Firm Size, the Corporate Tax Wedge, and Rent-Seeking

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Tax wedges, legal forms, and rent-seeking have historically been areas of significant study for economists. Here, we consider two stylized facts about legal form and the potential effect of each on rent-seeking. First, there has historically been a large tax wedge between corporate and non-corporate firms; corporate firms tend to be taxed at much higher rates. Second, corporate firms generally are much larger than non-corporate firms across most dimensions. We show that the first effect, the tax effect, introduces a bias against rent-seeking for corporations, but the size effect dominates this and quickly pushes non-corporate firms out of the rent-seeking competition. These results have significant implications for policy and may partially explain the recent trend toward consolidation.

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1 Introduction

Although there has been some consideration of the effects of corporate tax laws on rent-seeking, there has been very little consideration of the interaction between the existence of the corporate form and the tax wedge between corporate and personal taxation. That is, economists have considered the impact of coalitions on rent-seeking and the impact of corporate taxation severally, but not jointly.[1] Economists understand that both are relevant, but have not to this point analyzed them in the context of each other. A pressing need to do so has emerged in the wake of changes to corporate and personal tax law (Gale et al. 2018) and in an era of increasingly inefficient industrial concentration (Covarrubias, Gutiérrez, and Philippon 2020) in which larger firms may be more certain of winning rents than in previous eras.

Moreover, a distinct puzzle exists in the economics literature. Economists are aware of and have proposed several explanations for the persistence of corporations despite a substantial tax wedge between corporations and non-corporate firms Barro and Wheaton (2019) and Auerbach (2018). For example, Barro and Wheaton (2019, p. 9-10) argue that the ease of raising capital, the perpetual legal character of the corporation, limited liability, and earnings retention all make a substantial contribution to offsetting the burden of the higher taxation for C corporations. While these arguments surely contain substantial truth, we offer a complementary explanation: the corporate form allows for more effective rent-seeking than the non-corporate form, something which is mitigated for to some extent by the tax wedge. That is, although double taxation of corporate income is a substantial cost to incorporation, the coalitional aspect of incorporation greatly compensates for this by increasing the probability of winning rents.

1. Katz and Rosenberg (2000) provide the seminal study on the effects of corporate taxation. See Alexeev and Leitzel (1991), Baik and Lee (1997), and Burbidge et al. (1997) on the importance of group size in rent-seeking contests.

In other words, when the corporation is treated as a distinct legal entity and therefore as an artificial tax and income vehicle for shareholders, the relevant political entity becomes the corporation rather than the individual shareholder. Shareholders then cease to lobby on behalf of themselves individually. Rather, the corporation stands for all of their interests, allowing for a pooled rent-seeking effort. This stands in contrast to other types of firms, which are typically much smaller and in some cases are limited to relatively few shareholders. Thus, the pooled assets of shareholders allow them a distinct advantage in rent-seeking over other types of firms, while the increased taxation of corporate entities mitigates this. We find that even though corporate taxation reduces rent-seeking and the existence of a tax wedge mitigates the advantage held by corporations, the rent-seeking benefits of incorporation are substantial.

We propose that, in consideration of differential rent-seeking by different legal types, there are two relevant effects. The "tax effect" refers to the bias introduced against C corporations by a tax wedge. The higher the C corporation is taxed relative to other firm types, the lower it will rent-seek relative to other types, all else equal. The "size effect" refers to the fact that larger entities are better able to win rent-seeking competitions in the political space not just because they can afford larger bids, but because they are large relative to other competitors. We show that the latter effect dominates the former. In the following sections, we demonstrate this by modeling a non-cooperative rent-seeking competition first between one firm of each type and then many firms of each type.

A study of this kind is particularly relevant for the modern economy. The increasing consolidation and weak physical investment documented by Gutiérrez and Philippon (2017) has led to substantial hand-wringing from economists and policymakers. But as Crouzet and Eberly (2019) points out, the extent to which consolidation is driven by efficiency rather than the result of rent-seeking is a critical question in evaluating whether or not this is a beneficial development. Our results imply that consolidation is not a *re-*

sult of rent-seeking, but may indeed be its cause. Intangible investment, which has risen substantially in recent years, is perhaps most efficiently done by larger firms because of the property of scalability associated with intangibles (Doidge et al. 2018). Given that intellectual property protections offered by the government can be considered rents, our results reflect precisely what is seen in an increasingly consolidated modern economy, namely that rent-seeking competitions are dominated by a few large firms because it is inefficient for other firms to compete.

2 Incorporation and the Tax Wedge

To illustrate the trade-off between political benefits to incorporation and higher taxes, we adapt the benchmark models established by Katz and Rosenberg (2000) and Chowdhury and Sheremeta (2011). In doing so, we neglect relevant costs and benefits to incorporation, including potentially higher productivity and perpetual life, but this is purposeful: our goal is to establish a trade-off between incorporation and taxes.

