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Strategic compromise, policy bundling and interest group power: Theory and evidence on education policy ☆

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ABSTRACT

Policy reforms are often multifaceted. In the rent-seeking literature policies are usually taken as one-dimensional. This paper models policy formation using a political contest with endogenous policy proposals containing two dimensions, e.g. access and quality of education. The two dimensions provide an opportunity to trade off one policy over another to make the lobbying opposition less aggressive. In a first stage, the government proposes a reform over the two policies, and in a second stage engages in a contest with an interest group over the enactment of the proposed reform. As a result, the government makes a compromise, under-proposing in the policy the interest group opposes and over-proposing in the policy the interest group desires. Effectively, there will be strategic bundling of desired policies with undesired ones in an attempt to increase enactment probability and overall utility. We study this prediction empirically using a newly complied dataset on education legislation in the states of California, Illinois and Texas. Results suggest that stronger opposition is associated with less quality reforms. Moreover, as predicted by the model, when bundling access reforms together with quality, the negative effect is counteracted.

1. Introduction

Policy reforms are frequently multifaceted. They are composed of a collection of provisions involving more than one policy dimension. In international trade, for instance, decisions must be made about the commodities to be regulated as well as the level of tariffs. In health care policy, insurance coverage and insurance policy standards may fall under a single health reform bill. In education, a reform could contain provisions on the salary of teachers as well as on the curriculum. In social welfare, reforms can contemplate a change in the generosity of some benefit, and also changes in the group of beneficiaries. Often, these different

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elements of reform are used by opposing interests as tools for bargaining in the political arena. A group that prioritizes one policy dimension over another may use the other dimension as an instrument for negotiation.

During the heated 2009 debates regarding the United States' Obamacare health bill, certain concessions were made in order to secure the support of politicians to ensure the bill's passage, some of those policies on which compromises were made were the federal funding for abortion and the public health insurance option, which many agreed to be minor parts of the overall reform. Another example is Australia's controversial Higher Education Bill of 2014, whose main purpose was to reform the funding system for Australian universities through deregulation of higher education fees. The bill has undergone a series of compromises since its introduction early in 2014, including the proposed budget cut to universities by 20%, in order to win over the labor party, the Greens, and resistant cross-bench politicians.[1]

In this paper we explore such strategic behavior in a political contest model with two policy elements that may be traded off to augment the probability of winning. We consider a policy-oriented government interested in reforming a bundle of two policies, one of which is opposed and the other supported by an interest group. In the first stage, the government makes a reform proposal to the legislature, which then decides on its enactment in the second stage. The decision to enact the proposed reform is influenced negatively by the lobbying effort of the interest group and positively by the lobbying effort of the government. We therefore model the legislative process as a contest in which effort exerted by the interest group and the government are costs associated with gaining votes in the legislature. In this endogenous policy formation framework, we investigate the composition of the government's reform proposal in the presence of the interest group. By threatening to block the reform enactment in congress through lobbying, the interest group can nudge the government's policy proposal closer to their desired bundle. In equilibrium, the government makes a compromise with respect to its optimal bundle by proposing less of the interest group's opposed policy and more of the interest group's desired policy.

This result has an interesting implication for policy bundling. If the government were interested in reforming only one policy dimension, then, absent opposition, he would propose to keep the other policy at the *status quo*. However, if this policy is desired by the interest group, the model implies that an opposition would induce him in equilibrium to propose a level higher than the *status quo* to appease the lobby. In such a case, the government strategically bundles the policies into one proposal to maximize the chances of enactment.

The setup of our model has three features of the policy-making process that deserve preliminary comment. First, the government does not decide on reform enactment. Existing literature models the government as the contest maker who decides on the proposals of two opposing interest groups that expend effort to gain the favor of the government. Here, we assume instead a government whose reform-making power is constrained by the legislature. Thus, the contest-maker in our analysis is the legislative process. Second, although reform enactment is not determined entirely by the government, it has agenda-setting power.[2,3] The government can propose a reform bundle, whose enactment is then decided in congress. If congress votes favorably, the proposed reform is enacted; if not, *status quo* is maintained. Third, since government and an interest group engage in a legislative contest over the enactment of the proposed reform, both must exert effort to increase their probability of winning. We therefore assume that the effort expended by both sides are activities conducted for the purpose of gaining votes in their favor.[4] From the viewpoint of the interest group, lobbying effort comes in the form of campaign contributions, hiring lobbyists, organizing protests and printing newspaper ads and other publicity materials. From the viewpoint of the government, successful reform passage requires effort put into talks and negotiations with legislators, and into trying to nudge public debate in their favor, consequently influencing the constituencies of the legislators who must cast their vote.[5]

Such a setup is well suitable to represent numerous real-world applications, particularly presidential systems and coalition governments where the ruling party does not decide on the policy, but can propose bills that must survive the legislature. As a well known example of government lobbying, during the 111th United States Congress where the Patient Protection and Affordable Care Act (better known as Obamacare) was introduced, time and effort were spent in negotiations to break the threat of a Republican filibuster. Former U.S. president Barack Obama himself delivered a speech to a joint session of Congress to emphasize his commitment to the reform. Another example of government lobbying is the video released by the Italian government in the spring of 2015 about the highly-controversial and much opposed *La Buona Scuola* (The Good School) education reform. The video showed Italian prime minister Matteo Renzi discussing in detail the benefits of his administration's proposed reform. Other examples can be found in the sociological and political science literature, for instance in the fields of welfare state (Busemeyer and Neimanns, 2017; Häusermann et al., 2019), labor market (Gallego and Marx, 2017) and pension reforms (Milkman et al., 2012).

The strategic compromise and policy bundling resulting from our framework can be empirically analyzed using a newly complied dataset on U.S. state-level education legislation over the period 2008–2013. The advantage of education legislation is that policies

[1] See for example https://www.nytimes.com/2009/09/13/health/policy/13plan.html for the U.S and https://www.smh.com.au/politics/federal/turnbull-government-shelves-controversial-university-reforms-in-major-departure-from-abbott-era-20151001-gjynlt.html for Australia.

[2] See for example Knight (2005), for a study of proposal power in a Baron and Ferejohn's (1989) bargaining model, and Aragones et al. (2015), for an article studying agenda setting power.

[3] Finger (2017) argues that interest groups can also have agenda setting advantages by electing allies in the legislature. We do not consider interest groups' electoral motives here.

[4] We follow in some sense Skaperdas and Vaidya (2012) who take lobbying effort as the cost of "persuasion". This is in contrast to recent contest lobbying literature that takes effort to be favors or bribes that enter the government's utility function. The difference between influence through bribe and information is covered in details in a recent contribution by Gregor (2017).

[5] Epstein and Hefeker (2003) explore lobbying contests where opponents can use more than one instrument in order to win. In this study we assume all such instruments can be aggregated into a single measure of effort.

can be grouped into two broad categories: access and quality policies, the former being supported, and the latter opposed, by education's strongest interest group: teachers' unions. Our model assumes the existence of only one lobby, or more lobbies but with aligned interests, and this fits the case of teacher unions in the US. We focus on the states of California, Illinois and Texas because these three states combined already make up 12 percent of all enacted education legislation during the period, and have a good balance of teachers' union strength, with Illinois and California having one of the strongest, and Texas having one of the weakest teachers'union in the whole country. We find that stronger opposition induces fewer quality reforms. However, this negative relationship is counteracted when access is bundled together with quality reforms. Our paper contribution to the literature is thus two-fold: first it adds a multidimensional component in the theoretical framework of policy formation under lobby, secondly, our empirical analysis makes use of a newly collected dataset of legislation on education. More in detail, our paper innovates the theoretical literature on this topic by extending the main result of Epstein and Nitzan (2004) to the case of a two-policies space. The concept of "strategic restraint" is extended in a bidimensional polity, in which one of the players (the agenda-setter) proposes a bill not only with a lower level of its own "preferred" policy, but also with a higher level of its "opposed" policy. We show that this proposal is rational and utility maximizing in that it reduces the lobbying effort and it increases the probability of approval. Our paper also innovates the empirical studies, as it uses a novel dataset collected specifically for this purpose. First, we retrieved actual draft of bills on education at all stages of the legislative process (from the proposed to the enacted version) and we classify them according both to the type of intended reforms (access vs quality) and their direction, relying on automated text analysis. Second, we match each bill with its author and the characteristics of the district of election of the authors themselves. Finally, we measure the relative strength of teachers and teachers' unions in each district. We are therefore able to test the political mechanisms resulting from the theoretical model with data on education reforms in three US States.

The remainder of our paper proceeds as follows. In the next section, we review the most relevant literature. In Section 3 we present the basic setup of the model, that we solve and discuss in Section 4. Our empirical results on U.S. state-level education bills are presented in Section 5. Finally, Section 6 concludes.

