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Kosher Pork☆

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ABSTRACT

There are two common views of pork barrel spending. One is that pork barrel spending benefits special interests at the expense of social welfare, hence antithetical to responsible policy making, especially in times of crisis. An alternative is that pork "greases the legislative wheels" making possible the enactment of socially beneficial legislation that would otherwise not pass. In this paper we reexamine both arguments and show that they depend on the nature of heterogeneity of interests and information across legislators. Under full information, but with heterogeneous ideology, policy compromise may be sufficient to pass beneficial legislation. Pork typically reduces welfare as in the conventional wisdom, but we also characterize cases where pork can indeed "grease the wheels" and improve social welfare. When agents are heterogeneous not only in their ideology, but also their information, allocation of pork may be crucial to passage of legislation appropriate to the situation. It does so not simply by inducing legislators to accept legislation they view as harmful, but also by conveying information about the necessity of policy change, where it may be impossible to convey such information in the absence of pork. Moreover, pork will be observed when the public good is most valuable precisely because it is valuable and the informed agenda setter wants to convey this information. Moreover, information may be conveyed for the reason pork is widely criticized, that is, because it benefits special interests.

> "... trading of that sort [i.e., pork to pass bills] has characterized the fight for almost every major, controversial measure of domestic legislation in the last half century ...
>
> Frederick Lawton ... who had been for decades a career official at the Office of Management and Budget (as it now is called), once told me of a summons to Franklin Roosevelt's office in 1938, when the last big piece of New Deal legislation ever passed, the Fair Labor Standards Act, was teetering before the House of Representatives. "Fred", President Roosevelt said, as I heard the story, "I want you to go across the street [to the State Department building] find a vacant office with a desk, two chairs and a telephone, take a copy of the Budget Document with you, call me and give me the room number and then wait there all day. From time to time. members of Congress, sent by me, one by one, will knock on your door. And when they do, Fred, let them in, shut the door, open the Budget, and give them whatever they ask".
>
> Presidential scholar Richard Neustadt (as quoted in Evans, 2004)

1. Introduction

A common complaint about Congress is the prevalence of pork barrel spending, that is, of projects benefiting specific groups or districts at public expense. Conventional wisdom is that legislators take advantage of their opportunity to pad legislation with too much pork to the point where it harms the general interest. The common association of pork with "politics as usual" is contrasted with "responsible policy making", in which legislators put aside their love of pork and concentrate on socially beneficial legislation. This view supports proposals to ban or limit pork or "earmarks" with the aim of improving social welfare.

An alternative view is that pork is the "grease" that makes the legislative process work. In order to get the votes to pass legislation, it is necessary to build legislative coalitions. Legislators are brought into coalitions not only by the nature of the legislation on the table, but also by the favors they get conditional on delivering their

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votes. Under this view, pork barrel spending is a necessary evil in order to adopt socially beneficial legislation and in fact may be critical to the passage of such legislation. Consider, for example, the failure of the 2008 Troubled Asset Relief Program (TARP) legislation to pass in the House of Representatives on September 29th and its subsequent passage merely four days later when pork was added; or, the passage of major health care legislation in the U.S.[1] Earmarks have been part of congressional practice since its founding, but the practice was suspended between 2011 and 2021. The ten-year moratorium was allowed to expire based on the argument that "moderate members can find it easier to vote for their party's bill if the bill has something specifically for their voters."[2] This more "pragmatic conventional wisdom" takes account of the realities of the legislative process and the role of pork in "greasing the wheels" so that important legislation may be passed.

The purpose of this paper is to examine both the simple conventional wisdom that distribution of pork lowers social welfare and the "pragmatic" conventional wisdom that pork may be welfare-increasing because it allows coalition formation to pass socially beneficial legislation. A key result is that the latter may be the case particularly if it not only serves to "bribe" intransigent legislators, but also reveals information about the value of the legislation. Specifically, it is the willingness of a legislator to forego pork that signals the social value of legislation to other, less-informed legislators. When the better-informed legislator faces a problem convincing others that a bill is not only in her private interest, but in the social interest as well, foregoing pork and transferring it to others may be crucial to passing legislation. Moreover, we argue that what allows pork to be a welfare-improving tool is precisely what is widely condemned, namely, that the benefit is narrowly targeted to specific groups.

Asymmetrically informed legislators not only implies a potentially welfare-improving role for pork, but also reverses conventional wisdom about *when* pork will be observed. In the complete information model (as in Battaglini and Coate, 2008), pork will be distributed to coalition members when pre-existing fiscal obligations and/or the value of public goods are low, but legislators will forgo pork when pre-existing obligations and/or the value of public goods are high. In sharp contrast, under incomplete information, pork may be higher when the public good is *most* valuable, not when it is least valuable. That is, pork is not antithetical to "responsible policy making" but in fact part of the response of policy to a high valuation of the public good.[3] We also find that pork may be optimally given out even when the government budget constraint is very tight.

We show that while pork may lead to socially beneficial outcomes under full information, the case for the pragmatic conventional wisdom becomes strongest when one moves away from a perfect information world. Buying votes with pork to enable the passage of legislation is then only part of the story. The extent to which an agenda setter is willing to distribute pork ("give them whatever they ask") may reveal information about the importance of legislation. Crucially, differing views of the importance of legislation may reflect not only differences in ideology but also information about the state of the world or an understanding of all the possible consequences of a specific legislative initiative (as in the discussion of Lincoln and the Thirteenth Amendment in the previous footnote). For example, given the complexity of legislation and the impossibility of spelling out all contingencies, some legislators, such as committee chairs, may have superior information about the (social welfare) effects of legislation that cannot be conveyed simply by its contents. The possibility of information revelation of this sort will affect the nature of the legislative bargains that allow legislation to pass, as well as the welfare implications of allowing or restricting pork. Hence, the pragmatic view that pork is necessary to "lubricate" the legislative process is incomplete without considering how incomplete information affects the use of pork.

However, one cannot view policy choice under imperfect information as simply signaling the importance of legislation. The joint objectives of signaling and coalition building require differential treatment of different legislators across states of nature. More specifically, these joint objectives may require policies that in themselves benefit specific constituencies at the general expense, the defining characteristic of pork that leads to its condemnation for reducing social welfare. Hence, this characteristic of pork may in fact be quintessential to understanding the pragmatic conventional wisdom where pork is used to pass important legislation. Pork may be central to responsible policy-making, rather than antithetical to it. We will show that outlawing pork may make it impossible to respond to situations calling for higher expenditure on vital public goods, and hence may be welfare reducing.[4] We should stress that we do not claim that information transmission is the primary motivation for pork barrel spending. Rather, the amount and distribution of pork barrel spending in the process of coalition building also reveals information about the importance the proposer puts on legislation. When the proposer is, in addition, better informed about the legislation's content and its potential effects, this information is valuable and may play an important role in coalition building and in the passing of socially-beneficial legislation.[5] We note that we view our result as a possible explanation for the use of pork rather than arguing that it is *the* explanation. Nonetheless, our novel argument is that allocation of pork may convey information in a way that is socially beneficial, and which could not be conveyed if pork were prohibited.

The plan of the paper is as follows. In the next section we review some existing models of pork barrel spending. In Section 3 we set out the basic model and the legislative process. In Section 4 we derive the political equilibrium and its normative properties under full information. Section 5 presents the asymmetric information equilibrium, including some discussion of asymmetrically informed legislators in the real world. Section 6 presents conclusions. Proofs of the propositions and additional derivations can be found in the appendices, alongside other supplementary material.

[1] See https://www.sfgate.com/politics/article/Billions-in-earmarks-in-Senate-s-bailout-bill-3192435.php and http://www.lasvegassun.com/news/2009/dec/20/reid-compromise-gives-sweet-medicaid-deal-nebraska.

[2] Washington Post, February 18, 2021. https://www.washingtonpost.com/politics/2021/02/18/democrats-are-bringing-earmarks-back-arent-earmarks-bad/.

[3] This may help explain the use of pork to pass legislation during times of "crisis", for example as during the New Deal in the epigraph, or TARP during the 2008-9 financial crisis. Another example may be Abraham Lincoln's use of pork in 1865 to secure passage of the Thirteenth Amendment, which he believed to be of paramount importance. According to Goodwin (2005, p.687):

> He assigned two of his allies in the House to deliver the votes of two wavering members. When they asked how to proceed, he said, "I am President of the United States, clothed with great power. The abolition of slavery by constitutional provision settles the fate, for all coming time, not only of the millions now in bondage, but of unborn millions to come– a measure of such importance that those two votes must be procured. I leave it to you to determine how it shall be done; but remember that I am President of the United States, clothed with immense power, and I expect you to procure those votes". It was clear to emissaries that his powers extended to plum assignments, pardons, campaign contributions, and government jobs for relatives and friends of faithful members.

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[4] The same logic would hold for crucial tax cuts or a critical need to reduce public deficits.

[5] There is nothing unique about the proposer in this regard. If another coalition member has superior information, the proposer can use pork to elicit information from her bargaining partner.

2. Existing models of pork in legislatures

Several papers consider the allocation of pork barrel spending in a legislative setting, though generally without investigating its dependence on the interaction between ideology, informational asymmetries, and the social value of other legislation.