Assume that there are two types of firms competing for an indivisible rent of R dollars in an imperfectly discriminating contest. As in the standard contest, it is uncertain who will win the rent but contrary to the standard rent-seeking competition, it is also unclear whether or not the rent will be awarded. Consider this as something like a tax shelter or a subsidy that may or may not be awarded even if the firm "wins" the competition. This is not at all an uncommon situation in politics and therefore lends some realism. The probability of winning the rent is determined jointly by each competitor's bid size relative to other bids, as well as the gross assets of the competitor relative to other competitors. Less wealthy firms need to make larger bids to compensate for having fewer assets. Here, the idea is that wealthier firms have built-in influence and access and can trade off other

benefits with the political authority.[2] For each competitor i, the probability of winning the rent and receiving a payoff is given by

$$\pi_i = \pi_i \left(x_i, Y_i, W_i \right) \tag{1}$$

where x_i is the rent-seeking done by competitor i, $Y_i \equiv \sum_{j=1, i \neq j}^{n} x_j$ is the rent-seeking done by all other competitors other than i, and W_i is the gross assets of the competitor as a share of total assets. We require $x_i \geq 0 \forall i$ and $W_i \geq 0 \forall i$. For each competitor i, the probability of winning the competition is an increasing function of net assets and its own rent-seeking and a decreasing function of the aggregate rent-seeking done by others, i.e.,

$$\frac{\partial \pi_i}{\partial x_i} > 0 \qquad \frac{\partial \pi_i}{\partial Y_i} < 0 \qquad \frac{\partial \pi_i}{\partial W_i} > 0$$

The logic behind $\frac{\partial \pi_i}{\partial x_i} > 0$ and $\frac{\partial \pi_i}{\partial Y_i} < 0$ is intuitive. As firms increase their bids to win the rent, they naturally find themselves more likely to win. In like manner, an increase in bid by other firms increases Y_i and therefore decreases the probability of victory for firm x_i because relative bid size falls. This is standard in the literature and follows from Tullock (1980). Further explanation is required for $\frac{\partial \pi_i}{\partial W_i} > 0$. Primarily, we make this assumption to capture the idea that there are benefits to incorporation in the sense that shareholders can pool assets under a separable entity. However, it can also be justified under by acknowledging that wealthier firms tend to have greater ability to win rents both by virtue of being wealthy and because, in order for bids to be made in the first place, firms generally have to be larger and of higher status. At the federal level, it is inconceivable for a sole proprietorship restaurant to compete with a firm like McDonald's

2. Note that the proposed functional form has some similarity to Chowdhury and Sheremeta (2011, p. 415), in which effort has a direct effect on payoffs. Our analogy to effort is firm assets as a share of total assets in the competition. Note the meaningful difference: whereas competition where payoff is a linear function of effort generally result in payoffs for the winner, a competition such as ours where the payoff is a linear function of asset shares may not result in a payoff for the winner because the outcome is uncertain.

for a rent. In other words, the size of the bid matters, but so does who makes the bid.

There are n competitors. Each competitor is either a corporation or a non-incorporated single-member firm. There are n_c corporate competitors and n_p non-corporate competitors.

$$n_c + n_p = n \tag{2}$$

The economy is composed of N agents who are shareholders in either a corporation or a non-corporate firm. Each firm i has $n_{s,i}$ shareholders. We assume that each agent k is endowed with wealth w_k and each firm pools assets of its members to carry out the rent-seeking operation. Thus, gross assets available for rent seeking is given by $n_{s,i}w_k$ where $n_{s,i}$ is total number of shareholders in the firm. For the corporation, $n_{s,i} > 1$, whereas the non-corporate firm is restricted to $n_{s,i} = 1$. Note that this requirement forces all non-corporate firms to essentially be sole proprietorships. We acknowledge that there are non-corporate legal forms which can have many members, but these are typically quite restricted in membership. For example, s-corporations may not have more than 100 members and non-citizens are generally prevented from becoming members.

The effects of differing tax rates for corporations and individuals are considered by assuming two different types of political entities. The first type is the corporation, which faces a tax rate on income τ_c. There are n_c corporations. The second type is a firm composed of only one individual which faces tax rate $\tau_p < \tau_c$. There are n_p of these. Both types of firms are zero-profit entities in the sense that net profit from rent-seeking is a concave function of gross profit. In other words, a firm of either type will pay a tax rate $\tau_q, q \in \{c, p\}$ on its earnings from the rent if it wins and will absorb the full cost of its bid if it does not win the competition. Corporations expect to earn a net profit P_i^c from rent-seeking:

$$P_i^c = (1-\tau_c)(\pi_i R - x_i) - (1-\pi_i)\, x_i \qquad i = 1, \ldots, n_c \tag{3}$$

Non-corporate firms face a similar problems:

$$P_j^p = (1-\tau_p)(\pi_j R - x_j) - (1-\pi_j)\, x_j \qquad j = 1, \ldots, n_p \tag{4}$$

In equilibrium, each firm will maximize its expected net profit with respect to rent-seeking, taking account of the rent-seeking done by other firms regardless of type. Assuming an interior Nash equilibrium, corporations solve

$$\frac{\partial P_i^c}{\partial x_i} = (1-\tau_c)\left(\frac{\partial \pi_i}{\partial x_i} R - 1\right) - (1-\pi_i) = 0 \tag{5}$$

Similarly, non-corporate firms solve

$$\frac{\partial P_j^c}{\partial x_j} = (1-\tau_p)\left(\frac{\partial \pi_i}{\partial x_i} R - 1\right) - (1-\pi_i) = 0 \tag{6}$$

