right, title, and interest of the United States in and to the Transition Area. (b) Use of Land for Nonresidential Development.– (1) In general.–After the conveyance to the City under subsection (a), the City may sell, lease, or otherwise convey any portion or portions of the Transition Area for purposes of nonresidential development. (2) Method of sale.– (A) In general.–The sale, lease, or conveyance of land under paragraph (1) shall be through a competitive bidding process. (B) Fair market value.–Any land sold, leased, or otherwise conveyed under paragraph (1) shall be for not less than fair market value.	SEC. 2602. SOUTHERN NEVADA LIMITED TRANSITION AREA CONVEYANCE. (a) Definitions.–In this section: (1) City.–The term "City" means the City of Henderson, Nevada. (2) Secretary.–The term "Secretary" means the Secretary of the Interior. (3) State.–The term "State" means the State of Nevada. (4) Transition area.–The term "Transition Area" means the approximately 502 acres of Federal land located in Henderson, Nevada, and identified as "Limited Transition Area" on the map entitled "Southern Nevada Limited Transition Area Act" and dated March 20, 2006. (b) Southern Nevada Limited Transition Area.– (1) Conveyance.–Notwithstanding the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.), on request of the City, the Secretary shall, without consideration and subject to all valid existing rights, convey to the City all right, title, and interest of the United States in and to the Transition Area. (2) Use of land for nonresidential development.– (A) In general.–After the conveyance to the City under paragraph (1), the City may sell, lease, or otherwise convey any portion or portions of the Transition Area for purposes of nonresidential development. (B) Method of sale.– (i) In general.–The sale, lease, or conveyance of land under subparagraph (A) shall be through a competitive bidding process. (ii) Fair market value.–Any land sold, leased, or otherwise conveyed under subparagraph (A) shall be for not less than fair market value. (C) Compliance with charter.–Except as provided in subparagraphs (B) and (D), the City may sell, lease, or otherwise convey parcels within the Transition Area only in accordance with the procedures for conveyances established in the City Charter. (D) Disposition of proceeds.–The gross proceeds from the sale of land under subparagraph (A) shall be distributed in accordance with section 4(e) of the Southern Nevada Public Land Management Act of 1998 (112 Stat. 2345). (3) Use of land for recreation or other public purposes.– The City may elect to retain parcels in the Transition Area for public recreation or other public purposes consistent with the Act of June 14, 1926 (commonly known as the "Recreation and Public Purposes Act") (43 U.S.C. 869 et seq.) by providing to the Secretary written notice of the election.

Table 1: HR-146 bill insertion example. Matches highlighted in red.

Figure 2 presents the same comparison after the texts have been subjected to our pre-processing protocol. The texts are now nearly identical.

[25]Here we use a repeated n-gram algorithm WCopyFind (Bloomfield, 2008) to define matching text

HR-408-IH	HR-146-ENR
cited southern nevada limited transition area conveyance notwithstanding federal land policy management et seq request city without consideration subject valid existing rights convey city right interest united transition area use land nonresidential development general conveyance city city sell lease otherwise convey portion portions transition area purposes nonresidential development method sale general sale lease conveyance land competitive bidding process fair market value land sold leased otherwise conveyed less fair market value compliance charter except paragraphs city sell lease otherwise convey parcels within transition area accordance procedures conveyances established city charter disposition proceeds gross proceeds sale land distributed accordance southern nevada public land management stat use land recreation public purposes city elect retain parcels transition area public recreation public purposes consistent june commonly known recreation public purposes et seq providing written notice election noise compatibility requirements city plan manage transition area accordance united code relating airport noise compatibility planning regulations promulgated accordance agree land transition area sold leased otherwise conveyed city sale lease conveyance contain limitation require uses compatible airport noise compatibility planning reversion general parcel land transition area conveyed nonresidential development reserved recreation public purposes years enactment parcel land discretion revert united inconsistent use city uses parcel land within transition area manner inconsistent uses specified discretion parcel revert united make election city	march southern nevada limited transition area conveyance notwithstanding federal land policy management et seq request city without consideration subject valid existing rights convey city right interest united transition area use land nonresidential development general conveyance city city sell lease otherwise convey portion portions transition area purposes nonresidential development method sale general sale lease conveyance land competitive bidding process fair market value land sold leased otherwise conveyed less fair market value compliance charter except subparagraphs city sell lease otherwise convey parcels within transition area accordance procedures conveyances established city charter disposition proceeds gross proceeds sale land distributed accordance southern nevada public land management stat use land recreation public purposes city elect retain parcels transition area public recreation public purposes consistent june commonly known recreation public purposes et seq providing written notice election noise compatibility requirements city plan manage transition area accordance united code relating airport noise compatibility planning regulations promulgated accordance agree land transition area sold leased otherwise conveyed city sale lease conveyance contain limitation require uses compatible airport noise compatibility planning reversion general parcel land transition area conveyed nonresidential development reserved recreation public purposes years enactment parcel land discretion revert united inconsistent use city uses parcel land within transition area manner inconsistent uses specified discretion parcel revert united make election clause