2. Related literature

Our attempt to model policy determination in the face of opposition is related to the literature on policy formation under lobbying. So far, two opposite theories have been developed in the literature, the first being the "compromise" theory that says that the lobbying induces a compromise between the policy preferences of the stakeholders. Studies of this kind include Hillman and Ursprung (1988), Grossman and Helpman (1996), Epstein and Nitzan (2004), Münster (2006) and Felli and Merlo (2006). Grossman and Helpman's (1996) Downsian model considered lobbying as a "menu auction" and found that the equilibrium policy is a compromise between the policy preferences of the lobbies and the policy preferences of the voters. Felli and Merlo (2006) also used menu-auction lobbying to develop a citizen-candidate model of political competition where the politician selects the lobbies endogenously. In this setting, the policy outcome is a compromise between the policy preferred by the candidate and the policy preferred by the chosen lobbies. In the theoretical contribution closer to ours, Epstein and Nitzan (2004) used contests to model lobbying and relaxes the assumption commonly made in contest games that the policy proposals are exogenous. They develop a two-stage political contest between interest groups where first stage determines the choice of policy proposal and the second stage is where the contest occurs. They show that under these circumstances groups have an incentive to strategically moderate their proposals in order to reduce the effort of the opposition, thereby increasing their chances of winning. The resulting proposals are therefore less polarized than they would be without opposition. In their model, the proposals will never coincide. Münster (2006) explored the same setup for perfectly discriminating contests and found that the proposals of the two groups will not only be less polarized, but will coincide. A similar framework was used by Aidt (2002) in a context where two lobbies compete over a single policy. In the first stage one of the lobbies may find it optimal to withdraw if it makes the other to be less aggressive, leading to a Pareto-superior outcome.

The opposite theory in this strand of literature provides circumstances under which lobbying could result in extreme policies. Glazer et al. (1998) developed a simple framework showing that an incumbent may choose to implement an extreme policy if he is strongly office-motivated and the costs of a challenger reversing the policy is substantial. The intuition behind this is that the median voter with moderate preferences will prefer to reelect the incumbent with an extreme policy than vote for the challenger and incur the high cost of changing the policy when the challenger comes into office. More recently, Epstein and Nitzan (2006) studied a two-stage public policy contest in which a politician proposes a policy and interest groups compete for its approval or rejection. Building on the results of Epstein and Nitzan (2004) and Münster (2006), they find that a politician will propose an extreme policy if his marginal benefit from the lobbying expenditures exceeds his marginal losses from the disutility of the lobbies.

Inherent in these special interest and rent-seeking studies is the one-dimensionality of the policy space.[6] The few studies involving theoretical models with two or more policy components make simplifying assumptions about how the components affect special interests. For instance, Glazer et al. (1998) assume that one of the two types of policy issues is fixed due to predetermined positions reflecting ideology. Other studies assume that interest groups have preferences over only one of the policy components (List and Sturm, 2006; Chaturvedi and Glazer, 2005).

[6] We are aware of the significant strand of the literature which focus on the issue of multidimensional policy space in electoral competition, starting from McKelvey (1976) to the most recent contribution of McKelvey and Patty (2006), De Donder et al. (2012), Bellani and Scervini (2015), but we are not aware of any contribution that has addressed the issue in special interest and rent-seeking models.

This gap in the theoretical literature has persisted despite a number of empirical work acknowledging that reforms are multi-faceted and each facet affects interest groups in varying degrees (Kang, 2015; Lake, 2015; Fabella, 2017). We attempt to fill this gap by proposing a model of policy reform in a two-dimensional policy space, the components of which both enter directly into the preferences of the interest groups. This provides insights into the decision to trade off one component over another to augment the probability of reform enactment. Indeed, we find that compared to the government's preferred reform bundle when there is no interest group, the equilibrium proposal of the government will have more of the interest group's favored policy component and less of the opposed policy component. Hence, the government makes a strategic compromise in an attempt to make the interest group less aggressive. Moreover, the implications of our framework are similar to those of Cotton and Dellis (2016) who look at information lobbying and agenda distortion. They also find that the lobbying distorts the reform agenda towards the desired points of the interest groups, though their mechanism differs from ours in that they use information lobbying by interest groups that shifts the government's attention from constituency-preferred policies to interest group-preferred policies. Finally, in focusing on issue selection and on the possibility of distorting policy in some dimensions to gain the support, our paper relates naturally also to the literature on log-rolling that emerged in the 1980s (see for instance Shepsle and Weingast, 1981a,b; Weingast et al., 1981). However, we differ from this setting in that we do not explicitly consider vote trading by legislative members. Instead we look at simultaneous voting, instead of sequential, on the different issues.

3. Basic setting

In the spirit of the lobbying literature with endogenous policy proposals (Epstein and Nitzan, 2004), consider a setting with two actors: a policy-driven Government, G, and an Interest Group, I. The Government wishes to conduct a reform in two policy dimensions. As an illustrative example, these can be broadening access (a) versus improving quality (q), in the sense that applies to education policy. The proposal of the Government lies in the policy space (a, q) and, without loss of generality, let $s = (0, 0)$ be the *status quo*.

In our setup, reform enactment is not determined entirely by G, but by a political institution such as the legislature. G, however, possesses agenda-setting power and can make a proposal $r = (\widetilde{a}, \widetilde{q})$, which is then voted on in congress.[7] We model the policy formation as the outcome of a contest in which reform enactment is a function of G and I's effort to gain votes in the legislature. If G gets more votes than I, the reform proposal $(\widetilde{a}, \widetilde{q})$ is enacted, otherwise, *status quo* is maintained.

Let us call a generic proposal bundle $b = (a, q)$ and assume that the Government wants to implement its optimal bundle $g^* = (a_G^*, q_G^*)$. The point (a_G^*, q_G^*) can serve a number of interpretations. It can be the reform bundle that maximizes the utility of the group in power, or the bundle that maximizes an incumbent's political support, or even the bundle that maximizes the preferences of G's constituency. We make no assumptions about the motives that determine (a_G^*, q_G^*) and this point will therefore serve just as a benchmark upon which to compare the equilibrium reform levels that will emerge.

It is worthwhile noting that outside of this political contest, any other costs to G of deviating from its optimal point is assumed to be captured by a loss in utility U_G from deviating from the optimal bundle (a_G^*, q_G^*). This allows us to focus on the reform levels that emerge from the interaction between G and I.

Utility function. Let the utility of G be a continuous and decreasing function of the Euclidean distance $d(\cdot)$ between the generic bundle b and the optimal bundle g^*, $d(b, g^*) = \sqrt{w_G^a (a - a_G^*)^2 + w_G^q (q - q_G^*)^2}$, where w_G^a and w_G^q are weights representing the relative importance of each dimension. For convenience, we moreover assume without loss of generality that the utility depends on the square of the distance,[8] so that

$$U_G\left(d^2\left(b, g^*\right)\right) = U_G\left(w_G^a \left(a - a_G^*\right)^2 + w_G^q \left(q - q_G^*\right)^2\right). \tag{1}$$

U_G represents a general function for which the following condition holds:

$$\partial U_G / \partial d^2 < 0.$$

The utility is intuitively at the maximum if $a = a_G^*$ and $q = q_G^*$, and is decreasing with the squared Euclidean distance.[9]

We assume that the Government has an incentive to propose a reform only if its utility from the reform is higher than its utility in the *status quo*. Formally, we can define $M_G = U_G\left(d^2(r, g^*)\right) - U_G\left(d^2(s, g^*)\right) > 0$ as the difference between the utility of the Government when the reform (r) is implemented and the utility of the *status quo* (s). In the remainder of the paper we focus on the case of $M_G > 0$. Otherwise, the Government has no incentive to make a proposal in the first place.

The preferences of the Interest Group are modeled in a similar manner. Let its optimal bundle be denoted by $i^* = (a_I^*, q_I^*)$ and its preferences be described by $U_I(a, q)$, as follows

$$U_I\left(d^2\left(b, i^*\right)\right) = U_I\left(w_I^a \left(a - a_I^*\right)^2 + w_I^q \left(q - q_I^*\right)^2\right). \tag{2}$$

I's utility decreases with the squared distance between a generic bundle b and i^*, $\partial U_I / \partial d^2 < 0$. Also in this case, we make no explicit assumption on the determinants of i^*: the Interest Group's optimal bundle could have been chosen to maximize political prestige, the utility of its supporters, or funds raised. The interpretation of the utility function and its maximization conditions are the same as Eq. (1). Fig. 1 represents an example of Government and Interest Group utility functions.

[7] We shall use legislature and congress interchangeably.

[8] As this is a positive monotonic transformation of the distance and thus represent the same preferences.

[9] See appendix A.1 for the discussion of the first order condition.

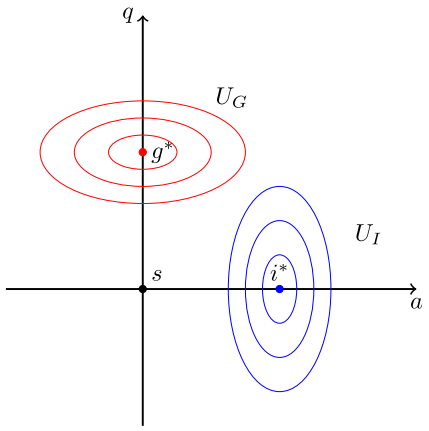

Fig. 1. Illustrative example of utility functions in case the Government (red) wants to improve only the quality (g^* is its optimal policy bundle) with respect to the *status quo* s, while the Interest Group (blue) wants to improve only the access. Indifference curves farther from g^* (i^*) represent lower levels of utility for the Government (Interest Group). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

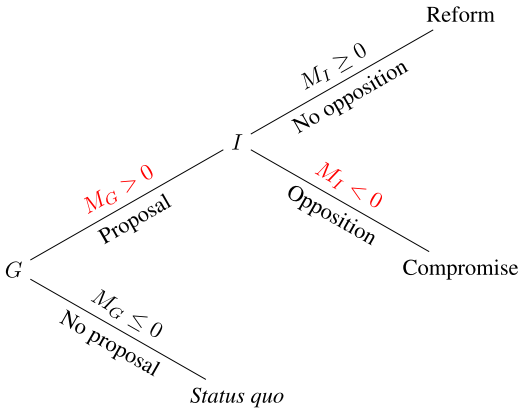

Fig. 2. Representation of the decision tree.