This result confirms that the tax rate of each legal type is relevant for the equilibrium solution; a change in the tax rate for either type will change the equilibrium rent-seeking conducted by both types of firms. We can conceive of the firm's rent-seeking game as a simultaneous game where there are two relevant factors: each firm's relative share of the economy and each firm's bid size. These constitutive elements determine whether or not a firm will win the competition, but it is uncertain whether any firm will actually win the award. Consider each element in turn. First, the firm makes a bid x_i for access to the rent-seeking authority. Following Tullock (1980), if considered separately from firm i's wealth share, the probability of winning the rent is:

$$\eta_i = \frac{x_i}{x_i + Y_i} \tag{7}$$

Thus, the probability of winning is an increasing function of bid size. Note that $\sum_{i=1}^{n} \eta_i = 1$. Considered separately from firm i's bid size, the firm's probability of winning the rent is a function of gross assets:[3]

$$\zeta_i = \frac{W_i}{\sum_{k=1}^{N} w_k} \tag{8}$$

where W_i is the gross assets of firm i and $\sum_{k=1}^{N} w_k$ is total assets of all competitors. This can be conceived in the following way. From the perspective of Firm i, the smaller it is relative to Firm j, the less inclined Firm i will be to make a bid because it conceives of itself as the underdog. There are a number of inherent advantages to a firm being relatively larger; it is likely more established, it is likely more influential, it has greater capacity to make larger bids, and so on. We try to capture those characteristics in (8). Putting both stages together, the probability of winning the rent for firm i is given by

$$\pi_i = \eta_i \zeta_i = \frac{x_i}{x_i + Y_i} \frac{W_i}{\sum_{k=1}^{N} w_k} \tag{9}$$

That is, a given firm's probability of winning the rent is proportional to its rent-seeking expenditures and its relative share of assets. Note that each of the constituent elements sum to one: $\sum_{i=1}^{n} \eta_i = 1$ and $\sum_{i=1}^{n} \zeta_i = 1$. By construction, $\sum_{i=1}^{n} \pi_i < 1$ unless there is only one firm in the economy. This means that firms are competing for an uncertain rent of magnitude R. Then for a given rent R, the expected value of that rent from the perspective of agents is given by

$$\pi_i R < R$$

In the case where we do not consider asset or tax effects, i.e., $\frac{\partial \pi_i}{\partial W_i} = 0$ and $\tau_c = \tau_p = 0$,

3. This conceptualization is similar to Öncüler and Croson (2005). Whereas they assume a two-stage game for politicians competing in a primary followed by a general election, we instead consider a simultaneous game where both relative wealth and bid size are relevant.

total rent-seeking is given by

$$TR = \frac{n_c + n_p - 1}{n_c + n_p} \tag{10}$$

In this case, each firm would have an equal probability of winning the rent, i.e., $\pi = \frac{1}{n_c+n_p}$.[4] Following Katz and Rosenberg (2000), we use this as a standard against which to judge the relative effects of changes in assets and relative tax rates on rent-seeking.

3 One corporation, one non-corporate firm

To begin the analysis, we consider a simple Cournot-Nash equilibrium with one of each type of firm. By doing so, we can easily consider different aspects of incorporation and relative taxation both diagrammatically and analytically. To proceed, assume all agents have the same endowment so that $w_1 = w_2 = \ldots = w_k = 1$. Further, without loss of generality, assume a rent of one dollar is available ($R = 1$). As a consequence, each firm's share of assets will be determined by the number of shareholders in the firm. To some extent, this is generalizable: if there are w_c shareholders in the corporation and w_p shareholders in the non-corporate firm ($w_p < w_c$), then the ratio $\frac{w_c}{w_p}$ serves as useful proxy for relative wealth and eliminates the need to consider the *absolute* size of each firm type. Note that total assets will then be given by $w_c + w_p$.

The corporation solves the following problem:

$$\max_{x_1} P_1 = (1 - \tau_c)\left(\frac{x_1}{x_1 + x_2}\frac{w_c}{w_c + w_p} - x_1\right) - \left(1 - \frac{x_1}{x_1 + x_2}\frac{w_c}{w_c + w_p}\right)x_1 \tag{11}$$

4. By construction, it follows that rents are not dissipated (Tullock 1980). See Wenders (1987) on perfect rent dissipation.

Similarly, the non-corporate firm solves

$$\max_{x_2} P_2 = (1-\tau_p)\left(\frac{x_2}{x_1+x_2}\frac{w_p}{w_c+w_p} - x_2\right) - \left(1 - \frac{x_2}{x_1+x_2}\frac{w_p}{w_c+w_p}\right)x_2 \qquad (12)$$

Assuming an interior Nash equilibrium, the corporate firm's reaction function is given by taking first-order conditions and solving for x_1 and x_2 simultaneously. See Appendix A for full derivation.

The solution of the simultaneous equations (21) and (22) is given in Appendix A. Note that while the first-order conditions for each type is not directly dependent on the other type's tax rate, they are dependent on the relative wealth of the other firm. For either firm type, the probability of victory is directly reduced by an increase in the relative wealth (or size) of the other firm and hence the equilibrium bid size is lower. This is the size effect. Moreover, even though the bid size of the non-corporate firm does not depend on the tax rate of the corporate firm (and vice versa), it does so indirectly. An increase in the the corporate tax rate, all else equal, leads to a reduced corporate bid, which increases the non-corporate firm's probability of victory. This is the tax effect.

We can conduct two useful experiments to illustrate the effects of differential sizes and tax rates for corporate firms and non-corporate firms. We begin by fixing firm sizes and altering tax rates. Fix $w_c = 2$ and $w_p = 1$ so that the corporate firm is twice as large as the non-corporate firm. The reaction curves of each type of firm corresponding to a fixed non-corporate tax rate $\tau_p = 0.2$ and varying corporate tax rates of $\tau_c = 0.3$, $\tau_c = 0.6$, and $\tau_c = 0.9$ are illustrated in Figure 1. Clearly, there is a tax-induced bias against each type of firm, depending on which is taxed at a higher rate. If corporations face a higher tax rate, as they typically do in practice, then the ratio of corporate to non-corporate rent-seeking will be lower, all else equal.