Table 2: HR-146 bill insertion example after pre-processing. Matches highlighted in red.

Supporting Information B Constructing Statistical Features

Unfortunately, not all cases of true hitchhikers are as clean as the example above. Laws incorporating language from other bills often delete, add or rearrange the original language. Thus an approach for distinguishing these messier hitchhiker cases from other cases of shared language was needed. We initially experimented with off the shelf similarity algorithms before developing the new approach that is described here.

We first tokenized the pre-processed text of each document in a way that preserved information about word ordering. We then represent each document as a set of overlapping n-grams. Here we opt for five grams (e.g. "any land sold under this") and a one word overlap. The tradeoff that must be made in terms of n-gram length is that longer n-grams (e.g. 50-grams) provide a tougher standard for shared text but open the door to more false negative predictions. Imagine two long documents that are identical except for every 50th word. A 50-gram approach will find no matches. Shorter n-grams (e.g. unigrams) will find the same two documents to be highly similar, but they open the door to false positive predictions. Imagine two documents that include the exact same words, but completely reversed. A unigram approach will conclude that the two documents are identical. Our decision to use 5 grams represents a middle ground approach.

We next record whether each 5-gram in a document has a match in the other document as a vector to retain information about each n-gram's location in the document. One limitation of simply asking if each n-gram has a match is that two matches are recorded when (for example) "increase funding for this program" occurs 2 times in the first document but only once in the second. On the other hand, an approach that excludes matched n-grams would (in the same example) would arbitrarily conclude that the second occurrence does not have a match (even when it was the second that did have a match, in actuality).

The resulting vectors capture a lot of information about each document's similarity to the other. Instead of simply comparing the proportion of n-grams that are shared, we can also compute statistics that also consider the locations of the shared n-grams. For example, we expect the matched n-grams of a hitchhiker to be located in a compact area of the law. The statistics computed for the current study are listed below (many more are possible). $\mathbf{bill}_1$ refers to the bill that did not become law, and $\mathbf{bill}_2$ refers to the law.[26] Note that below, n = 5 in all cases except the first bullet point.

- **Shared n-grams**: For each bill-law pair, we compute the simple proportion of shared n-grams in $\mathbf{bill}_1$ that have a match in $\mathbf{bill}_2$ and vice versa. We do this for unigrams, bigrams, trigrams, 4-grams, 10-grams, and 20-grams (12 metrics in all). These statistics do not rely on the sequence based approach, and are instead supplemental
- **Addition Scope**: This is calculated as the simple proportion of n-grams in $\mathbf{bill}_2$ that do not have a match in $\mathbf{bill}_1$.
- **Deletion Scope**: This is calculated as the simple proportion of n-grams in $\mathbf{bill}_1$ that do not have a match in $\mathbf{bill}_2$.
- **Scope**: This is calculated as mean of **Deletion Scope** and **Addition Scope** and gives a general characterization of the degree of difference between the two bills.