Buchanan and Tullock (1962) introduce pork barrel spending as part of vote-trading between legislators over projects in the legislative decision making process. Early formal modeling by Shepsle and Weingast (1981) and Weingast et al. (1981) argue that the political – not only economic – benefits of geographically concentrated projects explain their widespread use. Projects generate employment and income in the districts in which they are built, to the political benefit of the legislator representing the district. In these studies, and in most subsequent literature, there was no discussion either of using pork to enable the passage of broader legislation or how its social cost may vary depending on economic circumstances.

Baron and Diermeier (2001) consider a model of legislative bargaining where the agenda setter uses transfers to legislators to build legislative coalitions to pass policy measures. There is heterogeneity of legislators' preferences over policy, but agreement across legislators about the state of the world, which is common knowledge. Hence, though the allocation of transfers depends on the suitability of the status quo to the state of the world, as it does in our model, the assumption of full information means there is no need for the agenda setter to transmit information. Their analysis is positive and evaluates the types of coalitions that may form. They do not evaluate the normative implications of the distribution of pork—the subject of this study.

Evans (2004) is a detailed study of the use of pork as "greasing the wheels" of the legislative process. She presents numerous examples, such as the ratification of NAFTA by Congress in 1993. However, her study does not really explore the key question addressed here, that is whether use of pork to pass legislation is necessarily welfare improving. As we argue below, "greasing the wheels" may either raise or lower welfare, with a model-based analysis needed to determine general conditions for these two possibilities. However, there are, to our knowledge, no formal models of this phenomenon looking at the importance of the information structure in addressing this question.

Battaglini and Coate (2008) introduce a model capturing the dependence of policy-making regimes on the state of the world, by extending the Baron and Ferejohn (1989) legislative bargaining framework to a dynamic setting. Depending on the social value of public goods and on the level of outstanding debt, the economy may be in either of two "regimes". In BAU ("business as usual"), the agenda setter distributes pork to members of the (minimum winning) coalition. In contrast, in RPM ("responsible policy making"), when fiscal demands are high due to a high social value of public spending and/or high public debt, no pork is distributed. Central to their results, as we will argue, are homogeneity of legislators and full information.

Our paper is related to the role of information in legislative organization, as in Gilligan and Krehbiel (1987, 1989) and Krehbiel (1991, 2004). This literature explores how existing legislative institutions and procedure may assist or hamper the transmission of information within a legislature, when certain legislators (such as committee members) are better informed. Our paper follows their assumption that agenda setters may be better informed than other legislators. We outline evidence on asymmetric information in legislatures in Appendix C. In our analysis, we take legislative organization as given, although we extend our analysis to an open-amendment procedure in Appendix E. Instead, our focus is on the role of pork barrel spending as a potential signaling device.

"Money burning" is a previously-studied signaling device. Austen-Smith and Banks (2000) outline how an agent could inflict harm on themselves to the point of revealing privately-held information. Pork barrel spending will play a similar role in our analysis. An informed legislator forgoes pork, or agrees to allocate pork to another legislator, to her own detriment. This harm allows her to convey information about the state of the world. We compare pork barrel spending with money burning at various points throughout the paper and in more detail in Appendix D. We show that there are indeed instances where pork barrel spending or money burning could either be used to convey information.

Nevertheless, there are several reasons why we think money burning is an imperfect substitute for pork barrel spending in the current context. First, money burning causes harm to the informed legislator but no benefit to the uninformed one. Pork can simultaneously convey information and serve its traditional coalition-building and "vote buying" role. Second, for this reason, pork barrel spending is Pareto improving relative to money burning, because the former at least provides benefit to some citizens, while burnt money is pure waste. It is true that a legislator could burn private resources to signal the state of the world without distorting public policies and this would impose minimal cost to society. However, pork may be a more practical signaling device. It is difficult to enforce a contract stipulating that the informed legislator burns private resources in return for legislative favors. In contrast, pork is typically bundled in to the budgetary legislation in question. Further, other legislators may be unable to ascertain the informed legislator's value of private goods and therefore the amount of private money-burning required to signal the state of the world. It may be easier for other politicians to evaluate the political harm of higher taxes or lower pork to other legislators.

Finally, our paper is related to Cukierman and Tommasi (1998a,b), in which the known ideological bias of the agenda setter, combined with asymmetric information, makes it impossible to adopt policy appropriate to the state of nature, if it coincides with the agenda-setter's ideological bias. The problem is that the agenda setter cannot convince other political actors that the policy is social welfare enhancing rather than motivated by her own preferences. We show that the addition of pork to the policy menu may make it possible to adopt such policy in this situation. Foregoing pork allows the agenda setter to signal the social importance of a policy change. In this paper we explore the possibility that there are uses for pork other than bribing in which the agenda setter can transfer information by giving pork to other legislators and forgoing it herself.

3. Model

3.1. Set-up

Consider a legislature consisting of n districts. Each district i consists of a measure-one continuum of identical households with the following preferences:

$$u\left(c^i, g, s^i\right) = c^i + \left(z + \alpha^i\right) g + \theta s^i, \tag{1}$$

where c^i is consumption of private goods, g the per-capita expenditure on a public good, and s^i is the per-capita amount of pork barrel spending allocated to district i. The sum $z + \alpha^i$ represents the marginal value of the public good to households and includes a term z representing the state of nature that is identical across districts and another term α^i that is idiosyncratic to the specific district. Districts may have one of three valuations for the public good, $\alpha^i \in \{-\alpha, 0, \alpha\}$, where $\alpha > 0$. The three valuations represent right-leaning, centrist and left-leaning districts respectively (where "left" is defined here as a stronger preference for the provision of public goods).[6] Finally, $\theta \leq 1$ is a parameter that

[6] A large literature has studied the possibility that the pivotal legislator does not represent average preferences. Our assumptions imply that the centrist represents not only the preferences of the median district, but also the preferences of the average district. Hence, we can consider particular welfare costs and benefits of pork, abstracting from other median-voter distortions. We discuss possible implications of a non-representative median legislator below when we consider the full information results.

captures the deadweight loss incurred due to pork barrel spending: one dollar of pork spent in district i is worth only θ dollars of consumption. This may be because pork barrel spending is not consumed directly by households, but rather provided as a local public good, an in-kind transfer, or a public employment program. This parameter also incorporates any deadweight losses due to the distortionary nature of taxation used to fund pork barrel spending. $\theta = 1$ represents the extreme case where taxation is non-distortionary and pork is provided as a lump-sum transfer to households in district i.

Heterogeneity of legislator interests is crucial to the possible welfare-enhancing role of pork. We will show that when all legislators are identical in these respects, there is no need for pork to enable socially beneficial legislation to be passed. It can only be welfare-reducing. However, legislator heterogeneity is not a sufficient condition for welfare-improving pork. We will show that with fully informed legislators, "greasing the wheels" improves welfare only in very specific cases. Pork is often unnecessary to adopt beneficial legislation and its use often reduces welfare, consistent with common perceptions. In contrast, we find that, under asymmetric information about the effects of legislation, pork may be crucial for socially beneficial legislation to pass.

The household in district i has the following budget constraint:

$$c^i = c = y - \tau,$$

where y is pre-tax income and τ are lump-sum taxes (both assumed equal across districts). Results presented here generalize to allowing for endogenous labor supply and distortionary taxation.[7]

Fiscal policy satisfies a budget constraint,

$$\tau \geq g + X + \frac{\sum_i s^i}{n} \tag{2}$$

where X represents pre-existing fiscal commitments that must be met (for example, debt service or non-discretionary public spending) and is given in per capita terms, and $s^i \geq 0$. For tractability, we assume that g can take on two values: $g \in \{0, 1\}$, though this could be generalized at the cost of making the model much more complicated, as we have shown in previous versions of this article. We also assume that income in the economy satisfies $y > X + 1$, so that it is feasible for the government to provide the public good while meeting pre-existing fiscal commitments. Fiscal policy must satisfy economy's resource constraint $\tau \leq y$.[8]

For concreteness, we consider the case of three legislators ($n = 3$) who differ in their preferences for public goods.[9]

3.2. Information structure

We will explore two information structures, reflecting possible differences across legislators in their understanding about the consequences of specific legislation. First, we explore the case in which all legislators have complete information about the effect of legislation on all districts, so that the only heterogeneity is ideological. This is represented by assuming that the values of α^i for all i and z are common knowledge.

We then consider asymmetric information where the agenda setter has superior information or expertise that allows her to better understand the social welfare consequences of legislation in each state of the world. For tractability we represent this simply by assuming that while α^i is common knowledge, z is known only to the proposer of legislation, the coalition "formateur".

Specifically, we assume that z can take on one of two values $z \in \{\underline{z}, \bar{z}\}$, with $\bar{z} > \underline{z}$. Under asymmetric information, legislators other than the coalition formateur have expectations based on a prior distribution, assigning probabilities p and $1 - p$, respectively, to the states $\bar{z}$ and $\underline{z}$. We denote by $z^e \equiv p\bar{z} + (1-p)\underline{z}$ the expected value of z prior to the legislative round.