Table 1 provides the value of rent-seeking x_i for each type of firm for varying tax rates

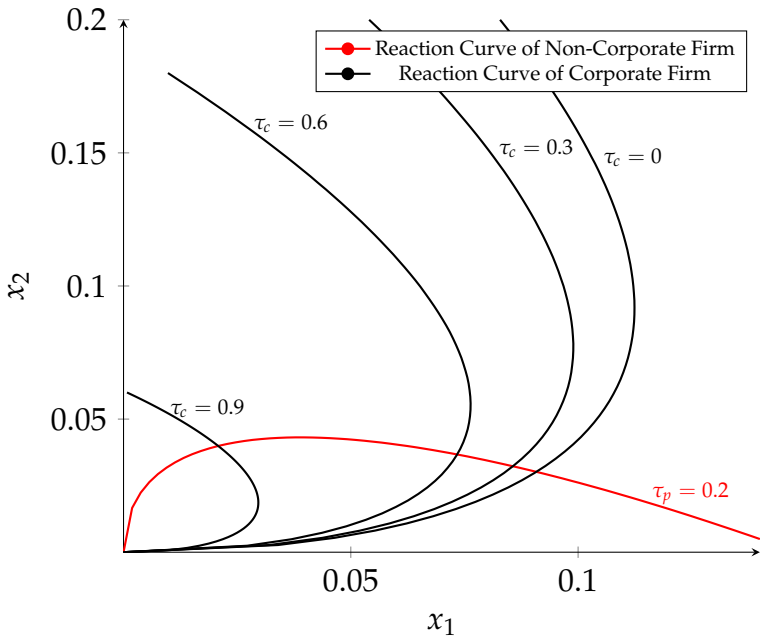

Figure 1: Rent-seeking equilibria for varying corporate tax rates, holding fixed $\tau_p = 0.2$, $w_c = 2$, and $w_p = 1$.

holding $\tau_p = 0.2$ fixed. Note that the corporate firm's probability of victory π_1 is a sharply decreasing function of the corporate tax rate, falling only by four percentage points following an increase in the tax rate from 0% to 50%, but falling by about 12 percentage points to 1/3 following an increase in the corporate tax rate from 50% to 82.6%. Moreover, corporations and non-corporate firms only offer the same bid when the corporate firm is taxed at 82.6%. That is, when the corporate firm is twice as large as its competitor, the additional benefits of being a corporation are mitigated at an exceptionally high tax wedge of 62.6 percentage points. There are two further interesting elements to consider. First, even for low tax rates initially, the probability of no rent being won despite bids from the firms is greater than 40% and is an increasing function of the tax rate. As taxes increase, bids go down because the net payoff of victory is smaller. π is an increasing function of bid size, and if aggregate bids go down, then the probability of no rent being won likewise decreases. Moreover, this is closely related to the fact that there is not perfect

rent dissipation in the model. Because it is uncertain whether a competitor will actually "take home" the bid even if he wins the competition, the expected value of the rent is less than one. Because of this, aggregate rent-seeking (in the table, this is the TR column) will be quite small relative to the standard model, in which rents are still only half dissipated.[5] Note that, in general, aggregate rent-seeking is only about one fifth as large as in the case where there is no taxes and competitors are the same size. Moreover, it is notable that the introduction of an uncertain rent and wealth concerns have significantly larger effects on rent dissipation than taxation. For a corporate tax rate of 10%, Katz and Rosenberg (2000), who studies only the impact of taxation, finds that rent-seeking relative to the benchmark case is 98.6%, whereas in our case it is only 24% of the benchmark. Given that, the size effect seems to be much larger than the tax effect.[6]

	x_1	x_2	π_1	$1-\sum_{i=1}^{2}\pi_i$	TR	TR/B
$\tau_c = 0\%$	.09579	.03018	.5069	.4132	.12097	.2419
$\tau_c = 10\%$	.08944	.03074	.4961	.4186	.12018	.2404
$\tau_c = 30\%$	.08564	.03228	.4842	.4246	.11792	.2358
$\tau_c = 50\%$	.07889	.03478	.4627	.4353	.1138	.2273
$\tau_c = 82.6\%$	.04301	.04301	.3333	.5	.08602	.17204

Table 1: Rent-seeking outcomes for $\tau_p = 0.2$, $n = 2$, and $w_c/w_p = 2$. x_1 gives the rent expenditure of the corporation and x_2 the rent expenditure of the non-corporate firm. π_1 is the probability the corporation wins the competition, $1-\sum_{i=1}^{2}\pi_i$ is the probability that no firm wins the competition, TR is total rent exenditures, and TR/B is total rent expenditures as a share of total rent expenditures when firms have identical sizes and there are no taxes.

A second experiment is to vary w_c/w_p and hold fixed tax rates for each type of firm, which allows us to investigate the effect on rent-seeking of increases in the relative size

5. In the benchmark Tullock (1980) model, $TR = 0.5$ in this case since there are two firms.

6. Katz and Rosenberg (2000) also uses a different functional form for firm profit function, assuming linearity for what he calls "established" corporations and concavity for zero-profit corporations. In our case, we assume that both types of firms are zero-profit firms and therefore do not expect to earn a net profit from rent-seeking.