  The remaining statistics do leverage information about matching n-gram location.
- **Maximum Match Length ($\mathbf{bill}_1$)**: The longest contiguous overlapping n-gram match in $\mathbf{bill}_1$. This captures the size of the "biggest chunk" of shared text in $\mathbf{bill}_2$ from $\mathbf{bill}_1$.
- **Mean Match Length ($\mathbf{bill}_1$)**: The mean length of contiguous overlapping n-gram matches in $\mathbf{bill}_1$.
- **Mean Match Length ($\mathbf{bill}_2$)**: The mean length of contiguous overlapping n-gram matches in $\mathbf{bill}_2$.
- **Number of Matching Blocks ($\mathbf{bill}_1$)**: The number of separate matching n-gram sequences in $\mathbf{bill}_1$.
- **Number of Non-Matching Blocks ($\mathbf{bill}_1$)**: The number of separate non-matching n-gram sequences in $\mathbf{bill}_1$.

[26] Only bill versions published prior to the law's enrollment date are considered.

- **Number of Matching Blocks** ($\mathbf{bill}_2$): The number of separate matching n-gram sequences in $\mathbf{bill}_2$.

- **Number of Non-Matching Blocks** ($\mathbf{bill}_2$): The number of separate non-matching n-gram sequences in $\mathbf{bill}_2$.

- **Average Deletion Size**: The average length of non-matching sequences (the purple sequences in Figure 1) of overlapping n-grams in $\mathbf{bill}_1$.

- **Proportion of Possible Deletions**: The proportion of separate non-matching n-gram sequences in $\mathbf{bill}_1$ relative to the possible separate non-matching sequences (if one token were different every n-gram size + 1 tokens).

- **Deletion granularity**: We start by dividing the average length of non-matching sequences (the purple sequences in Figure 1) by the total number of overlapping n-grams in $\mathbf{bill}_1$. When this proportion is equal to one, none of the text of $\mathbf{bill}_1$ is present in $\mathbf{bill}_2$. When it is zero, $\mathbf{bill}_1$ is identical to $\mathbf{bill}_2$. To calculate the deletion granularity (from $\mathbf{bill}_1$ to $\mathbf{bill}_2$), we subtract this proportion from 1.

Supporting Information C Active Learning with a Massive Ensemble

These statistics are then combined as features/variables in logistic regression models predicting whether a given bill was a hitchhiker on a given law. As discussed in the main text, the initial challenge was that there is no corpus of hitchhikers to train on so we needed to develop our own. The first step in this process was to use a simple bigram algorithm (Dice) to find all bill-law pairs where at least 80% of the bill's unique words (after pre-processing) matched words in the law. This filter reduced the candidate pairs by 99% (from about 400 million to about 5 million). We then identified a single law that matched 164 bills at this 80% threshold level (HR-146, the Omnibus Public Lands Management Act of 2009).

One of the authors examined and labeled these cases (using WCopyFind) and found 89 of the 164 to be true hitchhikers. The next step was to use these 164 examples to train regression models to predict additional likely cases that could also be labeled and added to the corpus. We constructed over 1,500 different models using the statistics described above.[27] We then trained these models on the initial corpus and used the best of them to predict additional likely hitchhiker cases.

In this first iteration, the 99 models that had precision and recall above 90% predicted 480 additional hitchhikers in the 111th Congress.[28] Twelve graduate students, one undergraduate, and one faculty member then labeled these cases (once again using WCopyFind to

[27] All possible 1-to-3 variable combinations for a total of: $\sum_{n=1}^{3} \frac{21!}{n!(21-n)!} = 1,561$ models.

[28] Precision and recall are calculated using an n-fold approach that averages results across 300 partitions of the corpus into 80% train and 20% test sets.

visually compare how the texts overlapped). This was easier than expected as we observed perfect agreement for the 10% of cases labeled by two or more individuals.