It is useful to highlight that the utility functions of the Government and the Interest Group are not necessarily symmetric. Indeed, the weights (w_j^i) attached to quality and access describe the relative preferences for the two policies and shapes the incentives of every single player to trade-off one to the other.

Agents' incentives. The attitude of the Interest Group depends on the relative distances between the *status quo* s, the proposal, $r = (\widetilde{a}, \widetilde{q})$, and its own preferred bundle i^*, that in turn affects the difference in utilities. If we define M_I analogously to M_G as the difference between utility under the reform and utility under the *status quo*,[10] we can state that:

i. if $d(r, i^*) > d(s, i^*) \Rightarrow M_I < 0$, then I prefers the *status quo*,
ii. if $d(r, i^*) < d(s, i^*) \Rightarrow M_I > 0$ then I supports the reform,
iii. if $d(r, i^*) = d(s, i^*) \Rightarrow M_I = 0$ then I is indifferent between the two options.

The only relevant case to study is the one in which the Interest Group has an incentive to oppose the reform. Otherwise, the Government and the Interest Group agree in support of the reform and the Interest Group has no incentive to oppose the reform. For this reason, the remainder of the paper focuses on the first case in which $M_I < 0$.

Fig. 2 shows the possible cases. If the Government has no incentive to propose a reform, then the *status quo* is maintained irrespective of the preferences of the Interest Group. Otherwise, the reform is implemented if it is proposed by the Government ($M_G > 0$) and not opposed by the Interest Group ($M_I \geq 0$), while some kind of compromise should be reached if the Interest Group exerts some effort against the reform ($M_I < 0$).

The no-proposal case can be seen as a trivial case where the *status quo* $(\widetilde{a}, \widetilde{q}) = (0, 0)$ is proposed. The no-opposition case, on the other hand, occurs when both the Government and the Interest Group prefer the reform over *status quo*. In both these cases, the

[10] $M_I = U_I\left(d^2(r, i^*)\right) - U_I\left(d^2(s, i^*)\right)$.

Government's utility is maximized. Furthermore, both cases have corner solutions in effort.[11] No efforts are exerted and the proposal is passed with full certainty.

From this point forward, let us consider only the case with an interior solution in efforts, i.e. $M_G > 0$ and $M_I < 0$ (highlighted red in Fig. 2).

The game. The timing of the game is as follows. In stage 1, G decides on his reform proposal $(\widetilde{a}, \widetilde{q})$. In stage 2, G and I engage in a contest over the enactment of $(\widetilde{a}, \widetilde{q})$ in the legislature. If G wins, his proposed reform $(\widetilde{a}, \widetilde{q})$ is enacted, if I wins, *status quo* is maintained.

In the second-stage contest, let e_G and e_I be the effort levels exerted by G and I, respectively, to gain votes in the legislature. Denote the probability that the proposal is enacted by the Tullock success function $p(e_G, e_I) \in [0, 1]$,

$$p\left(e_G, e_I\right) = \frac{\alpha_G e_G}{\alpha_G e_G + \alpha_I e_I}, \tag{3}$$

where α_j denotes the 'productivity' of each contestant's effort, with $\alpha_j > 0$, $j \in \{G, I\}$. As in the standard contest defined by Tullock (1980), whatever the outcome of the contest, the invested effort of both players are lost. This success function is increasing and concave in the lobbying effort of G, while it is decreasing and convex in the effort of I.[12] Such assumptions ensure a positive but diminishing marginal effect of each player's effort on their own probability of winning the contest; moreover, they ensure that an increase in each player's effort harms the other, making it strategically desirable for each player to induce a lower effort from the other.

The expected payoffs of G and I from the two-stage game are given by:

$$EU_G = pU_G\left(d^2\left(r, g^*\right)\right) + (1-p)\,U_G\left(d^2\left(s, g^*\right)\right) - e_G, \tag{4}$$

$$EU_I = pU_G\left(d^2\left(r, i^*\right)\right) + (1-p)\,U_G\left(d^2\left(s, i^*\right)\right) - e_I. \tag{5}$$

We consider subgame-perfect Nash equilibria consisting of reform proposals $\left(\widetilde{a}, \widetilde{q}\right)$ and effort levels e_G^* and e_I^* such that at every stage each player takes an action that maximizes his expected payoff given the other's behavior.

4. Equilibria

In this section we characterize the optimal behavior of the two agents using backward induction. Anticipating the level of effort of Government and Interest Group in the second stage, the Government chooses in the first stage the policy bundle that maximizes its expected utility, that is the balance between the benefit from the policy implemented and the cost from the effort necessary to counteract the opposition of the Interest Group. We will show that it is rational to choose a bundle closer to the Interest Group's preferences in the first stage if this is overcompensated by the gain in terms of reduced-effort in the second stage.

4.1. Second stage equilibrium

Our interest lies in the comparison between G's resulting reform proposals in the presence of an Interest Group and his proposal without an Interest Group. In the absence of I, the second stage legislative contest becomes trivial, and G will win the contest with no effort. In the first stage, G can therefore propose his optimal reform $\left(a_G^*, q_G^*\right)$. Without Interest Group, the optimal behavior of the Government is $\left(\widetilde{a}, \widetilde{q}\right) = \left(a_G^*, q_G^*\right)$, that is implemented with $p = 1$ with $e_G = 0$. This is a corner solution of the Government maximization problem at the maximum level of utility.

In the presence of I, G and I maximize their expected payoffs in Eqs. (4) and (5) with respect to their respective lobbying efforts. An interior equilibrium is then characterized by the following conditions [13]:

Lemma 1. *The equilibrium lobbying efforts of G and I are given by:*

$$e_G^* = -\delta M_G^2 M_I \tag{6}$$

$$e_I^* = \delta M_G M_I^2 \tag{7}$$

with $\delta = \frac{\alpha_G \alpha_I}{\left(\alpha_G M_G - \alpha_I M_I\right)^2}$.

Lemma 1 states that the effort of both the Government and the interest groups depends positively on their own incentive to propose/oppose the reform and on their opponent's incentive to oppose/propose it (recall that $M_G > 0$ and $M_I < 0$). Moreover, the equilibrium condition in Lemma 1 implies that $\frac{e_I^*}{e_G^*} = -\frac{M_I}{M_G}$, meaning that the relative effort exerted by the two groups equals the relative utility gain between the reform and *status quo*.[14]

[11] These corner solutions can be formalized as $e_G = e_I = 0$ and $p\left(\widetilde{a}, \widetilde{q}\right) = 1$, that will be formally defined in the next paragraph.

[12] Formally, $\partial p/\partial e_G > 0$, $\partial^2 p/\partial e_G^2 < 0$ and $\partial p/\partial e_I < 0$, $\partial^2 p/\partial e_I^2 > 0$.

[13] All proofs can be found in Appendix A.

[14] This also justifies the assumption made above about the incentives to exert effort. If $M_G < 0$ and/or $M_I > 0$, both efforts would be negative, which is a meaningless result. If we bound the efforts to be non-negative, then they would be both zero in this case.

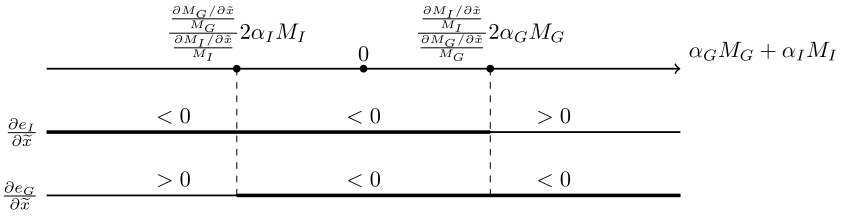

Fig. 3. Signs of the derivatives of the G and I's effort with respect to the policy proposal $\tilde{x}$, $x \in \{a, q\}$ [17].

Since equilibrium efforts e_G^* and e_I^* are functions of G's policy proposal $(\tilde{a}, \tilde{q})$, comparative static properties of the second stage contest can be characterized.