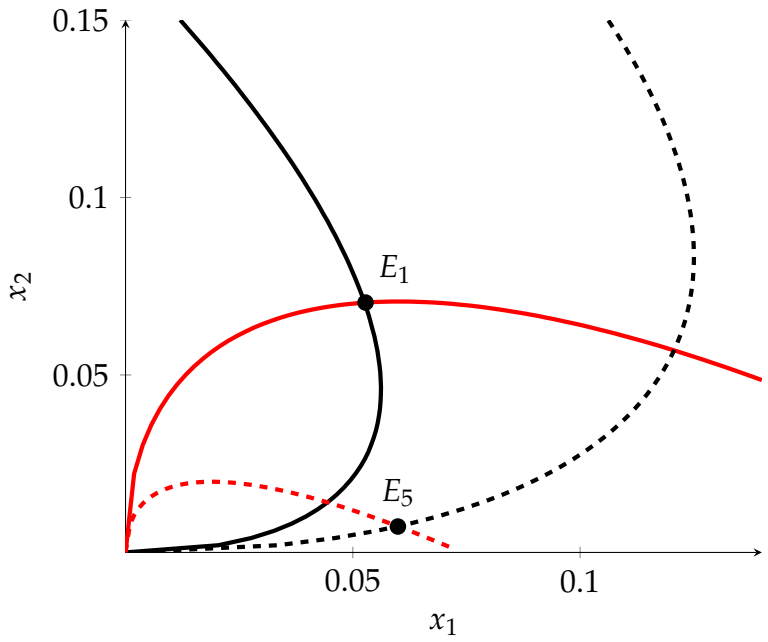

Figure 2: Rent-seeking equilibria for varying relative firm sizes, holding fixed $\tau_c = 0.5$ and $\tau_p = 0.2$. E_1 corresponds to each type being the same size, while E_5 corresponds to the corporate firm being five times larger.

of corporations to non-corporate firms. In this case we hold fixed $\tau_c = 0.5$ and $\tau_p = 0.2$.[7] We present two different equilibria in Figure 2. E_1 corresponds to a ratio $w_c/w_p = 1$ while E_5 corresponds to a ratio $w_c/w_p = 5$. Although the increase in relative size causes the corporation to bid only slightly more, it substantially reduces the bid size of the non-corporate firm. This is generalizable: for a contest between two firms, as $w_c/w_p \to \infty$, $x_2 \to 0$ and $\pi_1 \to 1$. In the limit, as w_c goes to infinity holding w_p fixed, the corporation will win the contest with certainty even as its bid size approaches zero.

This relationship is confirmed in Table 2. That is, it is clear that as the corporation increases in size relative to the non-corporate firm, total rents decrease, primarily due to the reduced incentive for the non-corporate firm to offer any bid. Recall that offer of a bid, or even offering the highest bid, does not guarantee victory, but only increases it. Similarly, it matters *who* is offering the bid; the rent is more likely to be won if the competitor

7. Corporate and personal marginal tax rates are taken from McGrattan (1994).

is wealthier than the other competitor. Increasing w_c by one reduces the non-corporate firm's share of wealth to 1/3, making it half as likely for it to win the contest even if it offers the same bid as the corporation (assuming the same tax rate). This effect is obvious when taxes are considered. For even when corporate face a 50% tax rate compared to a 20% rate for non-corporate firms, they will offer the same bid only if $w_c/w_p = 1.197$. That is, to compensate for a tax wedge of thirty percentage points, the corporate firm must be only 19.7% larger than the non-corporate firm.

	x_1	x_2	π_1	$1 - \sum_{i=1}^{2} \pi_i$	TR	TR/B
$w_c/w_p = 1$	.05258	.07036	.2138	.5	.12294	.2459
$w_c/w_p = 1.197$	.0624	.0624	.2724	.5	.1248	.2496
$w_c/w_p = 2$	.07899	.03478	.4629	.4352	.1138	.2275
$w_c/w_p = 3$	.07567	.01835	.6036	.3476	.09402	.18804
$w_c/w_p = 4$	.06759	.01107	.6874	.2844	.07866	.15732
$w_c/w_p = 5$	.05992	.00735	.7423	.1093	.0673	.1345

Table 2: Rent-seeking outcomes for $\tau_p = 0.2$, $\tau_c = 0.5$, varying w_c/w_p. x_1 gives the rent expenditure of the corporation and x_2 the rent expenditure of the non-corporate firm. π_1 is the probability the corporation wins the competition, $1 - \sum_{i=1}^{2} \pi_i$ is the probability that no firm wins the competition, TR is total rent exenditures, and TR/B is total rent expenditures as a share of total rent expenditures when firms have identical sizes and there are no taxes.

There are clear policy implications even from this simple game. While the tax effect is clearly significant, the size effect matters far more. A corporation only twice as large as a non-corporate firm dominates the rent-seeking competition. Assuming that rents will be offered and competed for, it follows that rent-seeking will be substantially reduced if the corporate form is unrestrained, at least in this context. That is, the corporation can practically win rents for nothing, freeing up corporate funds for investment into more productive activities. Tax policy also hinders rent-seeking, but the benefits of increasing taxes to reduce rent-seeking are small when the rent is uncertain, as in our model. In practice, cor-

porations tend to be many times larger than pass-throughs (Keightley 2012), meaning that tax policy intended to introduce a rent-seeking bias against corporations to compensate would likely not be beneficial, especially in consideration of the substantial distortions arising from a tax wedge (Barro and Wheaton 2019). This introduces another curiosity: if the benefits from rent-seeking derived from the size effect dominate the costs from the tax effect, why has the share of firms organized as C corporations declined substantially in the last forty years (Auerbach 2018)? We consider this question in the following section.

4 Many Firms of Each Type

While it is an interesting exercise to consider rent-seeking done by one firm of each type, this is typically not the situation in practice. In general, we observe multiple firms of each type competing for rents from a central authority. Although data does not yet exist to determine precisely the proportions of each firm type in any given rent-seeking competition, it is reasonable to assume that C corporations conduct the bulk of rent-seeking at the federal level, simply because they tend to be much larger and more influential than pass-throughs.[8] If all firms were equal, there were no taxes, and the probability of winning the rent reflected the standard Tullock (1980) formulation, then an interior solution would hold. But as Katz and Rosenberg (2000, p. 160) demonstrates, an interior solution may no longer represent an equilibrium as the number of firms increases when taxes are present and at least one type of firm has a concave profit function. We make a similar prediction: not only will an interior solution generally not exist as the number of competitors increases, but it will not exist when there are very few corporations, there is a large tax wedge, and the corporation is not substantially larger than the non-corporate firm. That

8. Recall that this is precisely the point of altering the standard Tullock (1980) formulation to include the share of wealth $\frac{w_c}{W}$ term.

is, non-corporate firms will drop out of the competition when these conditions are met.