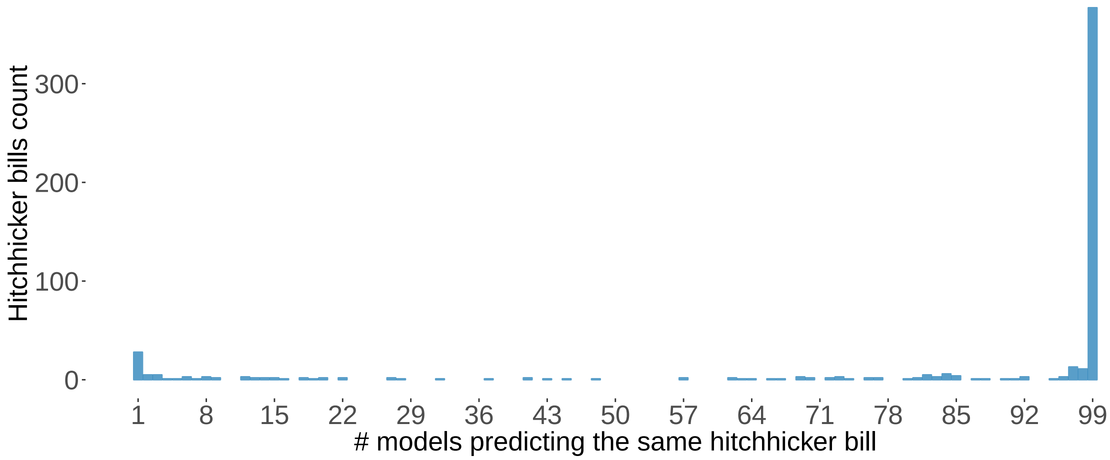

Figure 8: Bill insertion predictions for an ensemble of 99 models

We then retrained all 1,561 models using this larger corpus of 640 examples. In the second iteration, 39 models that exceeded the high performing threshold predicted just 5 additional cases. We labeled these cases and iterated the process two more times. The final ensemble of 22 high performing models - subsequently used to predict hitchhikers across all ten Congresses - had 92% precision and 95% recall. Closer inspection revealed that most of the false positive predictions (8%) were cases where a substantial portion (but not all) of the bill was in the law. The rest were very short bills that contained very similar language (such as duty suspension bills or continuing appropriations resolutions). The false negative cases (5%) tended to be cases where the annotator still judged it to be a hitchhiker case even though there was a fair amount of language difference between the overlapping text of the bill and law.

	Iteration 1	Iteration 2	Iteration 3	Iteration 4
Training Corpus Size	164	644	649	651
True Positives & Negatives	(P=89,N=75)	(477,167)	(481,168)	(483,168)
# High Performing Models	99	39	24	22
New Hitchhiker Predicted	480	5	2	1
Precision		91%	93%	92%
Recall		95%	94%	95%

Table 3: Summary of the Active Learning Process.

As a final step we used the same corpus of 650 labeled cases to compare the performance of several off the shelf algorithms.[29] Their average recall was higher (99%) but their precision was much lower (75%). This indicates that compared to the other methods, our approach is conservative. It is much less likely to make false positive predictions (92% versus 75%) at the expense of making a few more false negative predictions (95% versus 99%).

[29] Cosine similarity, Dice coefficient, WDiff, Smith-Waterman, Needleman-Wunsch.

Supporting Information D Logistic Regression Models

In this appendix we first present a table of descriptive statistics for all the variables included in the logistic regression models presented in the paper.