Lemma 2. *Equilibrium effort of the Interest Group, e_I^*, varies with the reform levels $\tilde{a}$ and $\tilde{q}$ such that*

$$\frac{\partial e_I^*}{\partial \tilde{x}} = \delta M_I \left[-M_I \left(\frac{\alpha_G M_G + \alpha_I M_I}{\alpha_G M_G - \alpha_I M_I} \right) \frac{\partial M_G}{\partial \tilde{x}} + M_G \left(\frac{2\alpha_G M_G}{\alpha_G M_G - \alpha_I M_I} \right) \frac{\partial M_I}{\partial \tilde{x}} \right] \tag{8}$$

where $x \in \{a, q\}$ and

$$\frac{\partial e_G^*}{\partial \tilde{x}} = -\delta M_G \left[-M_I \left(\frac{2\alpha_I M_I}{\alpha_G M_G - \alpha_I M_I} \right) \frac{\partial M_G}{\partial \tilde{x}} + M_G \left(\frac{\alpha_G M_G + \alpha_I M_I}{\alpha_G M_G - \alpha_I M_I} \right) \frac{\partial M_I}{\partial \tilde{x}} \right] \tag{9}$$

In order to study the sign of Eq. (8), let us recall that $M_G > 0$ and $M_I < 0$, that all the parameters $(\alpha_G, \alpha_I, w_G, w_I)$ are positive, and that the two derivatives have opposite signs.[15] Just as an illustrative example, let us assume that the change of $\tilde{x}$ increases the utility of the Interest Group $\frac{\partial M_I}{\partial \tilde{x}} > 0$ and decreases the utility of the Government $\frac{\partial M_G}{\partial \tilde{x}} < 0$. In this case, Eq. (8) is unambiguously negative if $(\alpha_G M_G + \alpha_I M_I)$ is below zero, that is, if $|\alpha_G M_G| < |\alpha_I M_I|$. In other words, if the utility gain of I from the reform is larger than the utility loss of G, then I's effort decreases with $\tilde{x}$. The same condition can be stated in terms of elasticity as follows:

$$\frac{\frac{\partial M_I/\partial \tilde{x}}{M_I}}{\frac{\partial M_G/\partial \tilde{x}}{M_G}} > \frac{\alpha_G M_G + \alpha_I M_I}{2\alpha_G M_G} \tag{10}$$

Intuitively, the sign of Eq. (8) is surely positive if we assume that the proposal goes toward the preferences of the Government instead of the Interest Group.[16] With respect to the effort put by the Government (Eq. (9)), it is surely negative if the opposite condition holds, that is if $(\alpha_G M_G + \alpha_I M_I)$ is positive, that can be stated also as $|\alpha_G M_G| > |\alpha_I M_I|$ or $\frac{\frac{\partial M_I/\partial \tilde{x}}{M_I}}{\frac{\partial M_G/\partial \tilde{x}}{M_G}} < \frac{\alpha_G M_G + \alpha_I M_I}{2\alpha_G M_G}$.

Since the sign of Eq. (8)–(9) depends on the term $(\alpha_G M_G + \alpha_I M_I)$, Fig. 3 represents the conditions that make the two equations positive or negative under the assumptions made above. Interestingly, if $\alpha_G M_G + \alpha_I M_I$ is sufficiently close to zero, that is if $|\alpha_G M_G|$ and $|\alpha_I M_I|$ are not too different, shifting the bundle towards the preferences of the Interest Group decreases the effort of both the Interest Group and the Government.

4.2. First stage equilibrium

In this subsection we first explore the case with a single-policy reform, as a reference, and then we analyze the policy bundle model with two policies that can be traded off.

Let us start by assuming that the G can propose each time a reform on a single policy only. Without loss of generality, we assume that G can only propose a reform on q, leaving a possible reform on a for a successive bill. Then, irrespective of the actual preferences of G and I on a, $\tilde{a} = 0$. In order to determine its best proposal, $\tilde{q}$, the Government maximizes with respect to q its expected utility in Eq. (4), where the probability of implementing the policy is described in Eq. (3) and depends on the efforts from the second stage maximization problem as in Lemma 1. The problem faced by the Government in then the following:

$$\max_q EU_G = \frac{\alpha_G^2 M_G^3}{(\alpha_G M_G - \alpha_I M_I)} + U_G \left(d^2 \left(s, g^* \right) \right) \tag{11}$$

whose solution is in the following Proposition 1:

Proposition 1. *In the presence of an opposition, the proposed reform $\tilde{q}$ will be such that $|q_I^*| < |\tilde{q}| < |q_G^*|$.*

[15] Indeed, this is a condition for the Interest Group to oppose the proposal of the Government. If a reform increased the utility of both the Government and the Interest Group (the two derivatives have the same sign), then there would be no bargaining.

[16] $\frac{\partial M_I}{\partial \tilde{x}} < 0$ and $\frac{\partial M_G}{\partial \tilde{x}} > 0$.

[17] The figure is qualitatively analogous if we switch the signs of the partial derivatives and of the two loss functions M_G and M_I.

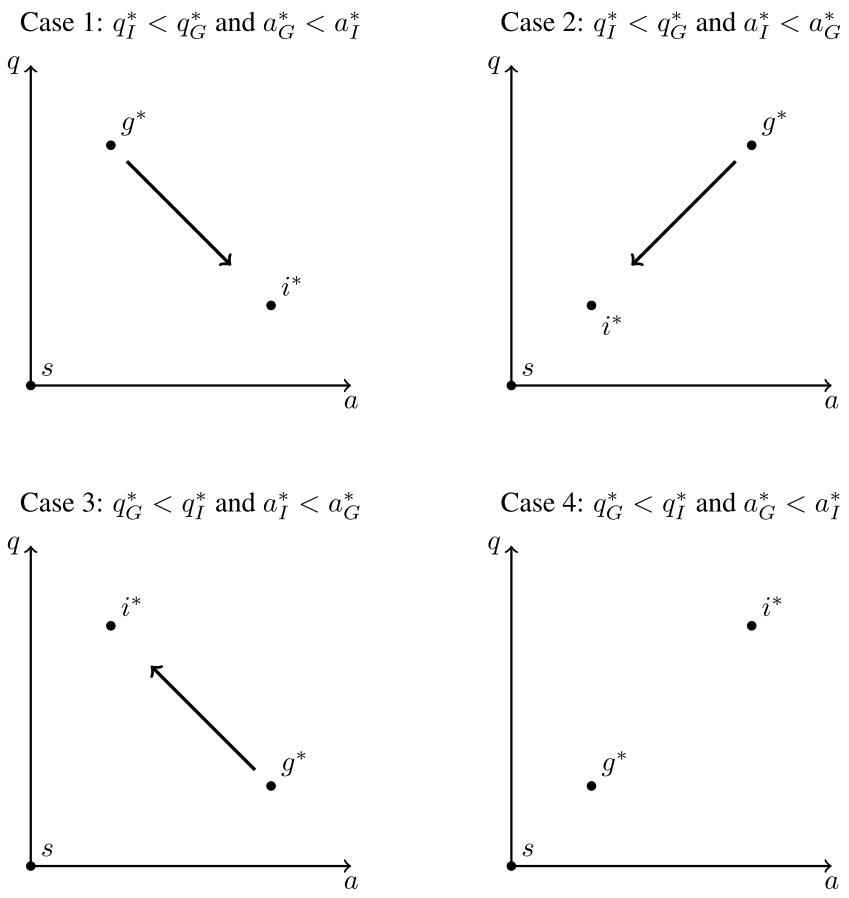

Fig. 4. Illustrative example of political compromise: case 1 and the symmetric case 3 describe the behavior of the Government when it over-proposes in one policy and under-proposes in the other to get closer to the bundle preferred by the Interest Group. Case 2 shows a situation in which the Government maximizes its utility by under-proposing in both policies. Case 4 is characterized by no opposition, since the Interest Group will always prefer the Government proposal with respect to the *status quo*. A similar picture could be drawn for negative values of any of the preferred policies.

Proposition 1 shows that – in a single-policy framework – the optimal behavior of the Government is to propose a policy $(\widetilde{q})$ which is closer to the preferences of the Interest Group with respect to its unconstrained optimal policy (q_G^*) in order to decrease the amount of effort needed to win the opposition of the Interest Group. Indeed, a more moderate policy would induce the Interest Group to put less effort in opposing the reform and, in turn, this requires less effort from the Government. This result coincides with the strategic restraint model of Epstein and Nitzan (2004). Essentially, the level of $\widetilde{q}$ proposed by the Government serves two functions: a policy reform that contributes to the utility of the Government, and a "bargaining tool" that affects the incentive of the opposition to engage in lobbying efforts against the reform.

Now let us assume instead that the Government is allowed to propose a reform in both dimensions, (a, q). In this case, the maximization problem is as follows:

$$\max_{a,q} EU_G = \frac{\alpha_G^2 M_G^3}{\left(\alpha_G M_G - \alpha_I M_I\right)} + U_G\left(d^2\left(s, g^*\right)\right), \tag{12}$$

which only differs from Eq. (11) in that the Government maximizes its utility with respect to two policy dimensions, a and q. In this case, the optimal behavior of the Government is described in the following Proposition 2:

Proposition 2. *In the presence of an opposition, the proposed reform $\widetilde{b} = (\widetilde{a}, \widetilde{q})$ lies in between the two preferred policy bundles $b_I^* = (a_I^*, q_I^*)$ and $b_G^* = (a_G^*, q_G^*)$.*

In seeking to maximize expected payoffs, G decides to propose a policy bundle that is closer to the preferred bundle of the opposition (when it exists, see Fig. 4). The rationale is quite straightforward: the relative loss due to a policy different from its preferred bundle is compensated by the decreased effort put in supporting the bill against the opposition.