Assume $n_c > 1$ and $n_p > 1$. Corporation i solves

$$\max_{x_{1i}} P_{1i} = (1-\tau_c)\left(\frac{x_{1i}}{x_{1i}+Y_{1i}}\frac{w_c}{W} - x_{1i}\right) - \left(1 - \frac{x_{1i}}{x_{1i}+Y_{1i}}\frac{w_c}{W}\right)x_{1i}, \qquad i = 1,\ldots,n_c \quad (13)$$

where

$$Y_{1i} = \sum_{\substack{k=1 \\ k\neq i}}^{n_c} x_{1k} + \sum_{k=1}^{n_p} x_{2k} \quad (14)$$

and

$$W = (n_c)(w_c) + (n_p)(w_p) \quad (15)$$

Here, W gives gross assets of all competitors. Similarly, non-corporate firm j solves

$$\max_{x_{2j}} P_{2j} = (1-\tau_p)\left(\frac{x_{2j}}{x_{2j}+Y_{2j}}\frac{w_p}{W} - x_{2j}\right) - \left(1 - \frac{x_{2j}}{x_{2j}+Y_{2j}}\frac{w_p}{W}\right)x_{2j}, \qquad i = 1,\ldots,n_p \quad (16)$$

where

$$Y_{2j} = \sum_{k=1}^{n_c} x_{1k} + \sum_{\substack{k=1 \\ k\neq j}}^{n_p} x_{2k} \quad (17)$$

Reaction functions are given by simultaneous equations (30) and (31) in Appendix B. Firms are treated as identical within each type. In Table 3, we present some results of the experiment. Holding fixed $\tau_c = 0.5$, $\tau_p = 0.2$, and $w_c/w_p = 5$, we show what happens for different quantities of each firm type.[9] For each combination of (n_p, n_c) in the table,

9. Note that these numbers are intended to be roughly representative of marginal tax rates and relative sizes. Marginal tax rates are obtained from (McGrattan 1994). To get some measure of w_c/w_p, we look at firms with receipts over \$50M. The typical C corporation is about five times larger than the typical s-corporation meeting this criterion (Keightley 2012, p. 6).

we show two relevant numbers: the probability that no firm wins the competition and the quantity of rent-seeking relative to the benchmark model, the former stacked on top of the latter.

	$n_p = 1$	$n_p = 2$	$n_p = 5$	$n_p = 25$	$n_p = 100$
$n_c = 1$	0.234 0.1345	0.361 0.0897	0.567 0.0517	0.863 0.0153	0.961 0.00426
$n_c = 2$	0.5 0.147	0.5 0.1171	0.5 0.0777	0.5 0.0266	0.5 0.00778
$n_c = 3$	0.667 0.1048	0.667 0.0915	0.667 0.0699	0.667 0.0302	0.667 0.00991
$n_c = 4$	0.75 0.08	0.75 0.0730	0.75 0.0560	0.75 0.0297	0.75 0.0106

Table 3: Holding fixed $\tau_c = 0.5$ and $\tau_p = 0.2$ and $w_c/w_p = 5$, probability that no rent is won

The results are striking. First, it is clear that non-corporate firms tend to drop out of the competition rapidly when only one additional corporate competitor is added. Indeed, it can be verified that even if there are only two corporate firms and one non-corporate firm, the non-corporate firm will drop out of the competition as soon as $w_c/w_p > 2.127$, i.e., as soon as the corporate firms are barely twice as large as the non-corporate firms. In practice, corporate firms tend to be many times larger than pass-throughs (Keightley and Hughes 2018), which may provide an explanation for why pass-throughs do not compete with C corporations for rents. The sheer size of the potential competition completely dissuades pass-throughs from even offering a bid.

Second, relative rent-seeking is very small. For only four corporate firms and 100 non-corporate firms, the relative rent-seeking is about 1% of the benchmark. Indeed, even for only one firm of each type and with $w_c/w_p = 5$, only 13.5% of benchmark rent-seeking will occur. Third, taxes do not have a large impact on rent-seeking. Indeed, they have a much smaller impact than the relative size of firms, except at the very top of the tax range. In any case, the size effect dominates the tax effect.

We return now to the question posed at the close of the previous section: Why is the share of C corporations declining relative to pass-throughs? Although the tax wedge has historically been closer to thirty percentage points (McGrattan 1994, p. 600), it has fallen to four in recent years Auerbach (2018, p. 106). Kahle and Stulz (2017) have pointed out that the remaining firms are much larger than those in the past and tend to be survivors; they argue that the corporate form itself may be less nimble and more inefficient than the typical pass-through. In the context of rent-seeking, another explanation emerges: there are fewer corporations because the benefits to rent-seeking are substantially smaller as the number of firms increases. This is true even if smaller pass-throughs are locked out of the competition. Note that the probability of no firm winning the rent increases as the number of firms increases, which leads to the prediction that over time, an industry will tend to consolidate or the number of firms will decrease. Indeed, this is supported by the data; Kahle and Stulz (2017, p. 69) finds that currently, firms are much larger than they have been in the past and Covarrubias, Gutiérrez, and Philippon (2020) find that consolidation has occurred more generally.