	Minimum	Maximum	Mean	Standard Deviation	Mode
Majority	0.00	1.00	0.593	0.491	1.00
Committee Chair	0.00	1.00	0.06	0.237	0.00
Subcommittee Chair	0.00	1.00	0.087	0.281	0.00
Committee Rank Member	0.00	1.00	0.029	0.167	0.00
Subcommittee Rank Member	0.00	1.00	0.05	0.217	0.00
Committee Member	0.00	1.00	0.45	0.498	0.00
Years in Congress	0.00	51.00	13.899	10.567	4.00
Extremism	0.00	1.26	0.442	0.175	0.00
Bills Sponsored	1.00	232.00	36.105	27.828	16.00
Female	0.00	1.00	0.16	0.366	0.00
African American	0.00	1.00	0.058	0.233	0.00
Hispanic	0.00	1.00	0.021	0.144	0.00
Number of Co-sponsors (log)	0.00	6.07	1.398	1.462	0.00
Unified Congress	0.00	1.00	0.72	0.45	1.00
Gridlock Interval	0.38	0.65	0.56	0.09	-
Senate	0.00	1.00	0.353	0.478	0.00
Reauthorization bill	0.00	1.00	0.017	0.127	0.00
Revenue Bill	0.00	1.00	0.248	0.432	0.00
Companion Bill	0.00	1.00	0.025	0.156	0.00
Administration Bill	0.00	1.00	0.003	0.056	0.00
Congress	103.00	113.00	-	-	110.00
Major Policy Agendas Topic code	1.00	21.00	-	-	3.00

Table 4: Model data: descriptive statistics table

Then in the following figure we show the coefficients (and standard errors in parenthesis) for the two logistic regression models for which we plotted marginal effects in Figure 4.

	LAW	HITCHHIKER
Majority	0.9093* (0.0748)	0.3487* (0.0626)
Committee Chair	1.1978* (0.0663)	0.7482* (0.0691)
Subcommittee Chair	0.6693* (0.0628)	0.3945* (0.0635)
Committee Rank Member	0.4587* (0.1536)	0.3094* (0.1229)
Subcommittee Rank Member	0.5354* (0.1345)	0.0701 (0.1131)
Committee Member	0.1742 (0.1138)	0.2828* (0.0865)
Committee Member x Majority	0.1065 (0.1277)	0.1986 (0.1031)
Years in Congress	0.0084* (0.002)	0.0054* (0.0019)
Extremism	-0.3276* (0.1226)	-0.7196* (0.1201)
Bills Sponsored	-0.0051* (0.001)	-0.0049* (9e-04)
Female	-0.2029* (0.066)	-0.0328 (0.0575)
African American	0.0284 (0.0993)	-0.1762 (0.105)
Hispanic	0.3237* (0.1275)	0.1429 (0.1298)
Number of Co-sponsors (log)	0.0555* (0.0141)	0.0784* (0.0138)
Unified Congress	0.4257* (0.0535)	0.6473* (0.0548)
Gridlock Interval	3.2796* (0.2935)	1.2349* (0.2662)
Senate	0.042 (0.0529)	0.3455* (0.0517)
Reauthorization bill	0.9503* (0.0911)	0.5626* (0.1097)
Revenue Bill	-0.5211* (0.0739)	-0.1614* (0.0661)
Revenue Bill x Senate	-2.5615* (0.2927)	0.1637 (0.0929)
Companion Bill	1.5338* (0.0796)	0.8541* (0.091)
Administration Bill	2.6897* (0.1545)	2.2986* (0.197)
Constant	-6.9682* (0.2578)	-4.8159* (0.2106)
N	84,913	82,009
AIC	21,509	23,763

Note: *p<0.05

Table 5: Results for two logistic regression models predicting whether a bill becomes a stand alone law (LAW) and, conditional on that not happening, whether it becomes law as a hitchhiker (HITCHHIKER). We include Congress (103 to 113th) and topic (Policy Agendas major topic) fixed-effects, although for simplicity we do not include the fixed-effect coefficients in the table.

Finally, in Figure 9 we explore potential significant heterogeneous effects across Congresses. We do not observe however any clear temporal trend, and despite some isolated exceptions, we find our findings to be robust across time (size and direction of the coefficients).