3.3. Parametric assumptions and conflicts of interest

The cost of providing the public good g is 1, so legislator i would like to provide the good if and only if $z + \alpha^i > 1$. To represent a possible conflict of interest between legislators and a challenge for information transmission, we make two parametric assumptions. First, we assume that

$$\bar{z} > 1 > \underline{z}, \tag{3}$$

so that the centrist ($\alpha^C = 0$) prefers $g = 1$ if $z = \bar{z}$, but $g = 0$ if $z = \underline{z}$. Second, we assume

$$\alpha > \bar{z} - \underline{z}. \tag{4}$$

This condition is sufficient to ensure that the left wing legislator ($\alpha^L = \alpha$) wants to provide the public good in any state of the world, that is $\underline{z} + \alpha > \bar{z} > 1$; the right wing legislator ($\alpha^R = -\alpha$) wants g to be provided in no state of the world, that is, $\bar{z} - \alpha < \underline{z} < 1$. Hence, partisan legislators (that is, those with $\alpha^i \neq 0$) are motivated solely by ideology in their preferences over government spending, while the non-partisan legislator ($\alpha^i = 0$) is motivated only by having government spending appropriate to the state of the world. This is a simple way to represent primarily ideologically- versus non-ideologically-motivated legislators. Hence, in a coalition of a left-wing agenda setter and a centrist, there is a conflict of interests when $z = \underline{z}$, or, in the case of asymmetric information, when the centrist's expectation of the state of the world $z^e < 1$.[10]

It is worth noting three cutoff values of θ. As already noted, $\theta < 1$ implies that increasing taxes to allocate pork equally across districts is socially wasteful (if all districts are equally weighted in the social welfare function). Further, if $\theta \leq \frac{1}{3}$, a legislator is harmed by pork barrel spending even if his district is the sole recipient. Finally, if $\theta \geq \frac{2}{3}$, a coalition of two legislators may benefit from increasing taxation and sharing its proceeds as pork barrel spending.

[7] This was shown in a previous version of this paper, Drazen and Ilzetzki (2011).

[8] This is equivalent to saying that the tax rate cannot exceed 100%. In Drazen and Ilzetzki (2011), this constraint is never binding because of distortionary taxes. As taxes approach their revenue-maximizing rate, they become increasingly costly to households, so that the revenue-maximizing rate (below 100%) is never chosen.

[9] When there are more than three legislators, the basic arguments are the same, as long as no type of legislator is in the absolute majority and hence can pass legislation without forming a coalition with legislators having different preferences over the public good. Three is the smallest number of legislators needed to make the arguments outlined in the article. We will see that only two of the three legislators are included in a "proto-coalition" in equilibrium and the third legislator has no impact on policy. Nevertheless, the third legislator plays an important role in evaluating the welfare implications of policy. The third legislator bears the externalities imposed by a imperfectly representative coalition. In particular, the coalition places a larger value on pork barrel spending than does the average citizen.

[10] This is the Cukierman and Tommasi (1998a,b) environment. There the ideological bias of (for example) a left-wing policymaker implies she wants to change policy in her desired direction even if there is no change in the state of the world. She has no way of signaling that the changed state of the world calls for a leftward policy shift, so that she is unable to enact socially optimal policy. This is exactly the problem here where no pork is available. However, the addition of pork (or an additional policy dimension) may enable the left-winger to signal and enact optimal policy.

3.4. Legislative procedure

In what follows, we show results for a closed-amendment procedure, where the formateur (to use Baron and Diermeier's (2001) terminology) chooses one other legislator to form a proto-coalition, i.e. a potential coalition. She then makes a take-it-or-leave-it policy proposal, which is adopted if accepted by the other coalition member. If the coalition member rejects the proposal, a status quo policy is implemented. All of our insights are robust to an open-amendment procedure, in which rejection of the formateur's proposal leads to an "amendment round" in which the other member of the proto-coalition may make a new proposal of tax, public good, and pork allocations, which is implemented if the two members of the proto-coalition vote for it. If no proposal passes, a status quo policy, in which no pork is allocated, is enacted. The open-amendment procedure is analyzed in Appendix E and differs mainly in the distribution of rents among proto-coalition members.

4. Full information

We begin with the case of full information about z, the social value of public goods. The full information case gives a frame of comparison for the model with asymmetric information in the following section. It also provides a counterpoint to the existing literature. The conventional wisdom, arising from models with homogeneous legislators, posits that pork can only be welfare reducing. In contrast, the pragmatic conventional wisdom, as in Evans (2004), suggests that pork enables legislation that otherwise would not pass. The analysis that follows shows that there is some truth to both views, but neither is complete. We show that, on one hand, it is true that pork allows political compromise that would not be possible otherwise. On the other hand, these political compromises will typically be to the detriment of citizens' welfare, so that abolishing pork is preferable. Further, the peculiar cases where pork does increase citizen welfare are not as envisioned in the pragmatic conventional wisdom. The pragmatic conventional wisdom sees an ideological political faction buying the support of moderate (median) legislators for their legislation. We show however, that pork is welfare-reducing in this case: Policies that the median legislator would not accept without pork are not to the benefit of the median district. Instead, it is circumstances when an ideological agenda setter receives pork that can be to the general benefit. The agenda setter may use status quo bias and her agenda-setting power to block legislation that is welfare increasing for the average district and pork can bring the ideological faction on board.

With $\theta \leq 1$, the social planner would not allocate pork and would set $s^i = 0$ for all i. The public good is socially desirable if and only if $z = \bar{z}$, so that the socially optimal policy is $g = 1$ if $z = \bar{z}$ and $g = 0$ if $z = \underline{z}$.

4.1. Prohibited pork

When pork barrel spending is forbidden, budgetary policy is a simple binary choice between providing the public good ($g = 1$, $\tau = X + 1$) or not ($g = 0$, $\tau = X$). Equilibrium depends on the ideology of the formateur, the status quo, and the state of the world z.

When the centrist is formateur, her problem is simple. On observing the state of the world, she forms a coalition that allows her to pass her desired policy. She forms a coalition with the left-wing legislator if $z = \bar{z}$ and proposes $g = 1$; she forms a coalition with the right-wing legislator if $z = \underline{z}$ and proposes $g = 0$. The proposal is accepted, regardless of status quo. Hence the choice of coalition partner by a centrist formateur allows the socially optimal policy to be adopted without distribution of pork. Pork barrel spending cannot improve social welfare.

Consider instead an ideological formateur, for example, a left-wing formateur. She would choose the centrist as proto-coalition partner under any status quo and state of the world, but whether socially optimal legislation can be adopted depends on the combination of the two. If $z = \bar{z}$ the socially-optimal policy of $g = 1$ is adopted regardless of status quo. Allowing distribution of pork could only reduce social welfare. In contrast, if $z = \underline{z}$, there is a conflict of interest: the left-wing legislator wishes to provide the public good (since $\underline{z} + \alpha > 1$) but the centrist does not (since $\underline{z} < 1$). Consequently, the status quo would remain in place. This would be socially optimal if $g^q = 0$, but sub-optimal if the status quo is $g^q = 1$ and pork can potentially increase welfare by allowing socially optimal policy to be adopted.[11,12]

The only possible case for socially beneficial pork is when the agenda setter is ideologically opposed to changes in the status quo and uses her agenda setting (or veto) power to prevent a socially-desirable policy change ($g^q = 1$ and $z = \underline{z}$ when the agenda setter is left-wing or $g^q = 0$ and $z = \bar{z}$ when the agenda setter is right-wing). We summarize this in:

Proposition 1. *With full information, the social optimum is always achieved with a centrist agenda setter. With a left-wing (right-wing) agenda setter, the social optimum is achieved if the agenda setter's ideological preference agrees with the optimal policy, i.e. if $z = \bar{z}$ ($z = \underline{z}$). If it does not, i.e. $z = \underline{z}$ ($z = \bar{z}$), the social optimum is achieved if and only if the status quo is optimal, i.e. $g^q = 0$ ($g^q = 1$).*

Proof. In the previous paragraphs. ■

To summarize, socially optimal policy can be achieved without pork in the majority of cases. The combination of the agenda setting power of an ideological legislator and a sub-optimal status quo policy that is adopted absent legislative agreement are the political frictions that prevent a socially desired outcome in some situations. In these cases, pork may be useful in providing an additional bargaining dimension, which facilitates a cooperative bargaining outcome, and distribution of pork *may* increase social welfare. We now consider whether or not it actually does and we show that this depends on how distortionary pork is, that is, on the value of θ.[13,14]

[11] The case of a right wing formateur is symmetric to her left wing counterpart. The socially optimal policy is adopted, except when $z = \bar{z}$ but the status quo is $g^q = 0$. In this case, the status quo is adopted and $g = 0$.

[12] Results are qualitatively similar with continuous public goods, as in Drazen and Ilzetzki (2011). There, each legislator has a different ideal tax-spending mix. Pork allows the coalition to compromise on a policy that averages the preferences of these two legislators. Whenever the status quo favors the agenda setter, i.e. provides more public goods than the compromise policy, pork barrel spending can improve social welfare by moderating policy. However, when the status quo favors the centrist, by providing less public goods than the compromise policy, pork causes double harm: it leads to a more extreme policy than the status quo and is itself wasteful.