This result is of particular relevance to the modern economy. The rise of intangible capital in recent years documented by Haskel and Westlake (2018) has been a major contributor to the increase in firm size (Doidge et al. 2018). To the extent that one considers intellectual property protections "rents" offered by central authorities, it is almost certainly the case that competitions for these rents has driven consolidation. The reason is that intangible capital tends to be far more scalable than physical capital. Hence the sort of competitions described in the simple model above may very well be occurring with respect to rent-seeking around intangible capital.

5 Concluding remarks

While we believe that the above assumptions are reasonable, a number of other assumptions could have been made. For example, we could have assumed that large corporations make a positive profit not related to rent-seeking and consequently could offset part of its rent-seeking expenditures against profits (Katz and Rosenberg 2000, p. 161). Alternatively, we could have considered a rent-seeking contest where competitors bid for a non-rivalrous rent that grants each an exemption from some taxation. Finally, though not exhaustively, it would be interesting, though computationally taxing, to study the model in the context of endogenous firm sizes, as in (Baik and Lee 1997). These all represent avenues for future research.

Regardless, we found the following. First, that when payoffs are a linear function of the relative size of one firm to the competitors, rent-seeking will be substantially lower relative to the benchmark case. Moreover, compared to the case where rents are fully dissipated, aggregate rent-seeking will only be a tenth as large when there are only two competitors, and perhaps 1% as large when there are many firms of each type. Second, that while the tax effect is important, the size effect matters substantially more. Indeed, the size effect rapidly pushes out smaller competitors, leaving only larger corporations. This suggests that, in the long run, consolidation will occur to minimize rent expenditures, something that we have observed in practice. Finally, it is important to note that, even though there are trade-offs to the tax effect and the size effect when considering which legal form an organization should take, the rent-seeking benefits of switching to a C corporation from a pass-through are not likely to be realized in the short run. For, even if a pass-through reorganizes as a pass-through, it will not capture the rent-seeking benefits because it likely will not be large enough anyway. Thus, the rent-seeking benefits to reorganization are forward-looking and long-run benefits are uncertain and may not

even be captured if the industry is highly fractured anyway. However, even if a firm is originally organized as a corporation, it is difficult to capture the size benefits associated with that if there are multiple firms competing for the rent, meaning that even if the aggregate size effect dominates the aggregate tax effect, for an individual firm, the tax effect may dominate because there is little chance of winning the rent in the first place. Thus, firms are more likely to reorganize as pass-throughs from C corporations than vice versa.

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A One firm of each type

When we have one of each type of firm ($n_c = n_p = 1$), the corporation solves the problem

$$\max_{x_1} P_1 = (1-\tau_c)\left(\frac{x_1}{x_1+x_2}\frac{w_c}{w_p+w_c} - x_1\right) - \left(1 - \frac{x_1}{x_1+x_2}\frac{w_c}{w_c+w_p}\right)x_1 \tag{18}$$

Similarly, the non-corporate firm solves

$$\max_{x_2} P_2 = (1-\tau_c)\left(\frac{x_2}{x_1+x_2}\frac{w_p}{w_p+w_c} - x_2\right) - \left(1 - \frac{x_2}{x_1+x_2}\frac{w_p}{w_c+w_p}\right)x_2 \tag{19}$$

Maximizing with respect to x_1 for the corporation and x_2 for the non-corporate firm yields the following results:

$$\begin{aligned}\frac{\partial P_1}{\partial x_1} = 0 = &\frac{(1-\tau_c)\left(-\left(w_c+w_p\right)\left(x_1+x_2\right)^2 + w_c\left(x+y\right) - w_c x_1\right)}{\left(w_c+w_p\right)\left(x_1+x_2\right)^2} + \\ &\frac{\left(x_1+x_2\right)\left(w_c x_1 - \left(w_c+w_p\right)\left(x_1+x_2\right)\right) - x_1\left(w_c x_1 - w_c\left(x_1+x_2\right)\right)}{\left(w_c+w_p\right)\left(x_1+x_2\right)^2}\end{aligned} \tag{20}$$

The non-corporate firm's first-order condition is similar. The corporation's reaction function is given by solving for x_1 and the non-corporate firm's by solving for x_2. Let M represent $w_c * w_p$:

$$\begin{aligned}x_1 = &\frac{-\sqrt{M\tau_c^2 x_2 + M\tau_c x_2^2 - 3M\tau_c y - 2Mx_2^2 + 2Mx_2 + w_c^2\tau_c^2 x_2 + w_c^2\tau_c x_2^2 - 2w_c^2\tau_c x_2 - w_c^2 x_2^2 + w_c^2 x_2}}{w_p\tau_c - 2w_p + w_c\tau_c - w_c} + \\ &\frac{-w_p\tau_c x_2 + 2w_p x_2 - w_c\tau_c x_2 + w_c x_2}{w_p\tau_c - 2w_p + w_c\tau_c - w_c}\end{aligned} \tag{21}$$

$$\begin{aligned}x_2 = &\frac{-\sqrt{M\tau_p^2 x_1 + M\tau_p x_1^2 - 3M\tau_p x_1 - 2Mx_1^2 + 2Mx_1 + w_p^2\tau_p^2 x_1 + w_p^2\tau_p x_1^2 - 2w_p^2\tau_p x_1 - w_p^2 x_1^2 + w_p^2 x_1}}{w_c\tau_p - 2w_c + w_p\tau_p - w_p} + \\ &\frac{-w_c\tau_p x_1 + 2w_c x_1 - w_p\tau_p x_1 + w_p x_1}{w_c\tau_p - 2w_c + w_p\tau_p - w_p}\end{aligned} \tag{22}$$

Note that since rent-seeking must be greater than or equal to zero, we restrict the domain to $x_1 \geq 0$ and $x_2 \geq 0$. The intersection of equations (5) and (6) yields a single real solution such that x_1 is the real root of (21) and (22), which is an equilibrium.