Let us define the preference of the Government and the Interest Group over the policies as:

Definition 1 (*Conflicting Preferences*)**.** if the preferred bundle of the Interest Group is such that $x_I^* > x_G^*$ and $y_I^* < y_G^*$ with $x = a, q$ and $y = q, a$.

One interesting case among the results of Proposition 2 is the following:

Corollary 1. *If the Interest Group and the Government exhibit conflicting preferences, the Government makes a strategic compromise by over-proposing in the policy component that the lobby favors and under-proposing in the component that the lobby opposes.*

The intuition behind the results is simple. In the face of opposition, G recognizes that it is dealing with a group whose lobbying efforts are affected by the extent of its proposed reforms. As a result, we can have a case in which although proposing an $\widetilde{a} > a_G^*$ and a $\widetilde{q} < q_G^*$ reduces his payoffs, doing so also reduces the stake of I, thereby reducing their incentive to exert as much lobbying effort. In effect, it gets a higher probability of reform enactment and a lower cost from effort, increasing its expected utility in the first stage of the game.

The rationale behind this result is that any change in the policy bundle proposed by the Government triggers a reaction by the Interest group, as described in Eq. (8) of Lemma 2. If the Government proposed a policy reform only in one dimension (e.g. an increase of q from the *status quo* s toward g^* in Fig. 1), this would make the effort of the Interest Group stronger and would therefore imply a larger effort from G too, increasing its cost and decreasing its (expected) utility. The only way to balance costs and benefits is to trade some utility from the policy a for a lower cost from efforts. Corollary 1 ensures that the in order to make the costs smaller than the benefit, the proposed bundle must lay in a specific region of the $a - q$ plane, that is with $\widetilde{a} > a_G^*$ and a $\widetilde{q} < q_G^*$.

Based on these results, it is possible to go a step further and stating that:

Corollary 2. *In the presence of an opposition, the Government will strategically bundle different policies in the same reform.*

Referring to the situation represented in Fig. 1 as an illustrative example, Corollary 2 ensures that – starting from s – the Government has to bundle the desired increase of q with an increase of a, so that $\widetilde{q} > 0$ and $\widetilde{a} > 0$. This implies that, in this case, an increase of q causes always a cost in terms of larger effort that is larger than the increase of utility. To balance the two, the Government has to increase also a, so that the effort of the interest groups declines, and so the Government effort. This result is clear because, in this example, the *status quo* coincides with the preferences on one dimension for both agents. Things are slightly more complicated if the *status quo* and the preferences are different in both dimensions. What is important to notice is that the Government trades-off the two policy dimensions with respect to its preferred policy bundle and not with respect to the *status quo*.

To sum up, our main results predict that (i) the Government bundles different policies in the same reform, (ii) the Government increases the level of the policy supported by the opposition and decreases the level of the opposed policy in the proposed (and enacted) reforms. In the remaining of the paper, we investigate empirically whether these two predictions can find some support in the data.

5. Empirical case study: California, Illinois and Texas

The political legislative process is very articulated and involves several formal and informal steps, that cannot always been rationalized and measured. Moreover, it is very far from being universal, and every institutional asset and law have their peculiarities. For instance, the government can decide to bundle the policies in the first draft of the proposal, or to add a second policy dimension only in a next stage; the bundling can take place in a single law including both dimensions, or in two separate laws approved in a short period; and so on. For this reason, the purpose of this empirical exercise is to describe a case study where our setting could be applied. The primary elements of the political contest developed in this paper are the reform bundles in two dimensions, and the interest group. In order to test our model's predictions, we need, for each reform, a measure of the government's desired levels (a_G^*, q_G^*), the resulting reform levels $(\widetilde{a}, \widetilde{q})$, and the amount of opposition faced by the reform. For this we use legislative data on education legislation for California, Illinois and Texas during the years 2008–2013. Most education reforms may be grouped into two broad categories: broadening educational access (*access* reforms), or improving educational quality (*quality* reforms). The delineation between the two broad categories of education reforms therefore matches the theoretical assumptions made in our model. Access reforms expand the opportunities for education by providing more schools and textbooks, improving school infrastructure and offering scholarships and financial aid. Such policies essentially expand the *extensive* margins of education. Quality reforms on the other hand expand the *intensive* margins of education through policies that try to improve the effectiveness of education production. Examples of these are changing the curriculum, imposing teacher performance evaluations, linking teacher salaries to performance and creating school accountability measures.

It is well documented that a strong and organized interest group, the teachers' unions, have a stake in education policy and are active in lobbying in congress *in favor of* access reforms and *against* quality reforms (Corrales, 1999; Grindle, 2004; West et al., 2012; Moe, 2012; Fabella, 2017). Teachers like access reforms because more schools translate to more jobs, and better school infrastructure translates to a better working environment. On the other hand, literature agrees on the fact that most teachers dislike quality reforms because such reforms impose costs on them, for instance, adjustment costs that come with a change in the curriculum, or effort costs associated with improved performance and evaluations.[18] Since teachers' unions serve to further teachers' interests and, as West et al.

[18] For a more comprehensive discussion on the differences between access and quality education reforms, refer to Fabella (2017), the references therein as well as a recent contribution by Bruns et al. (2019).

(2012) show, teachers have very different view on education polices than the general population, it is sensible to assume that the utility of teachers' unions increase with access reforms and decrease with quality reforms, which correspond to the assumption we make in the two-dimensional policy setting of Section 3, where interest group I favors A-reforms and opposes Q-reforms.

The dataset compiled for this paper contains information on (1) the final and all previous drafts of the legislative document as it went through the different committees, and (2) the names and party affiliations of the representatives who proposed the bills, which were collected individually from every state-level general assembly website.[19] This gives us the opportunity to obtain a measure for the level of reforms within a bill as it goes through the legislative process. Furthermore, for each of the bills analyzed in this paper, information on the associated bill author were collected, as well as information on the legislative districts every bill author represents. Since obtaining this information requires substantial amounts of time and resources, for this empirical case study, we have focused on the three states that satisfy the following conditions: (1) states that have the most education bills in the period 2008–2013, (2) provide older drafts of every enacted bill, and (3) represent both sides of the interest group-strength spectrum. Between 2008–2013, the education bills enacted in the three states of California, Illinois and Texas alone comprise 12 percent of all state legislative bills enacted throughout the country (National Conference of State Legislatures, 2014). Furthermore, these three states provide a good balance of interest group strength in our sample. In 2012, California and Illinois had teachers' unions among the strongest across all states, while Texas had ones among the weakest (Winkler et al., 2012). Finally, the corresponding legislatures of all three states publicly provides legislative information for enacted bills from 2008–2013.[20]

Our data consists of 684 enacted education bills from 2008 to 2013, of which 30% contain access and/or quality education reforms. The following subsections elaborate on the procedures used for the creation of our variables of interest: education reforms and bill opposition.

5.1. Access and quality education reforms

Measures of access and quality reforms were generated using the text contained in the initial and final drafts of each bill.[21] To measure the extent to which a bill contains access and quality reforms, we use an index formed by the following two components, as follows:

$$\begin{aligned} Access_{ij} &= \left(\sum_{k \in A} \frac{f_{ijk}}{n_{ij}} \cdot p_{ijk} \right) \times 100 \\ Quality_{ij} &= \left(\sum_{k \in Q} \frac{f_{ijk}}{n_{ij}} \cdot p_{ijk} \right) \times 100 \end{aligned} \tag{13}$$

where draft j of bill i contains a total word count of n_{ij}, while f_{ijk} is the number of times the term k appears in the text of draft j and p_{ijk} is a weighing factor associated with term k, which will be discussed shortly. A and Q are the sets of access and quality education reform terms. The sets A and Q are based on several papers which discuss the differences between access and quality reforms in detail and provide examples for each. These papers include Corrales (1999), Grindle (2004), Bonesrønning (2013), Braga et al. (2013). Furthermore, the publicly accessible Glossary of Education Reforms (*Edglossary.org*) was used as a supplementary resource to determine specific terms like "charter schools" and "common core standards". The expressions inside the parentheses are therefore the proportions of the total word count relating to access or quality reforms. Multiplying by a hundred converts the values into percentages.

This measure identifies therefore the number of times a particular access or quality reform is mentioned in the text of the bill. To be able to differentiate between progressive versus regressive policy changes, which would have different consequences on the behavior of the opposition, we use the weighing factor p_{ijk} to count only the reform terms that are mentioned with nearby qualifying words (henceforth called "qualifiers") that indicate the direction towards an access or quality reform.[22] For each reform term selected, a set of qualifiers indicating the correct direction of the reforms are selected, also based on the papers mentioned above, as well as from inspections of the bill texts themselves.[23] For this we borrow a concept from computational linguistics called the N-gram, which is a sequence of n adjacent terms taken from a longer sequence of text. An N-gram is therefore an n-word slice of a sentence. Every sentence is typically sliced into a set of overlapping N-grams.[24] For our purposes, we set the length of the N-grams to 5 words (5-grams), so that we can capture a maximum of 4 words to the left and to the right of each reform term. We therefore take 5-grams of every bill text and consider only those 5-grams that contain reform terms listed in Table 1. We then count the proportion of these 5-grams containing qualifiers for draft j of bill i as follows:

$$p_{ijk} = \frac{q_{ijk}}{g_{ijk}} \tag{14}$$

[19] The sources of the bills can be found in Table B1 in Appendix.