[13] Welfare implications rely on the assumption that the centrist's preferences represent social welfare, or are closer to social welfare than those of the ideological coalition partner. An alternative interpretation of Evans's (2004) argument is that pork barrel spending helps close the gap between the preferences of the pivotal legislator and the average citizen. This could arise when super-majorities are required to pass legislation. It could also arise if the President is the agenda setter and is a better representative of citizen's preferences than is the pivotal legislator. However, the general argument that welfare-improving pork is an exception to the rule follows in these cases too. Pork only promotes social welfare when it is used to "buy off" legislators with preferences more distant from social welfare than the remaining coalition. Unrepresentative legislatures could further exacerbate the social harm of pork, further weakening the case for pork under full information.

[14] An open amendment procedure strengthens the centrist's bargaining power and leads to an even sharper result: the socially optimal policy is always adopted and pork is always harmful.

4.2. Pork as a coalition building tool

Consider the case of a left-wing agenda setter when $g^q = 1$ but the state is $\underline{z}$ (so that the optimal policy of $g = 0$ cannot be adopted in the absence of pork), and now allow the distribution of pork $s^i \geq 0$. With a proto-coalition of C and L, equilibrium is a policy $\{g, \tau, s^C, s^L\}$ that maximizes the agenda setter's utility (given by (1) with $\alpha^i = \alpha^L = \alpha$ and $c^i = c^L = y - \tau$) subject to the government's budget constraint (2), feasibility ($\tau \leq y$), and the requirement that the centrist prefers this policy to the status quo, that is, it satisfies the centrist coalition partner's participation constraint:

$$y - \tau + \underline{z}g + \theta s^C \geq y - X - 1 + \underline{z}. \tag{5}$$

The left-hand side of (5) gives the centrist's utility when g and s^C are chosen by legislative agreement. The right hand side gives his utility in the status quo, where $g = g^q = 1$, $\tau = X + 1$, and no pork is distributed ($s^C = 0$) .[15]

4.2.1. Possible political equilibria

Equilibrium differs depending on which members of the coalition obtain pork. There are three regimes to consider: (i) a *rent-seeking* regime, where pork is distributed to both coalition members, that is, beyond what is necessary for coalition formation; (ii) a *coalition building* regime, where pork is distributed only to the ideological agenda setter in order to form a coalition; and (iii) a *gridlock* regime, where pork is not distributed even though it is allowed. The full derivation of the conditions for these three regimes to obtain is given in Appendix A.[16]

Which regime obtains depends on the values of θ and $\underline{z} + \frac{\alpha}{2}$.[17] The former is the marginal value of pork, while the latter gives the value of the public good averaged over the left-wing and centrist coalition partner. Fig. 1 shows which regime arises depending on θ. The top panel shows the case $\underline{z} + \frac{\alpha}{2} \geq 1$, while the bottom panel reflects the case $\underline{z} + \frac{\alpha}{2} < 1$. This inequality determines whether the average coalition member wishes to provide the public good or preserve low tax rates. In the text we discuss the general properties of these 3 regimes, where the precise values of θ leading to the regimes are discussed in the legend to the figure and in Appendix A.[18]

In the rent-seeking regime, pork is extracted beyond the minimum required to build a coalition. This occurs when θ is sufficiently high so that its marginal benefit to the coalition (but never to society) exceeds its tax costs ($\theta > \frac{2}{3}$). This is the right-most regime in both panels of Fig. 1. The public good g may be provided in the rent-seeking regime, when the value of the public good to the average coalition member is greater than the marginal cost of taxation ($\underline{z} + \frac{\alpha}{2} \geq 1$, as in the top panel) and the marginal value of pork θ is sufficiently low relative to the value of the public good ($\theta \leq \frac{2}{3}\left(\underline{z} + \frac{\alpha}{2}\right)$) so the coalition prefers the public good to both pork and private consumption.[19]

The *coalition building* regime may arise for intermediate values of θ. In this regime, pork is allocated to the agenda setter alone, to compensate her for policy change to $g = 0$.[20] This regime can only arise when $\underline{z} + \frac{\alpha}{2} < 1$, as in panel B of the figure, otherwise the average coalition member prefers to provide the public good and it is impossible to arrive at an agreement to cut public good spending. Further, pork must be sufficiently non-distortionary to allow compensation of the agenda setter for adopting $g = 0$, but distortionary enough that the coalition will not raise taxes for pure rent extraction, i.e. give pork to both coalition members, as in the rent-seeking regime. The latter condition requires that $\theta \leq \frac{2}{3}$. The condition that pork is not too distortionary is more stringent than the requirement that pork provides its recipient with a net benefit (i.e., $\theta > \frac{1}{3}$). Instead, it requires that pork's benefits to the agenda setter are sufficiently large to persuade her to change policy at a reasonable cost to the centrist. The exact lower bound of this regime shown in Panel B is derived in Appendix A.

Finally, the gridlock regime arises when θ is sufficiently low. A low value of pork – large dead-weight losses due to redistribution – implies that the costs of compensating the agenda setter for reducing g outweigh the value to the centrist of the policy change that it enables. No consensus arises and policy remains as the status quo. This regime holds for the remaining values of θ, shown in the left-most part of both panels of Fig. 1.

4.2.2. Welfare implications

We now turn to the welfare implications of allowing pork. In the *gridlock* regime, the availability of pork is irrelevant for welfare as pork is not used. In the *coalition building* regime, pork is *always* kosher, i.e. welfare-improving. Pork is given only to the agenda setter. The centrist's participation implies that he is no worse off than in status quo (the equilibrium without pork). The average district is slightly better off than is the centrist, because it partly internalizes the benefits from the pork delivered to the agenda setter.

Turning to the rent-seeking regime, pork can only improve welfare if the public good is cut to zero, thus improving public policy. Even when public goods are cut, there is tradeoff between pork's benefit in greasing the wheels to allow better policy and the potentially excessive distribution of pork. Whether the average citizen benefits from this equilibrium depends on whether the value of cutting public spending justifies the social losses due to pork barrel spending.[21] Specifically, welfare will be higher, that is, pork will be kosher, if

$$1 - \underline{z} \geq (1 - \theta)(y - X). \tag{6}$$

The inequality has a simple intuition. The left hand side of the inequality gives the value of "getting policy right". It is large when $\underline{z}$ is small relative to one, representing the net value of cutting public goods and taxes by one unit. The right hand side of the inequality gives the dead-weight loss incurred due to pork barrel spending. This is low if θ is sufficiently close to 1, that is, if waste from pork is low relative to its (tax) cost. It will also be low when fiscal space ($y - X$) is low. This latter condition arises because fiscal space limits the amount of pork available, and thus the social damage it can cause.[22]

The welfare effects are summarized in the following proposition.[23]

[15] The formulation assumes a closed-amendment legislative process, where the agenda setter makes the centrist a "take it or leave it" offer. We omit the agenda setter's participation constraint for the sake of brevity, as it is generally not binding. In an open amendment procedure, the tables are turned and the centrist makes a counter-offer that maximizes his utility subject to the agenda setter's participation.

[16] The appendix also shows why a fourth regime, where only the centrist receives pork, never arises.

[17] Fiscal space $y - X$ does not affect the cutoffs because taxation is not distortionary. One can think of the more general case with distortionary taxation as one where θ is increasing in fiscal space because dead-weight losses due to taxes are higher when the tax base y is small relative to fiscal commitments X.

[18] In Drazen and Ilzetzki (2011), pork is wasteful only in that it requires distortionary taxation. There, it is the elasticity of labor supply that governs the magnitude of deadweight losses.

[19] As tie-breaking rules at the cutoff between regimes we have the agenda setter making the choice that (i) maximizes public good provision, and (ii) minimizes pork, in that order of priority. In making welfare evaluations we will state conditions for pork being weakly welfare improving.

[20] With an open amendment procedure, the left-wing formateur is compensated only to the extent needed to ensure her support for the policy shift. With a closed amendment procedure, the formateur uses her agenda setting power to extract further rents through pork.

[21] Notice that linear utility gives the best case scenario for pork barrel spending, because taxation is not distortionary. One might think of the value of θ as incorporating the dead-weight losses due to distortionary taxes in addition to any preferences for distributional equity.

[22] In a model with distortionary taxation, the range where pork is kosher in the rent-seeking regime is further limited by the fact that coalition members forgo pork and gridlock arises when fiscal space is tight.

[23] The proposition holds identically when legislative procedure is open amendment.