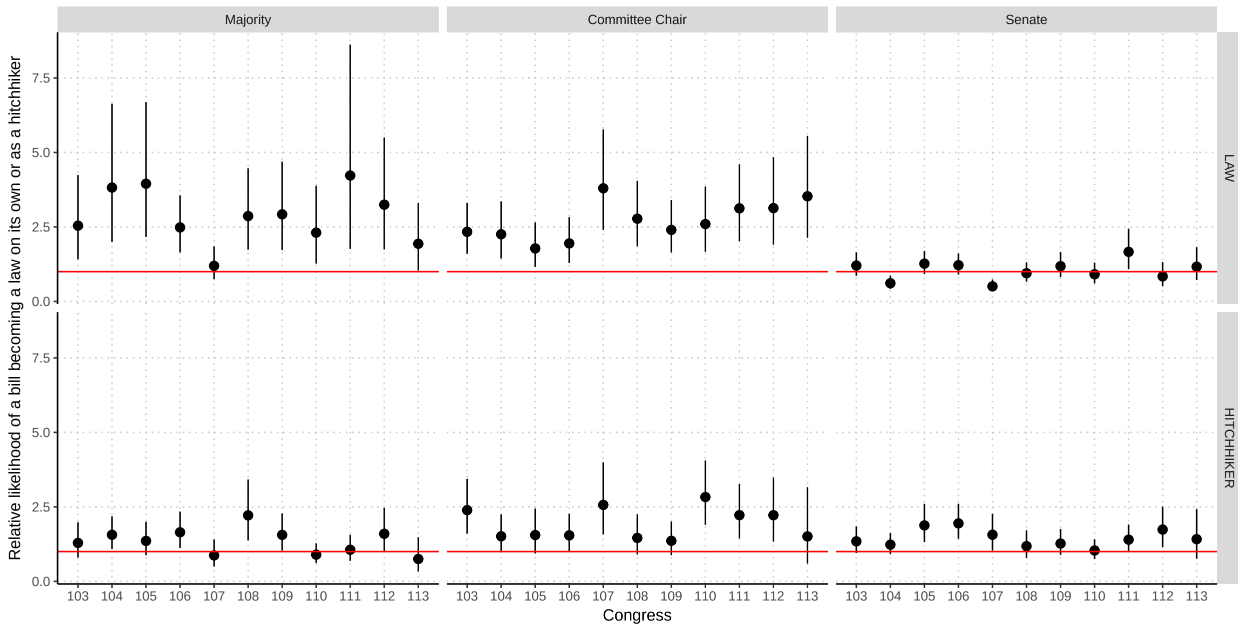

Figure 9: Key coefficients of interest when estimating a separate model for each Congress.

Supporting Information E Hitchhikers Bills for two Target Law Examples

Affordable Care Act (HR-3590) – 111th Congress		Financial Freedom Act of 1999 (HR-2488, 106th Congress)	
111-HR-1010	111-S-1108	106-HR-1039	106-HR-870
111-HR-1402	111-S-1130	106-HR-1127	106-S-1010
111-HR-1415	111-S-1213	106-HR-1172	106-S-1057
111-HR-1460	111-S-1239	106-HR-1194	106-S-1057
111-HR-1570	111-S-1256	106-HR-1546	106-S-1116
111-HR-20	111-S-1279	106-HR-1616	106-S-1124
111-HR-2006	111-S-1384	106-HR-1703	106-S-1136
111-HR-2223	111-S-1423	106-HR-1914	106-S-1136
111-HR-2301	111-S-1473	106-HR-1955	106-S-1164
111-HR-2358	111-S-1628	106-HR-1986	106-S-1208
111-HR-2525	111-S-1959	106-HR-2018	106-S-1357
111-HR-3138	111-S-2922	106-HR-2400	106-S-14
111-HR-3242	111-S-301	106-HR-2416	106-S-162
111-HR-3256	111-S-324	106-HR-2430	106-S-288
111-HR-3468	111-S-408	106-HR-264	106-S-506
111-HR-3556	111-S-621	106-HR-423	106-S-540
111-HR-362	111-S-631	106-HR-487	106-S-60
111-HR-3648	111-S-647	106-HR-607	106-S-646
111-HR-3688	111-S-660	106-HR-630	106-S-649
111-HR-4313	111-S-670	106-HR-7	106-S-670
111-HR-444	111-S-677	106-HR-739	106-S-713
111-HR-479	111-S-795	106-HR-813	106-S-779
111-HR-756	111-S-860	106-HR-859	106-S-87
111-S-1022		106-HR-865	106-S-933