[20] Virginia, for example, has the most education bills among all the states in the given period, but the Virginia state legislature website publishes only the final version of each bill, making it inapplicable to the empirical strategy of this paper.

[21] Text processing was conducted using the software KNIME (Berthold et al., 2007).

[22] E.g. a bill containing the term "charter school" could propose to either *expand* or *limit* the number of charter schools in the state. In the sentence, "charter school *expansion*," the word "expansion" is thus a qualifier for the term "charter school".

[23] Every reform term has its own set of qualifiers, which are presented, together with their respective terms in Tables B2 and B3 in Appendix.

[24] For example, the sentence "The bill is long" will have the following N-grams of length 2 (bi-grams): "the bill", "bill is", and "is long ".

Table 1
Terms associated with primary and secondary access and quality reforms in the U.S.
Source: Fabella (2017).

Access reforms	Quality reforms
School-related	
Textbooks and instructional materials	Class size, curriculum, instructional time
Libraries	Intervention strategy for underperforming schools
Broadband, web-based, internet-based or mobile learning	School adequate yearly progress and achievement gap
Student transportation services	School district accountability report card
School or school district procurement	Common Core standards
	Charter schools, open enrollment[a]
	Education tax credits, school voucher programs
Teacher-related	
Alternative routes to teacher certification[b]	Teaching standards, licensing and certification
Teacher shortage areas	Teacher preparation, mentoring and evaluations
Critical needs areas	Professional development programs
Teach for America program	Pay-for-performance, performance compensation
Student-related	
Student financial aid, equalization grants	Student academic evaluation and intervention programs
Scholarships, stipends, grants, funding	Dropout prevention for at-risk students
Schools for the deaf and blind and other disabilities	Math and reading skills proficiency and instruction
Opportunities for low-income students, home-schooled, foster children or juveniles	Science, Technology, Engineering and Mathematics (STEM) programs
English language learners (ELL) programs	Career coaching, college or career readiness
Alternative learning schools, special education	Vocational, career and technical education programs
Summer school and after school programs	Work-partnership programs, pre-apprenticeship
	Dual-credit placement, concurrent enrollment

[a]Open enrollment allows parents to enroll their children in schools outside of their own school district.
[b]Alternative routes to teacher certification provides certification opportunities to teachers who might otherwise be uncertified.

where g_{ijk} is the number of 5-grams containing the term k and q_{ijk} is the number of 5-grams containing relevant qualifiers among those that have the term k. Note that the closer a relevant qualifier is to the reform term, the higher p_{ijk} will be. Therefore this measure assigns higher values to nearby qualifiers, which is ideal since the closer the qualifier is to the term, the more likely it is that it refers indeed to the correct reform.[25]

Access and quality education reforms can also be subdivided according to the school unit that they directly affect: students, teachers and schools. For instance, scholarship grants and college readiness programs are provided for students. Changes in teacher certification and merit pay reforms affect the teachers. At the same time, providing better school infrastructure or changing the curriculum affects the schools, but also indirectly affects teachers through better working environment (with improved school infrastructure) or through additional work (with a change in the curriculum). Table 1 enumerates the different reform terms we used to generate our access and quality measures, disaggregated according to school unit. In our empirical analysis we will employ two measures of reforms, one containing reforms across all school units, and the other containing only school and teacher reforms. This allows us to investigate how sensitive the interest group is to reforms that have a more direct impact on their welfare.

5.2. Bill authors and legislative districts

Every education bill in our dataset is associated with a legislator who sponsored the bill in the state legislature (henceforth called authors). For each of authors, we obtain information such as age, tenure, party, gender and whether he sits in the upper chamber (senator) or lower chamber (representative). We also supplement the data with socio-economic, demographic, and school information on the district represented by the authors. Socio-economic variables include income, inequality and unemployment, demographic variables include populations shares by age and race, and school variables include average student–teacher ratio, the share of charter schools, and the share of students eligible for free lunch. These variables were sourced from the U.S. Census Bureau and the National Center for Education Statistics (NCES), both of whom provide the information at the county-level.[26] We then convert county measures to legislative-district level measures using population weights from the 2010 Census Redistricting Data Files.[27] More in details, county level data are converted into district level data by averaging variables according to the shares of

[25] As robustness we have re-run our text coding routine using 4-grams and 6-grams and, as shown in Table B4 in the Appendix, the correlations of the measure of access/quality in the bill draft calculated with a 5-gram with the one calculated with a smaller and bigger N-gram are very high, always above .90 and mostly above .95.

[26] Unemployment rates were provided by the Bureau of Labor Statistics.

[27] Census Redistricting data is only collected every 10 years. We therefore use the 2010 data files (as opposed to the 2000 data files) because it is the relevant year for our sample.

Table 3
Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Introduced drafts					
Access reforms in first draft	686	.066	.256	0	2.834
Quality reforms in first draft	686	.058	.2	0	2.322
School & teacher access reforms in first draft	686	.032	.194	0	2.834
School & teacher quality reforms in first draft	686	.047	.189	0	2.322
Final, enacted drafts					
Access reforms in final draft	686	.061	.205	0	2.327
Quality reforms in final draft	686	.069	.183	0	2.344
School & teacher access reforms in final draft	686	.022	.118	0	1.684
School & teacher quality reforms in final draft	686	.057	.173	0	2.344
Teachers variables					
Teachers share of population	686	.01	.003	.002	.019
State-standardized teachers in district	686	.012	.993	−2.149	3.708
Regressors					
Bill author is a senator	686	.446	.497	0	1
Bill author is male	686	.685	.465	0	1
Bill author is a democrat	686	.727	.446	0	1
Age of bill author	686	55.268	9.721	30	79
Tenure of bill author	686	7.907	6.325	1	40
Log income per capita	686	10.165	.209	9.383	10.675
District Gini coefficient	686	.465	.026	.375	.521
District unemployment rate	686	8.085	2.642	3.409	15.969
District share below 5 years old	686	.073	.01	.048	.124
District share between 5 and 17 years old	686	.185	.019	.102	.247
District share above 65 years old	686	.109	.021	.065	.223
District hispanic share	686	.326	.185	0	.959
District black share	686	.106	.076	0	.321
Share of charter schools in district	686	.076	.081	0	.465
Student–teacher ratio	686	17.822	3.216	11.011	26.794
Share of students eligible for free lunch	686	.396	.193	.017	.857

population from different counties in the same electoral district. Population data are collected at zipcode level, that are used to link counties and districts. We use population values from the 2010 Census, since it is used to design electoral districts in the period analyzed in this paper. Table 3 provides descriptive statistics for all the variables used in the analysis.

5.3. Interest group strength

The ideal measure for bill opposition would be the amount of lobbying effort the primary interest group (the teachers' unions) were willing exert to keep each bill from being passed in congress. This information however is not readily available. Moreover, it could be affected by reverse causality issues, since the amount of effort depends on the characteristics of the bill. Instead, we argue here that the number of teachers in the district represented by the author of the bill is a good proxy for interest group power he/she is facing, since one of the primary methods by which unions exert their political influence is through member mobilization (Moe, 2012), and is predetermined, avoiding endogeneity issues. In California, the combined affiliate membership of the American Federation of Teachers (AFT) and the National Education Association (NEA) is 445,000, about one percent of California's population. The proportion is nearly double in Illinois (with 238,000 combined membership of the AFT and NEA) while the proportion is halved in Texas.[28] When it comes to the legislative district-level proportions, Table 4 indicates that in our sample, the percent of teachers in the population range from 0.2 to 1.9 percent of the district population, with some variability across States. Also access and quality reforms change across States, with a significant lower amount of reforms in Texas with respect to California and Illinois. In our empirical analysis, our primary measure of interest group strength is the proportion of teachers in the district.[29] As a robustness check, we also provide results using the number of teachers, standardized using the state-specific distribution of teacher counts per district. We are aware that the actual strength of teachers and teachers' associations also depend on the political contest, that is their relations with the party in power, the conflict with the legislators and so on. However, in the baseline regression model we include a set of fixed effects that control for these possible noises, that are otherwise difficult to measure. In addition, we also run alternative specifications with State-specific time trends and the interaction between our measure of teachers strength and the party affiliation of the author of the bill and results suggest that our main conclusions are not driven by such political factors, as shown in Tables B5 and B6 in Appendix.

[28] Based on the websites of the California, Texas and Illinois Federation of Teachers (cft.org, www.texasaft.org and www.ift-aft.org), the California and Illinois education associations (www.cta.org and ieanea.org) and the Texas State Teachers Association (www.tsta.org).

[29] Teacher counts were obtained from the National Center for Education Statistics.

Table 4
District-level teacher statistics by state.