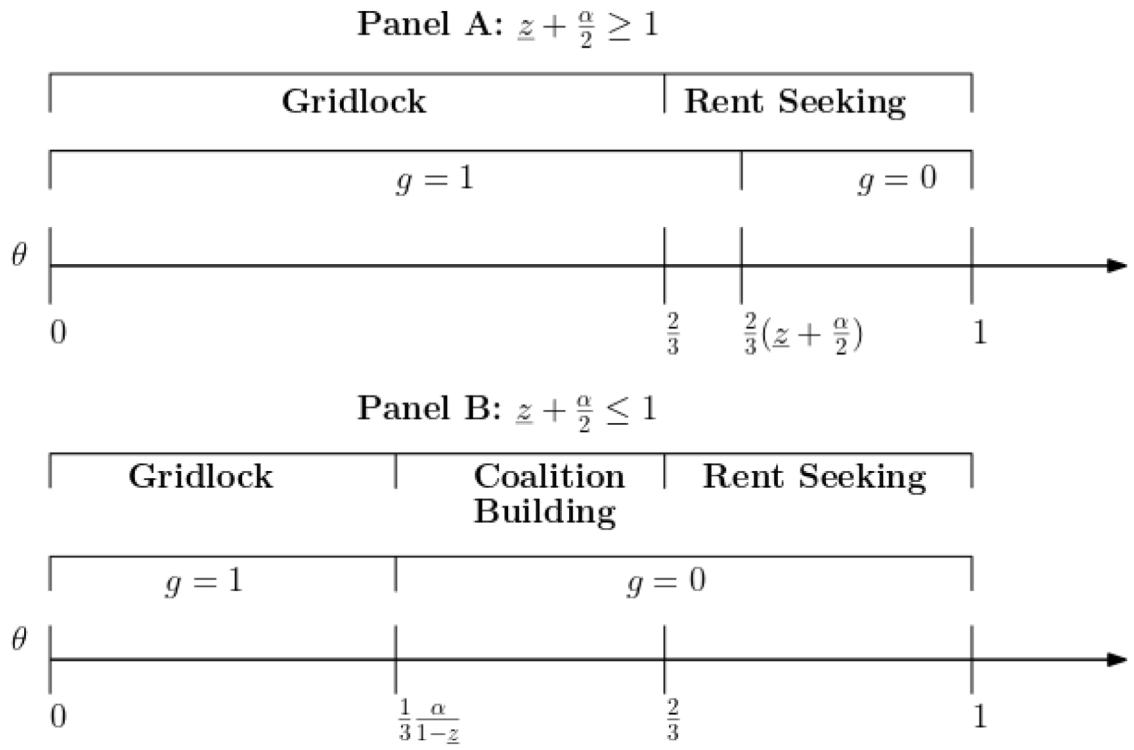

Fig. 1. Regimes in the full information equilibrium. Note: The figure shows which regimes arise as a function of the value of pork barrel spending θ in an equilibrium with full information. In both panels of the figure $z=\underline{z}$ and the status quo is $g^q=1$. Panel A (top) considers the case $\underline{z}+\frac{\alpha}{2}\geq 1$ Here, the rent seeking regime, where both legislators extract pork beyond the necessary to build a coalition, arises if $\theta>\frac{2}{3}$. Otherwise, equilibrium is gridlock at the status quo, with no pork. The public good is provided if and only if $\theta\leq\frac{2}{3}\left(\underline{z}+\frac{\alpha}{2}\right)$. Panel B (bottom) considers the case $\underline{z}+\frac{\alpha}{2}<1$. Here, the rent seeking regime arises if $\theta>\frac{2}{3}$ and equilibrium is gridlock if $\theta\leq\frac{1}{3}\frac{\alpha}{1-\underline{z}}$. Between these two thresholds, equilibrium is coalition building, where only the agenda setter receives pork to allow coalition agreement to eliminate the public good. The public good is provided only in the gridlock regime.

Proposition 2. *With full information, a left-wing agenda setter, and* $g^q=1$, $z=\underline{z}$, *pork is welfare increasing in*

(1) the coalition building regime, and

(2) the rent-seeking regime with $g=0$ $\left(\theta>\max\left\{\frac{2}{3}\left(\underline{z}+\frac{\alpha}{2}\right),\frac{2}{3}\right\}\right)$, *if (6) holds.*

For all other combinations of status quo and the state of the world, the availability of pork reduces social welfare.

Proof. Appendix A. ■

The proposition is summarized graphically in Fig. 2 for the case $\underline{z}+\frac{\alpha}{2}<1$. As noted above, when this condition holds, there are three regimes: gridlock (with $g=1$, bottom, black), coalition building (with $g=0$, middle, gray), and rent seeking (with $g=0$, top, white). The figure further shows in $(y-X,\theta)$ space when pork is kosher—the dotted areas in the figure. Pork is kosher in the coalition building regime as well as in the rent-seeking regime if (6) holds. This latter condition gives the dotted white area at the top of the figure, where pork is kosher in the rent seeking regime.

Fig. 2 illustrates the insight that the social value of pork in equilibrium is non-monotonic in its wastefulness. When the value of pork is low, it will not be distributed in equilibrium, and it has no effect on social welfare. At intermediate values, its use is limited to coalition building purposes, and it improves welfare. Once we enter the rent-seeking regime (the white area, where $\theta>\frac{2}{3}$), pork is less distortionary, but this is precisely why it is used for rent seeking, in addition to coalition building, so that restricting pork would improve welfare. As θ increases further, pork becomes kosher once again (the white dotted area). While pork is used for pure rent seeking, it is sufficiently non-distortionary to justify the social cost of getting the socially desirable level of public goods ($g=0$).

Proposition 2 and Fig. 2 challenge both the conventional wisdom that pork is always wasteful and the pragmatic conventional wisdom that it improves welfare by allowing compromise and enabling passage of social-welfare-improving legislation that would not pass if pork was unavailable. Either statement may be true, depending on the amount of fiscal space available and how wasteful is the pork barrel spending in question. Broadly speaking, the conventional wisdom that "pork is waste" holds up rather well. For most combinations of agenda setter, the status quo, and the state of the world, coalition formation necessary to pass socially beneficial legislation does not need pork to grease the wheels.

5. Asymmetric information

We now consider the pragmatic conventional wisdom when there is asymmetric information about the value of legislation. Our key result is that pork may serve an important role in transmitting such information. By signaling the importance of legislation, the allocation of pork may therefore be welfare-improving in situations where, if used under full information, it would reduce welfare.

As discussed in the introduction, we think of asymmetric information as reflecting not only differences in information about the economic situation but also differences in understanding of the suitability of legislation for a given state. We outline some examples of asymmetrically informed legislators in Appendix C to motivate the case of asymmetric information. We note however that observing pork in major legislative packages – such as TARP or health care as mentioned above – does not in itself tell us whether it is being used to inform legislators or to buy their support.

In what follows, we assume the agenda setter – the proposer of the legislation – has superior information about the state of the economy

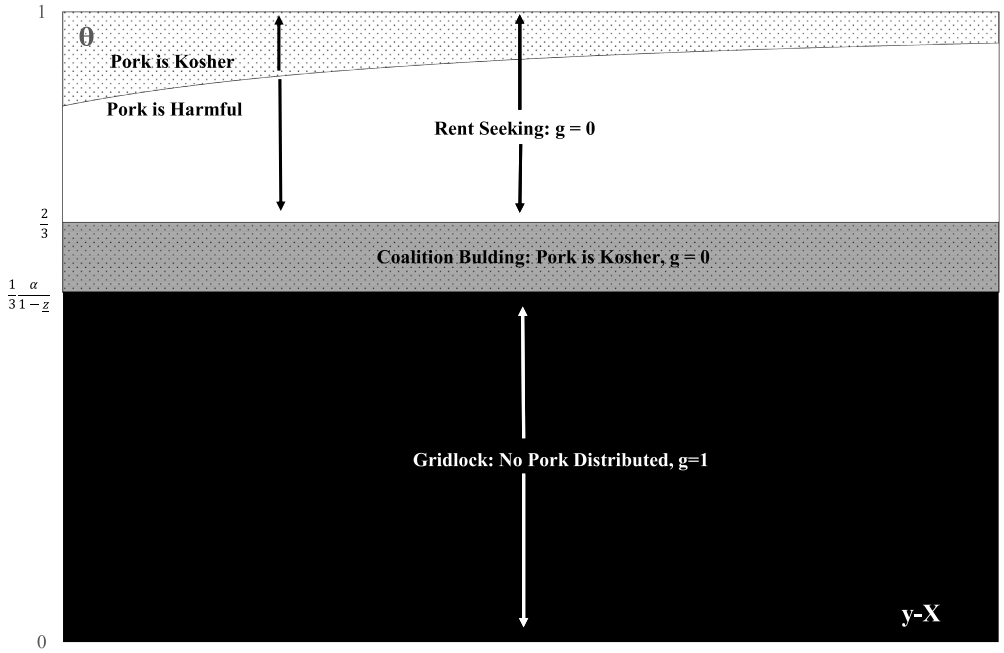

Fig. 2. Kosher Pork in the full information equilibrium. Note: The figure shows which regimes arise and when the availability of pork barrel spending improves welfare. This is plotted as a function of the value of fiscal space $y - X$, on the x axis, and of the value of pork barrel spending θ, on the y axis. The figure is plotted for an equilibrium under full information. The figure is plotted for $z = \underline{z}$, a status quo of $g^q = 1$ and the case $\underline{z} + \frac{\alpha}{2} < 1$. The bottom black region where $\theta \leq \frac{1}{3}\frac{\alpha}{1-\underline{z}}$ is the gridlock regime, where equilibrium remains as in the status quo. No pork is distributed and the availability of pork has no implication for social welfare. The public good is provided only in this regime. The middle, gray-dotted area, where $\frac{2}{3} \leq \theta < \frac{1}{3}\frac{\alpha}{1-\underline{z}}$, is the coalition building regime, where only the agenda setter receives pork to allow coalition agreement to eliminate the public good. The availability of pork improves social welfare in this regime, as discussed in the text and shown in the proof to Proposition 2. The top white area, where $\theta > \frac{2}{3}$, is the rent-seeking regime, where both legislators extract pork beyond the necessary to build a coalition. Here, the availability of pork improves public welfare only in the upmost dotted white area, where fiscal space is limited and/or pork is least distortionary. The cutoff for is shown by the concave line separating the white area into the dotted and solid areas, given by (6). The figure is plotted for $\alpha = 0.25$ and $z = \underline{z} = 0.85$ and is qualitatively the same for all values such that $\underline{z} + \frac{\alpha}{2} < 1$. If $\underline{z} + \frac{\alpha}{2} \geq 1$, pork is welfare-reducing in all regimes: The coalition building regime disappears, as does the rent-seeking region where pork is kosher.