B Many firms of each type

Suppose there are n_c identical corporations with assets w_c and n_p identical non-corporate firms with assets w_p competing for a rent of \$1. Corporation i solves

$$\max_{x_{1i}} R_{1i} = (1-\tau_c)\left(\frac{x_{1i}}{x_{1i}+Y_{1i}}\frac{w_c}{W} - x_{1i}\right) - \left(1 - \frac{x_{1i}}{x_{1i}+Y_{1i}}\frac{w_c}{W}\right)x_{1i}, \qquad i = 1,\ldots,n_c \tag{23}$$

where

$$Y_{1i} = \sum_{\substack{k=1 \\ k\neq i}}^{n_c} x_{1k} + \sum_{k=1}^{n_p} x_{2k} \tag{24}$$

and

$$W = (n_c)(w_c) + (n_p)(w_p) \tag{25}$$

W is the assets of all firms which make bids in the competition. Similarly, non-corporate firm j solves

$$\max_{x_{2j}} R_{2j} = (1-\tau_p)\left(\frac{x_{2j}}{x_{2j}+Y_{2j}}\frac{w_p}{W} - x_{2j}\right) - \left(1 - \frac{x_{2j}}{x_{2j}+Y_{2j}}\frac{w_p}{W}\right)x_{2j}, \qquad i = 1,\ldots,n_p \tag{26}$$

where

$$Y_{2j} = \sum_{k=1}^{n_c} x_{1k} + \sum_{\substack{k=1 \\ k\neq j}}^{n_p} x_{2k} \tag{27}$$

First-order conditions are given below.

$$\frac{\partial R_{1i}}{\partial x_{1i}} = \frac{((\tau_c-2)W + w_c)x_{1i}^2 + ((2\tau_c-4)W + 2w_c)Y_{1i}x_{1i} + (\tau_c-2)WY_{1i}^2 + w_c(1-\tau_c)Y_{1i}}{W(x_{1i}+Y_{1i})^2} = 0 \tag{28}$$

$$\frac{\partial R_{2j}}{\partial x_{2j}} = \frac{\left(\left(\tau_p - 2\right) W + w_p\right) x_{2j}^2 + \left(\left(2\tau_p - 4\right) W + 2w_p\right) Y_{2j} x_{2j} + \left(\tau_p - 2\right) W Y_{2j}^2 + w_p \left(1 - \tau_p\right) Y_{2j}}{W \left(x_{2j} + Y_{2j}\right)^2} = 0 \quad (29)$$

Note that with symmetry within each type, $x_{1i} = x_1 \forall i = 1, \ldots, n_c$ and $x_{2j} = x_2 \forall j = 1, \ldots, n_p$. Given that, the reaction function for each corporation can be written as follows

$$\begin{aligned} x_1 = \left(\frac{1}{2\left(n_c^2 \tau_c W x_2 - 2n_c^2 W + 2n_c w_c - w_c\right)}\right) \Bigg[& 4n_c n_p W x_2 - 2n_c n_p \tau_c W x_2 + n_c w_c \tau_c - n_c w_c - \\ & 2n_p w_c x_2 - w_c \tau_c + w_c - \Big(w_c \Big(n_c^2 w_c \tau_c^2 - 2n_c^2 w_c \tau_c + n_c^2 w_c + 4n_c n_p w_c \tau_c x_2 - \\ & 4n_c n_p w_c x_2 + 4n_c n_p \tau_c^2 W x_2 - 12 n_c n_p \tau_c W x_2 + 8 n_c n_p W x_2 - 2n_c w_c \tau_c^2 + 4n_c w_c \tau_c - \\ & 2n_c w_c + 4n_p w_c x_2^2 + 4n_p^2 \tau_c W x_2^2 - \ 8n_p^2 W x_2^2 + w_c \tau_c^2 - 2w_c \tau_c + w_c \Big)\Big)^{0.5} \Bigg], \quad x_1 \geq 0 \end{aligned} \quad (30)$$

Similarly, the reaction function for non-corporate firms is

$$\begin{aligned} x_2 = \left(\frac{1}{2\left(n_p^2 \tau_p W x_1 - 2n_p^2 W + 2n_p w_p - w_p\right)}\right) \Bigg[& 4n_c n_p W x_1 - 2n_c n_p \tau_p W x_1 + n_p w_p \tau_p - n_p w_p - \\ & 2n_c w_p x_1 - w_p \tau_p + w_p - \Big(w_p \Big(n_p^2 w_p \tau_p^2 - 2n_p^2 w_p \tau_p + n_p^2 w_p + 4n_c n_p w_p \tau_p x_1 - \\ & 4n_c n_p w_p x_1 + 4n_c n_p \tau_p^2 W x_1 - 12 n_c n_p \tau_p W x_1 + 8 n_c n_p W x_1 - 2n_p w_p \tau_p^2 + 4n_p w_p \tau_p - \\ & 2n_p w_p + 4n_c w_p x_1^2 + 4n_c^2 \tau_p W x_1^2 - 8n_c^2 W x_1^2 + w_p \tau_p^2 - 2w_p \tau_p + w_p \Big)\Big)^{0.5} \Bigg], \quad x_2 \geq 0 \end{aligned} \quad (31)$$

The intersection of simultaneous equations (30) and (31) give an interior Nash equilibrium for certain parameter values; otherwise a corner solution results and only corporations bid. This occurs for $x_2 < 0$ since there cannot be negative rent-seeking. These claims can be verified graphically.