Variable	Obs	Mean	Std. Dev.	Min	Max
Pooled					
Teachers share of population	686	.01	.003	.002	.019
State-standardized teachers in district	686	.012	.993	−2.149	3.708
Quality reforms in final draft	686	.069	.183	0	2.344
Access reforms in final draft	686	.061	.205	0	2.327
Quality reforms difference between final and first draft	686	.011	.154	−1.923	1.026
Access reforms difference between final and first draft	686	−.005	.189	−2.779	1.049
Share of votes against the final draft	672	.058	.114	0	.486
Share of votes against the first draft	686	.056	.11	0	.443
California					
Teachers share of population	287	.007	.001	.003	.012
State-standardized teachers in district	287	.021	1.004	−1.773	3.3
Quality reforms in final draft	287	.086	.225	0	2.344
Access reforms in final draft	287	.073	.186	0	1.684
Quality reforms difference between final and first draft	287	.008	.192	−1.923	1.026
Access reforms difference between final and first draft	287	−.011	.252	−2.779	1.049
Share of votes against the final draft	282	.087	.133	0	.417
Share of votes against the first draft	287	.083	.128	0	.397
Illinois					
Teachers share of population	180	.009	.002	.002	.018
State-standardized teachers in district	180	−.012	.968	−2.149	3.708
Quality reforms in final draft	180	.082	.162	0	.932
Access reforms in final draft	180	.074	.277	0	2.327
Quality reforms difference between final and first draft	180	.028	.138	−.406	.932
Access reforms difference between final and first draft	180	.003	.151	−1.683	.75
Share of votes against the final draft	177	.047	.109	0	.465
Share of votes against the first draft	180	.049	.108	0	.443
Texas					
Teachers share of population	219	.013	.002	.008	.019
State-standardized teachers in district	219	.022	1.005	−1.063	1.656
Quality reforms in final draft	219	.036	.127	0	1.188
Access reforms in final draft	219	.034	.151	0	1.196
Quality reforms difference between final and first draft	219	0	.099	−.512	.961
Access reforms difference between final and first draft	219	−.005	.101	−.509	.906
Share of votes against the final draft	213	.027	.072	0	.486
Share of votes against the first draft	219	.027	.07	0	.423

5.4. Empirical analysis

A number of testable implications can be inferred from the theoretical model. The most straightforward implication is that the stronger the interest group in the district of the bill author, the fewer quality reforms, and the more access reforms there will be in the bill. We test this hypothesis by estimating the equations:

$$\begin{aligned} A^E_{ijst} &= \alpha_{10} + \alpha_{11} T_{jst} + \boldsymbol{\beta}_1' \boldsymbol{X}_{ijst} + \theta_{1s} + \gamma_{1t} + u_1 \\ Q^E_{ijst} &= \alpha_{20} + \alpha_{21} T_{jst} + \boldsymbol{\beta}_2' \boldsymbol{X}_{ijst} + \theta_{2s} + \gamma_{2t} + u_2 \end{aligned} \tag{15}$$

Where A^E_{ijst} and Q^E_{ijst} are our continuous measures of access and quality reforms, respectively, in bill i, authored by legislator j, in state s, in year t. The superscript E indicates that the final, enacted draft of the bill was used for this measure. The variable T_{jst} is the proportion of teachers in the district, our variable of interest and the parameters θ_s and γ_t are state and year fixed effects. The vector $\boldsymbol{X}_{ijst}$ contains author characteristics such as gender, party affiliation, age and tenure in the legislature. We also include variables on socio-economic characteristics of the districts of the authors, such as income, inequality, unemployment, various population measures and school characteristics.

The parameters of interest are α_{11} and α_{21}, the marginal effects of interest group strength on the final level of access or quality reforms in the bill. Our model predicts that the effect of teachers on access should be positive, that is, $\alpha_{11} > 0$, while the effect on quality reforms should be negative, $\alpha_{21} < 0$.

Table 5 presents the results of these estimations across different specifications. Quality reforms are significantly negatively affected by interest group strength, as seen from the negative and statistically significant coefficient of teacher share in Panel A. This holds true even after controlling for time-invariant state-level characteristics and year fixed effects. In Panel B, the coefficient of teacher share is positive but not statistically different from zero, suggesting that teachers' union strength only has an effect on reforms which they oppose. This is however consistent with the empirical literature that interest groups are less successful at lobbying in favor of a reform compared to opposing a reform. Segal et al. (1992), Kang (2015), Fabella (2017).

The second empirical implication of the model is that bundling of reforms reduces the effort of the interest group in opposing undesired policy. Thus, one can ask whether the effects of interest group strength on enacted reforms varies with other reforms that

Table 5
Baseline results.

	(1)	(2)	(3)
Panel A. Dependent variable: Quality reforms in final draft			
Teachers share of population	−13.264***	−15.013***	−11.240**
	(4.901)	(5.338)	(5.073)
Controls	Yes	Yes	Yes
Year FE	No	Yes	Yes
Country FE	No	No	Yes
R^2	0.048	0.056	0.066
Observations	686	686	686
Panel B. Dependent variable: Access reforms in final draft			
Teachers share of population	−0.044	0.684	1.541
	(3.775)	(4.747)	(5.207)
Controls	Yes	Yes	Yes
Year FE	No	Yes	Yes
Country FE	No	No	Yes
R^2	0.030	0.032	0.033
Observations	686	686	686

Robust standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

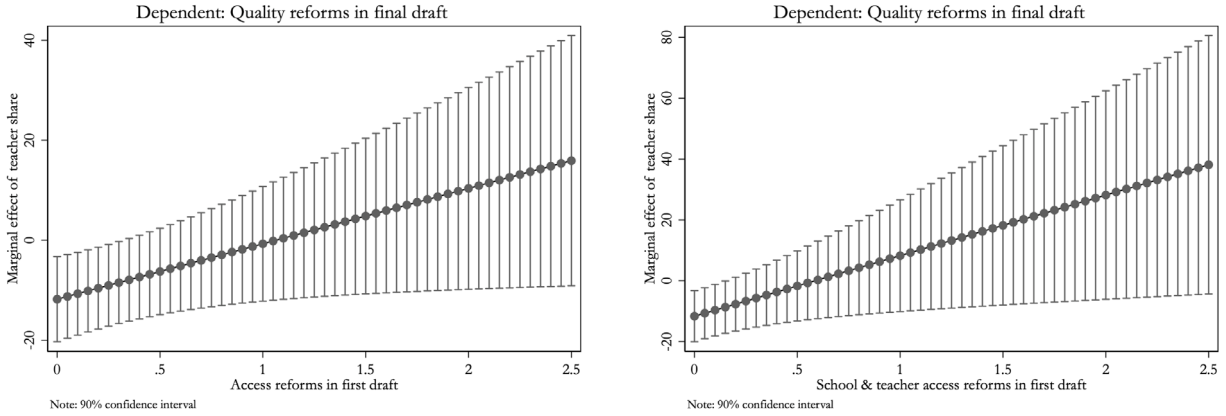

Fig. 5. Marginal effect of teacher share on quality reforms.

may be present in the introduced draft. To answer these questions we estimate an extended version of the original specification, this time including reforms in the first draft, and its interaction with our proxy for group strength.

$$\begin{aligned} A^E_{ijst} &= \alpha_{10} + \alpha_{11} Q^I_{ijst} + \alpha_{12} T_{jst} + \alpha_{13}(Q^I_{ijst} \times T_{jst}) + \boldsymbol{\beta_1'} \boldsymbol{X_{ijst}} + \theta_{1s} + \gamma_{1t} + u_1 \\ Q^E_{ijst} &= \alpha_{20} + \alpha_{21} A^I_{ijst} + \alpha_{22} T_{jst} + \alpha_{23}(A^I_{ijst} \times T_{jst}) + \boldsymbol{\beta_2'} \boldsymbol{X_{ijst}} + \theta_{2s} + \gamma_{2t} + u_2. \end{aligned} \tag{16}$$

Eq. (16) now includes A^I_{ijst} and Q^I_{ijst}, which are measures of reforms in the introduced versions of the bills. We have already found that interest group strength negatively correlates with enacted quality reforms. If bundling is indeed an effective strategy to reduce opposition, we should find that more bundling in the first draft counteracts this negative influence of teachers on quality reforms. Table 6 presents the estimation results for Eq. (16). At the bottom of each column is the *p*-value that tests the sum of the coefficient of teacher share and the interaction term.

The three columns of the table reflect the different combinations of reforms used for the dependent variable and interaction term. In the first two columns of the table, the dependent variable is our standard measure of access and quality reforms that includes student, teacher and school reforms (see Table 1). In the last column, the dependent variable is a more specific measure that consists of only school and teacher reforms. Doing so gives us a sense of whether teachers react more strongly to reforms that more directly affect them. As for the interaction term, the first column uses our standard measure of all reforms, and the last two use the more specific measure of school and teacher reforms.

In all three columns, we get that although the coefficient of teacher share on quality reforms is still negative and highly significant, the interaction between teacher share and access in the first draft is *positive* and significant. In fact, the magnitudes of the two parameters in column (1) are strikingly close and their sum is no longer different from zero (*p*-value = 0.90). Moreover, in columns (2) and (3), the interaction coefficient is even larger in magnitude than the estimate of teacher share (with an even stronger statistical significance in column (3)), suggesting that teachers are more sensitive to bundling when the reforms that are

Table 6
Reform bundling.