or the implications of legislation. This is the point of departure of the existing literature on informational asymmetries within committees and legislatures (Austen-Smith and Riker, 1987, Gilligan and Krehbiel, 1987, 1989). Gilligan and Krehbiel (1989) cite Cooper (1970) in saying that information acquisition is the primary purpose of standing committees in the House of Representatives and this likely gives them superior information about legislation they bring to the floor. Further, there is some suggestive evidence, outlined in Appendix C that legislative agenda setters, such as committee chair have greater expertise on their subject-matter than do other legislators. They likely gain further information about the implications of their proposed legislation in the process of drafting legislation. Further, insofar as the legislative agenda setter is of the same political party as the executive, she will typically draft the legislation in collaboration with the executive, with its superior resources to craft and analyze legislation. However, it is not crucial for the analysis that the agenda setter be the more informed party. A less-informed agenda setter would face a screening problem rather than a signaling problem and pork plays a similar information-revelation role (as we see for the case of the open-amendment procedure in Appendix E).

5.1. Prohibited pork

To represent superior information about the effects of legislation under asymmetric information, we assume that only the formateur knows the state z ex ante. All other legislators have a prior p on the high state $\bar{z}$, such that the expected value of the public good is $z^e \equiv p\bar{z} + (1-p)\underline{z}$.

Without pork, bargaining is only over whether the public good is provided. When the coalition formateur is centrist, information is revealed through her choice of coalition partner, as she will partner with the ideologue most suited to pass legislation for the existing state of the world. Optimal policy is always passed.

As we have noted, information asymmetry has a greater impact on equilibrium when the agenda setter is ideological. Therefore, we consider a left-wing formateur in coalition with a centrist. The interesting case arises when $z = \bar{z}$. The centrist and the left-wing agenda setter would be aligned in their preferences if the centrist knew the state of the world, but the centrist coalition partner believes there is a conflict of interest because $z^e < 1$. Now, roles are reversed relative to the full-information case: The informed agenda setter is the "guardian" of the public interest, while the centrist might use his veto power to enforce his perceived uninformed interests. If $g^q = 0$, the informational friction can lead to sub-optimal policy. The centrist uses his veto power to maintain this status quo, which he incorrectly believes is optimal. The key problem is cheap talk: the centrist cannot distinguish between the agenda setter proposing $g = 1$ because this is the socially desired policy ($z = \bar{z}$) or because she is ideologically pre-disposed to providing the public good in either state of the world (because $\underline{z} + \alpha > 1$). With pork restricted to zero, there is no way for the agenda setter to signal that $z = \bar{z}$.[24]

We think of the state $z = \bar{z}$ as representing the need for action in unusual situations: a "crisis". With $z^e < 1$, this state is a low probability need for a large change in policy. Because crises are uncommon, the (uninformed) centrist believes that the policy $g = 0$ is generally appropriate, absent evidence to the contrary. The agenda

[24] Hence the importance of assumption $\alpha > \bar{z} - \underline{z}$ in (4). We note that is not a necessary condition for the conflict of interest to arise from an informational friction, but we think this simple representation of how ideology may override objective conditions makes the exposition simpler and clearer.

setter's known ideological bias makes it difficult for her to credibly convey this information.[25] Even if a crisis is general knowledge, its magnitude and the appropriate measures for its containment may not be. For example, general realization that there is a viral pandemic can nonetheless lead to sharp differences in views on its severity, as well as the appropriate policy response, where better-informed health officials may have difficulty convincing less well-informed citizens on these matters because the latter view the former as inherently biased. The two-state, two-policy framework is used to illustrate this problem in a simple way.[26]

5.2. Pork as a signal

Under asymmetric information, pork can and will be used to signal the state of the world z. The equilibrium concept is Perfect Bayesian Equilibrium and we restrict attention to pure-strategy equilibria that satisfy the intuitive criterion (Cho and Kreps, 1987). The game proceeds as follows. First, nature assigns a value to z, choosing $\bar{z}$ and $\underline{z}$ with probabilities p and $1-p$, respectively. Second, on observing z, the agenda setter proposes a policy $\{g, \tau, s^L, s^C\}$ that satisfies the budget constraint (2). Third, the centrist updates his beliefs about the value of z and either accepts the policy or rejects it. Finally, if the policy is accepted it is enacted; if it is rejected, a status quo policy is adopted. Payoffs to both parties are then realized based on the adopted policy.

A Perfect Bayesian Equilibrium comprises a pair of policy proposals $\{g, \tau, s^L, s^C\}$ that the agenda setter proposes in each of the two states $\bar{z}$ and $\underline{z}$; a pair of updated beliefs $p^C(z)$ that the centrist adopts on observing each of the policies; and the centrist's voting rule to vote for or against each of the policies. These must satisfy the following conditions. First, the agenda setter's proposals must be incentive compatible, i.e. the agenda setter cannot profitably deviate by proposing a different policy in either state of the world. Second, the centrist updates his beliefs using Bayes' rule whenever possible. Finally, given the centrist's beliefs, the centrist's voting rule is such that he cannot profitably deviate by voting otherwise.

As is often the case in games with asymmetric information, a large multiplicity of equilibria may exist without further restrictions on off-the-equilibrium-path beliefs. We therefore restrict attention to equilibria that are supported by beliefs that satisfy the intuitive criterion of Cho and Kreps (1987). These beliefs put zero probability on the state of the world $z = \underline{z}$ if the centrist observes a policy proposal that the agenda setter would not propose in that state of the world, even if doing so would cause the centrist to believe that $z = \bar{z}$.

In a separating equilibrium, the agenda setter proposes a different policy in each state. The complete analysis in Appendix B also considers pooling equilibria. In these equilibria, the agenda setter is unable to reveal the state of the world to her coalition partner and pork plays only a coalition-building role as in Section 4, not a signaling role.[27] For some parameter values, both equilibria exist (multiple equilibria).[28]

We study a separating equilibrium, in which the agenda setter uses pork to signal to the centrist that $z = \bar{z}$ by choosing a policy she would not choose if z were equal to $\underline{z}$. When the agenda setter observes $z = \bar{z}$, she proposes a policy $\{g = 1, \tau, s^L, s^C\}_{\text{sep}, z=\bar{z}}$ to maximize her utility subject to the centrist's participation constraint, the budget and feasibility constraints, and non-negativity of pork. The participation constraint, requiring that centrist gets no lower utility from this policy than from the status quo $g^q = 0$ and $\tau^q = X$, is:

$$y - \tau + \bar{z} + \theta s^C \geq y - X \tag{7}$$

In addition, a separating equilibrium requires an incentive compatibility constraint ensuring that the agenda setter would not have proposed the same policy if the state of the world were $z = \underline{z}$. That is, the agenda setter would have found it optimal to separate set a policy with $g = 0$ if the state were $\underline{z}$ rather than mimic policy of $z = \bar{z}$. Denoting with $U_L(z, g^q, \text{Sep})$ as the utility the agenda setter obtains when $z = \underline{z}$ in a separating equilibrium, one may write:

$$(\underline{z} + \alpha) g + y - \tau + \theta s^L \leq U_L(\underline{z}, g^q = 0, \text{Sep}). \tag{8}$$

A separating equilibrium is such that the centrist will update his beliefs to assign $p^C = 1$ when $z = \bar{z}$ and $p^C = 0$ when $z = \underline{z}$, i.e. he will become fully informed of the value of z. The agenda setter of state $z = \bar{z}$ is not tempted to mimic the $z = \underline{z}$ policy because she is better off when the centrist believes $z = \bar{z}$. When $z = \underline{z}$, the agenda setter knows that the state of the world has been revealed and proposes a policy that is equivalent to one that would be proposed under full information. When $z = \bar{z}$, a separating equilibrium requires that τ be high enough and the distribution of pork not so generous to the agenda setter, such that the agenda setter would prefer to accept the corresponding policy with $g = 0$ if the value of public spending were $z = \underline{z}$.

The nature of the equilibrium policy is best illustrated for low values of θ; more concretely, consider $\theta < \frac{1}{3}$, where pork is so wasteful that it harms even its recipient. (We subsequently generalize this to other values of θ). With pork so wasteful, it would not be used in either state under full information. We now show, in contrast, that under asymmetric information, pork may be used as a signaling device.[29]

As previously noted, the agenda setter of $z = \underline{z}$ would choose her first-best full-information policy, knowing that she is unable to mimic the $z = \bar{z}$ policy.[30] When $\theta < \frac{1}{3}$, pork is extremely wasteful, and the equilibrium policy is the status quo of $g = 0$ and $\tau = X$, with no pork to either district.

The agenda setter's incentive compatibility constraint (8) becomes

$$\underline{z} + \alpha + \theta s^L \leq \tau - X, \tag{9}$$

while the centrist's participation constraint (7) requires

$$\bar{z} + \theta s^C \geq \tau - X \tag{10}$$

[25] A right-wing agenda-setter faces the converse problem of persuading the centrist that a sharp cut in public spending is truly necessary.

[26] In Drazen and Ilzetzki (2011), we consider a continuous policy, with similar results. There, an ideological agenda setter trying to signal the state of the world without pork might attempt to increase public goods g to a level that is sufficiently high to signal that $z = \bar{z}$. I.e., she might consider proposing a level of g that she would never propose if $z = \underline{z}$. However, condition (4) implies that this policy is not acceptable to the centrist even if the state $z = \bar{z}$ is revealed. The agenda setter's signaling and coalition-building objectives are directly at odds. Pork allows the agenda setter to both signal the state as in the binary public good case analyzed here and to induce the centrist to participate once the state of the world is revealed.

[27] In particular, we consider pooling equilibria where the centrist "punishes" deviations from the equilibrium by believing that $z = \underline{z}$. These off-the-equilibrium path beliefs lead to the largest parameter set with pooling equilibria.

[28] In the separating equilibrium, the centrist expects the agenda setter to signal that $z = \bar{z}$ and infers that $z = \underline{z}$ when he does not receive this signal. Accordingly, the agenda setter provides sufficient pork to signal the state when $z = \bar{z}$. In the pooling equilibrium, the centrist does not expect to observe a signal and the agenda setter's best response is to provide the centrist with sufficient pork to accept the public good based on the centrist's prior belief z^e, in either state of the world.

[29] The remainder of the parameter space is analyzed formally in Appendix B.

[30] This full information policy differs from the full information equilibrium described in Section 4 where the policy favors the left-wing agenda setter ($g^q = 1$), rather than the centrist ($g^q = 0$), as is the case here.

When $z = \bar{z}$ these two conditions must be satisfied to signal the state and build a coalition with the centrist. However, they cannot be simultaneously satisfied if pork is prohibited, since $\alpha > \bar{z} - \underline{z}$. This underscores the need for pork as a signaling tool: Absent pork, coalition building is at odds with signaling the state of crisis requiring policy change. Further, it is immediately apparent they cannot be satisfied if the agenda setter gets more pork than the coalition member and $s^C > s^L$ must hold. Hence, the standard result that the coalition formateur uses her position to get more pork (transfers, perks, etc.) than other coalition members would be inconsistent here with signaling the state to achieve legislative agreement.[31] The agenda setter must forgo some pork for legislation to be adopted. This, in short, is her cost of signaling.

This is a key result of the paper. When the agenda setter is sufficiently ideological—in the sense that she prefers high spending no matter what the state of the world, the goals of signaling and coalition building are at odds with one another under imperfect information. The agenda setter is unable to credibly signal that public goods are socially desirable if her only policy tools are spending on goods and taxes. This is precisely the informational friction highlighted in Cukierman and Tommasi (1998a,b), where a left-wing politician cannot credibly convey the need for a left-leaning policy ($g = 1$). Allowing pork enables a left-wing policymaker to escape this bind (and similarly allows a right-wing policymaker to convey the information that a cut in spending is socially optimal). It allows the agenda setter to benefit the two districts differentially and achieve these otherwise conflicting tasks of signaling and coalition building. Pork barrel spending is a valuable signaling tool because of its ability to target benefits to a narrow constituency financed out of the general budget, *the very characteristic of pork barrel spending for which it is condemned.*

The equilibrium proposal sets $s^L = 0$: pork is too wasteful to be extracted for its own sake and more pork to the agenda setter merely exacerbates the informational problem in (9). On the other hand, s^C must be large enough both to get the centrist to agree to the (high tax, high spending) proposal and to harm the agenda setter sufficiently to signal that the public good is indeed crucial.

There are two conditions on parameter values for the existence of such an equilibrium. First, the policy must be individually rational for the centrist. This is a restriction on θ being sufficiently high that the losses due to pork justify the value of the public good. This condition is given by[32]

$$\theta \geq \frac{1}{3}\frac{\underline{z} + \alpha - \bar{z}}{\underline{z} + \alpha - 1}. \tag{11}$$

Second, the proposal must be feasible ($\tau \leq y$). This requirement is equivalent to

$$y - X \geq \underline{z} + \alpha. \tag{12}$$

Intuitively, signaling is more difficult if the agenda setter's ideological inclination to provide the public good is greater or fiscal space is smaller. The more the agenda setter benefits from the public good, the more pork she must provide to her coalition partner to convince him that provision of the public good is motivated by considerations of signaling the need for policy change rather than ideology. When fiscal space is smaller, less budgetary resources are available to provide pork to signal the state.

It may seem counter-intuitive that pork is useful in a subset of the range $\theta < \frac{1}{3}$, where pork is directly wasteful from the perspective of both coalition members, i.e. less valuable to their districts than the tax liability used to finance it. Pork is useful because it conveys information about the optimality of policy change. It does so by harming the centrist and the agenda setter *differently*. While both coalition members bear the burden of taxation, when $s^C > 0$ the centrist obtains some of the benefits, while the agenda setter receives none.

We have considered the case of $\theta < \frac{1}{3}$, in which it is least likely for pork to be used with full information. The following proposition makes a more general statement about when pork barrel spending will be used as a signaling device.

Proposition 3. *When information is asymmetric, pork is used as a signaling tool to raise public good provision in a crisis ($z = \bar{z}$, $z^e < 1$, $g^q = 0$) if the value of pork satisfies*

$$\frac{1}{3}\frac{\underline{z} + \alpha - \bar{z}}{\underline{z} + \alpha - 1} \leq \theta \leq \min\left\{\frac{2}{3}, \frac{\alpha}{\underline{z} + \alpha - 1}\right\}$$

and fiscal space is sufficiently large so that $y - X \geq \underline{z} + \alpha$.

A separating equilibrium also exists when both

$$\max\left\{\frac{2}{3}, \frac{2}{3}\left(\underline{z} + \frac{\alpha}{2}\right)\right\} \leq \theta \leq \frac{2}{3}\left(\bar{z} + \frac{\alpha}{2}\right)$$

and fiscal space satisfies

$$y - X \geq \max\left\{\frac{\underline{z} + \alpha}{3\theta - 1}, \frac{3\theta - \bar{z}}{3\theta - 1}\right\}.$$

Proof. Appendix B. ■

Fig. 3 illustrates the positive result. It shows the state space with fiscal space ($y - X$) on the horizontal axis and the value of pork barrel spending (θ) on the vertical axis.[33] It is immediately apparent that asymmetric information dramatically increases the range in which pork is used in comparison to the full information equilibrium shown in Fig. 2.[34]

The figure also shows the range in which pork increases social welfare. Pork increases social welfare for intermediate values of θ. In these intermediate values, pork allows the agenda setter to signal that the public good is needed because $z = \bar{z}$. If pork barrel spending is very distortionary (θ is low) its social costs outweigh its signaling benefits, even if the coalition finds it valuable. This is the part of the gray (coalition building) region in the figure that is not dotted (pork is harmful). There are two reasons for the gap between value of pork to the coalition and to the general public. First, the coalition has a stronger preference for the public good (with an average valuation of $\bar{z} + \frac{\alpha}{2}$) than does the average citizen (with a valuation of $\bar{z}$) and therefore the coalition benefits more than the general population from

[31] In this regard, we obtain an opposite result than in standard legislative bargaining models under full information (e.g., Baron and Ferejohn (1989) and Baron and Diermeier (2001)) in which the agenda setter, by virtue of her position, gets more pork than other coalition members.

[32] One can show that the left hand side of this inequality is smaller than $\frac{1}{3}$, so that this condition does not contradict the earlier assumption that $\theta < \frac{1}{3}$.

[33] The figure uses the same parameter values used in Fig. 2 These have $\underline{z} + \frac{\alpha}{2} < 1$, which means that the coalition does not deliver the public good when $z = \underline{z}$.

[34] Note that nothing in the equilibrium definition prevents the agenda setter from "burning money" as in Austen-Smith and Banks (2000). The agenda setter could satisfy the equilibrium condition while allowing the budget constraint (2) to hold with slack, so that tax revenues are destroyed rather than used for public goods, pork, or debt service. In Appendix B, we show that in some instances the agenda setter is indifferent between using pork and this money-burning tactic, but she never strictly prefers money burning to pork. In cases of indifference, we refine the equilibrium by selecting the one that maximizes the coalition's joint utility. This eliminates the money-burning equilibrium, because welfare is increased by providing these tax revenues as pork to some district rather than destroying them entirely. In Drazen and Ilzetzki (2011), the money burning equilibria are eliminated with a continuous public good. The continuous public good gives the agenda setter an additional margin of adjustment to satisfy both her incentive compatibility (signaling) constraint and the centrist's participation constraint with equality. In this case, it is inefficient to "burn" resources because any burnt dollar could be used more advantageously to relax the coalition partner's participation constraint. Appendix D investigates alternative interpretations of "money burning" in this model.