Dependent var.:	All reforms		All reforms		School & teacher reforms	
Interaction:	All reforms		School & teacher reforms		School & teacher reforms	
	Coefficients	Margins	Coefficients	Margins	Coefficients	Margins
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Dependent variable: Quality reforms in final draft						
Teachers share of population	−11.808**	−11.074**	−11.659**	−11.020**	−12.357**	−11.753**
	(5.167)	(5.066)	(5.094)	(5.085)	(4.831)	(4.814)
Access reforms in first draft	−0.115*	−0.009	−0.152*	0.038	−0.134*	0.046**
	(0.061)	(0.020)	(0.089)	(0.025)	(0.081)	(0.023)
Teachers share of population ×Access reforms in first draft	11.086*	.	19.913*	.	18.819**	.
	(6.326)	.	(10.240)	.	(9.272)	.
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.068		0.068		0.070	
Observations	686	686	686	686	686	686
Standard errors clustered at legislator level						
Panel B. Dependent variable: Access reforms in final draft						
Teachers share of population	0.974	1.305	1.008	1.227	−3.316	−3.152
	(5.364)	(5.235)	(5.346)	(5.232)	(2.701)	(2.641)
Quality reforms in first draft	−0.087	−0.033	−0.090	−0.046*	−0.044	−0.011
	(0.075)	(0.022)	(0.091)	(0.025)	(0.038)	(0.015)
Teachers share of population ×Quality reforms in first draft	5.669	.	4.624	.	3.449	.
	(7.654)	.	(9.518)	.	(3.911)	.
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.035		0.035		0.039	
Observations	686	686	686	686	686	686
Standard errors clustered at legislator level						

Robust standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

bundled into the bill are more targeted to them. The sum of the coefficients of teacher share and the interaction in these regressions is also insignificant (with a p-value of 0.04). Having access reforms in the first draft essentially nullifies the negative influence of teachers on quality reforms. One can see this relationship more clearly in Fig. 5, where the average marginal effect of teachers strength is plotted against access reforms in the first draft for the regressions with all reforms as the dependent variable. A couple of things can be observed from this figure. First, when access reforms are close to zero, the marginal effect of teacher share is negative and significant at 10%. Second, as access reforms in the first draft increases, this negative relationship between interest group strength and quality reforms weakens. This can be gleaned from the upward-sloping marginal effects curve. Furthermore, at some threshold level of access reforms, teachers strength no longer has a significant impact on the amount of quality reforms in an enacted bill. Observe that the threshold level of access is closer to zero when school and teacher access reforms are bundled with quality. Such a result suggests that bundling access with quality weakens the opposition to the bill, particularly so when the bundled reforms affect them more directly.

When it comes to the question of whether bundling quality in the first draft influences the amount of enacted access reforms in the final draft, Panel B of Table 6 reveals no significant effects.

As a robustness check, we test whether our results are sensitive to changes in the proxy for interest group strength. Up to this point, the measure we have been using is the number of full time-equivalent teachers as a proportion of district population. Here, we look at the total counts of full-time equivalent teachers. The three states in our sample however tend to differ substantially in the size of the electoral districts. To correct for this discrepancy we standardize the number of teachers using the state-specific distributions. Estimating Eq. (16) with state-standardized teacher counts results in Table 7. The coefficients reveal that one standard deviation increase in the number of teachers reduces quality reforms in a bill by about 3 percentage points. The marginal effects of teachers remain significant after using the new teacher variable. However, the interaction term is now different from zero only when teacher counts are interacted with school and teacher reforms, and are now highly significant. The counteracting effect of access only works if the reforms being bundled are more closely linked to their welfare.

One can also observe that on the access equations of Panel B, the estimate of the interaction term has become positive and significant at 5% when the final draft includes all reforms. Indeed, for these regressions, the total effect of teachers on access reforms (the sum of the coefficient of teachers and the interaction) is now positive and statistically different from zero (with p-values of around 0.04 to 0.05). Fig. 6 shows how the effect of teachers on access reforms varies with quality reforms. In contrast to Fig. 5, teachers have a statistically significant impact on access only for large enough levels of quality reforms in the first draft. If the bill has little to no quality reforms, having more teachers in the district has no effect on access reforms. However, the effect of teachers

Table 7
Robustness checks.

Dependent var.:	All reforms		All reforms		School & teacher reforms	
Interaction:	All reforms		School & teacher reforms		School & teacher reforms	
	Coefficients	Margins	Coefficients	Margins	Coefficients	Margins
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Dependent variable: Quality reforms in final draft						
State-standardized teachers in district	−0.037**	−0.036**	−0.037**	−0.037**	−0.044***	−0.043***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.016)	(0.016)
Access reforms in first draft	−0.019	−0.019	0.005	0.005	0.015	0.015
	(0.016)	(0.016)	(0.021)	(0.021)	(0.020)	(0.020)
State-standardized teachers in district ×Access reforms in first draft	0.022	.	0.029***	.	0.027***	.
	(0.013)	.	(0.011)	.	(0.010)	.
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.068		0.068		0.072	
Observations	686	686	686	686	686	686
Panel B. Dependent variable: Access reforms in final draft						
State-standardized teachers in district	−0.002	0.002	−0.001	0.002	−0.004	−0.003
	(0.017)	(0.017)	(0.017)	(0.017)	(0.009)	(0.009)
Quality reforms in first draft	−0.057***	−0.056***	−0.076***	−0.075***	−0.025**	−0.025**
	(0.021)	(0.021)	(0.024)	(0.024)	(0.011)	(0.011)
State-standardized teachers in district ×Quality reforms in first draft	0.061**	.	0.068**	.	0.030	.
	(0.027)	.	(0.029)	.	(0.019)	.
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.037		0.038		0.039	
Observations	686	686	686	686	686	686

Robust standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

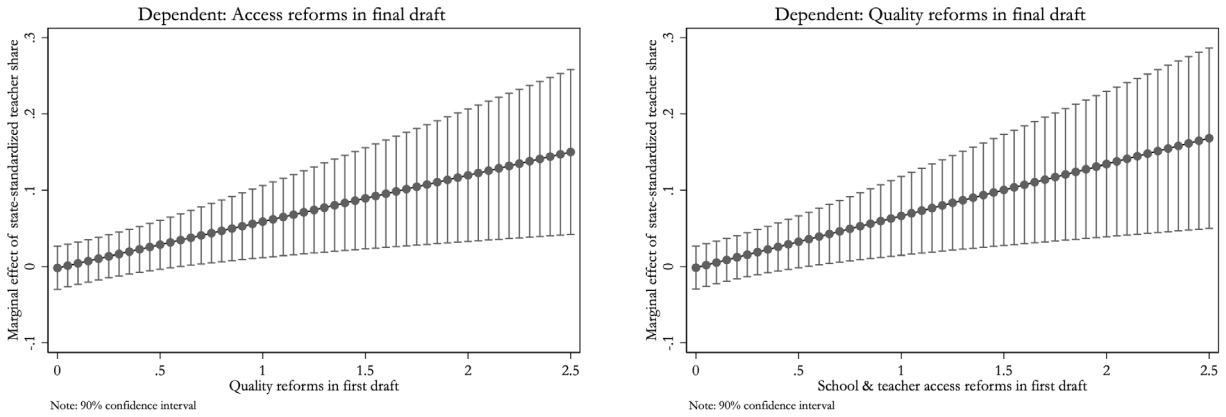

Fig. 6. Marginal effect of state-standardized teacher counts on access reforms.

on access reforms becomes positive and significant as quality reforms in the first draft increases. This could be indicative of the fact that as the interest group becomes stronger, having more quality requires bundling of more access for the bill to get enacted. Such an effect, however, is not robust to changes in the measure of interest group strength.

6. Conclusion

In this paper we set up a game-theoretic framework to explain policy formation under multiple reform dimensions, such as health (e.g. Obamacare health bill) and education reforms (e.g. Australia's Higher Education Bill and Italy's *La Buona Scuola* (The Good School) bill). In our setting a policy-oriented government can endogenously propose a bundle of two policies which is then voted on in the legislature. We model this legislative process as a contest between the government and an interest group and find that the government compromises on his reform proposal to appease the opposition. In effect, he uses the two policy dimensions as tools of bargaining. He proposes more of what the interest group supports and less of what it opposes. We also find that strategic bundling of policies may occur when the government prefers the *status quo* for one policy but proposes a positive value in equilibrium, to

make the opposition less aggressive. The resulting bundle of reforms contains more of the policy desired by the interest group, and less of the policy disfavored by the interest group.

This result is a first attempt to rationalize the frequent behavior of governments and policy makers that bargain over two policy dimensions. Consistently, the model is able to predict the legislative process whenever a bargaining over different policies is possible. Finally, it is also relevant from a policy perspective: by identifying the policy dimension valued the most by the interest groups, policy makers can reduce their opposition by over-proposing in that dimension. Indeed, the 'size' of over- and under-proposing depends on the relative weights attached to the policy dimensions by the government and the interest group.

As an example, the education setting lends well to this theoretical framework because it has one well-organized interest group, the teachers unions, and many different kinds of education policies. Using legislative data on California, Illinois and Texas education bills from 2008–2013, we find that stronger opposition is associated with less quality reforms. Moreover, as predicted by the model, when bundling access reforms together with quality, the negative effect that we find is counteracted.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.ejpoleco.2022.102283.

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