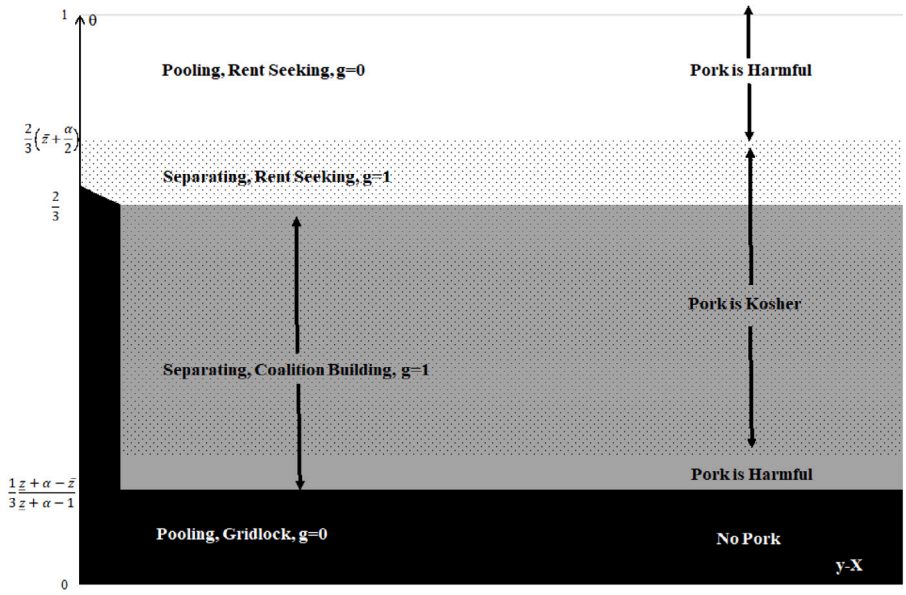

Fig. 3. Regimes and social welfare in the asymmetric information equilibrium. Note: The figure shows which regimes arise and when the availability of pork barrel spending improves welfare. This is plotted as a function of the value of fiscal space $y-X$, on the x axis, and of the value of pork barrel spending θ, on the y axis. The figure is plotted for an equilibrium under asymmetric information. The figure is plotted for $z=\bar{z}$, a status quo of $g^q=0$ and the case $\underline{z}+\frac{\alpha}{2}\leq 1$. The bottom black region where $\theta\leq\frac{1}{3}\frac{\underline{z}+\alpha-\bar{z}}{\underline{z}+\alpha-1}$ or $y-X$ is sufficiently low, is the gridlock regime, where equilibrium remains as in the status quo. No pork is distributed and the availability of pork has no implication for social welfare. The middle, gray, are where $\frac{1}{3}\frac{\underline{z}+\alpha-\bar{z}}{\underline{z}+\alpha-1}\leq\theta\leq\frac{2}{3}$ and $y-x$ is sufficiently high, is the coalition building regime, where only the centrist receives pork to allow coalition agreement to provide the public good. The availability of pork allows a coalition to form and the agenda setter to signal the state of the world $z=\bar{z}$ to the centrist. The availability of pork improves social welfare in the upper dotted area of this regime, where (13) holds, i.e. pork is sufficiently non-distortionary. The top white area, where $\theta>\frac{2}{3}$, is the rent-seeking regime, where both legislators extract pork beyond the necessary to build a coalition. Here, the availability of pork improves public welfare only in the lower dotted white area, The figure is plotted for $\alpha=0.25$, $z=\underline{z}=0.85$, and $z=\bar{z}=1.05$ and is qualitatively the same for all values such that $\underline{z}+\frac{\alpha}{2}<1$.

the policy change achieved due to pork. Second, pork barrel spending is targeted to the coalition, so that the coalition benefits more from pork barrel spending (with a average valuation of $\frac{\theta}{2}$ per unit of pork barrel spending) than does the average citizen (with a valuation of $\frac{\theta}{3}$).

There is an additional range at the top of the figure where pork is harmful once again. In this region, pork is sufficiently non-distortionary that the coalition forgoes the public good in favor of pork, even if the state of $z=\bar{z}$ is known to all. The resulting equilibrium is pooling where the agenda setter and centrist use the entire budget for pork to their two districts. This is harmful, given that pork is distortionary ($\theta<1$). However, this occurs when the distortionary cost of pork – and therefore social harm – is small.

The following proposition summarizes the exact conditions when pork is socially beneficial when used as a signaling device.

Proposition 4. *In a separating equilibrium, pork increases social welfare when the value of pork θ and fiscal space $y-X$ are in one of the following two ranges.*

(1) Coalition Building:

$$\frac{1}{3}\frac{\underline{z}+\alpha-1}{\bar{z}+\underline{z}+\alpha-2}\leq\theta\leq\min\left\{\frac{2}{3},\frac{1}{3}\frac{\alpha}{\underline{z}+\alpha-1}\right\} \tag{13}$$

and

$$y-X\geq\underline{z}+\alpha \tag{14}$$

(2) Rent-Seeking:

$$\max\left\{\frac{2}{3},\frac{2}{3}\left(\underline{z}+\frac{\alpha}{2}\right)\right\}\leq\theta\leq\frac{2}{3}\left(\bar{z}+\frac{\alpha}{2}\right) \tag{15}$$

and

$$y-X\geq\max\left\{\frac{\underline{z}+\alpha}{3\theta-1},\frac{3\theta-\bar{z}}{3\theta-1},\frac{\bar{z}+\alpha-\theta}{1-\theta}\right\} \tag{16}$$

Proof. Appendix B. ■

Proposition 4 is the main normative result in the paper, showing that pork as a signaling tool can have social value. In fact, pork may even be socially beneficial even when it is extremely wasteful, e.g. in the range $\theta<\frac{1}{3}$ where it would never be used for even for rent-seeking or coalition-building purposes alone.

This result is counter to the existing literature predicting when pork is used and when its use will increase welfare. Battaglini and Coate (2008) consider a full-information model in which all legislators have an identical valuation of public goods in a state of nature. In their model, pork barrel spending will be most prevalent when fiscal space is ample and/or the need for the public good is small. In periods of crises (fiscal or other), politicians will abandon their selfish desire for pork and forgo taking it. Our theory predicts, in contrast, that pork may be observed both in crises and in times of "business as usual,"but will generally serve different purposes in the two situations. Consistent with Battaglini and Coate, our theory predicts that pork will typically be socially wasteful if it is used merely as a distributive tool. But it also predicts that pork may still be used – and, in fact, may be for the common good when used – in times of crisis. Thus our theory is easier to reconcile with pork barrel spending in the midst of the Great Depression or the global financial crisis. However, the theory suggests that insofar as pork was kosher in these episodes, it was due not only to its redistributive role, but also the information it conveyed to legislators about the importance key policy-makers attached to a strong response to the crisis.

6. Conclusions

Pork-barrel spending is generally viewed as "politics as usual," with lawmakers choosing to make expenditures to benefit their constituents at the general expense. As such, conventional wisdom argues that it is to be distinguished from "responsible policy making," when public goods

have high value. In this paper we have re-examined this view when all legislators are not equally informed and differ in the value they assign to public spending in a specific economic situation. We argued that once one considers legislators who are heterogeneous both in ideology and their information about the economic situation, allocation of pork may serve a function in the legislative process of enabling the formation of coalitions to pass legislation appropriate to the situation.

Pork "greases the wheels" of the legislative process, but does this not (only) by bribing legislators to accept legislation they view as harmful, but also by conveying information about the state of the world and hence the value of policy change. We showed that it may be impossible to convey such information if signaling must be done via policies that affect welfare directly. Hence, conceptually, we think it is incorrect to argue that pork is simply "politics as usual," that is, a sign of the absence of responsible policy-making. As we argued in the previous section, pork is not antithetical to "responsible policy making" but in fact may be crucial to policy being able to respond to a high need for policy change.

More generally, our results suggest that if signaling the value of policy change is important, it may be better to use changes in policy that has no direct social benefit to convey information and build coalitions rather than using changes in policy with direct social benefits. Or, a leader may want to signal the importance she assigns to larger policy goals (for example, energy independence) by forgoing her preferred policy on smaller goals (for example, by allowing offshore oil drilling in specific areas).

Our arguments are in line with other work in political economy arguing that specific political institutions may be useful in conveying information. This may explain complex procedures, for example, standing committees and restrictive amendment procedures, as in Gilligan and Krehbiel (1987). As in the case of pork, information transmission may be important in an otherwise reviled practice, for example, special interest lobbies who have superior information about the effect of policies.

What should a reader take away from the paper? We think the general message is three-fold. First, in analyzing how legislatures operate, assuming homogeneous legislators may be reasonable for some questions but not others. This is more than the argument that heterogeneity is the *sine qua non* of political economy (Drazen, 2000); this is well recognized. It is the argument that the nature of heterogeneity may be crucial in analyzing political phenomena and especially how legislatures operate. Second, and more specifically, since coalition-building among legislators with different preferences is crucial to passing legislation, the allocation of pork or "favors" will play a role in the process. This too is recognized. Our addition is to show that this role may be for better-informed legislative leaders to convince less-informed legislators of the need for policy changes. Third, and most generally, our paper presents yet another example of pitfalls in using representative agent models.

Declaration of competing interest

The authors declare no financial conflicts of interest.

Data availability

No data was used for the research described in the article.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jpubeco.2023.105001.

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