

# The Dynamics of a Policy Outcome: Market Response and Bureaucratic Enforcement of a Policy Change\*

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## Abstract

Policy outcomes are determined not by the words in a statute but by the actions of private citizens in response. Whether a policy succeeds or fails depends on how policy shapes behavior and how that behavior, in turn, shapes the future course of policy. To understand this process, we develop a model that explicitly combines the political and non-political domains, focusing on competition policy and the regulation of markets. We show how the outcome of a change in policy develops over time as firms respond in the market and interact with bureaucratic enforcement. We identify a critical threshold in market structure that determines whether a policy succeeds or fails, and discuss how the design of political institutions can affect this level. The threshold represents a balancing of the path-dependence of politics with the self-correcting nature of markets. It establishes when political forces dominate those in markets and, thus, when a policy change will have a lasting effect on society.

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# 1 Introduction

The outcomes of policies are not determined in congress, in parliament, or in the halls of any legislature. Rather they are determined by the actions of private citizens. Policies set the rules of engagement but outcomes are determined by how people respond to these rules.

It follows that policy outcomes are only partially within the grasp of policymakers. Good intentions, or even clear precedent, need not translate into desired outcomes. Moreover, the dependence on private actors means that policy outcomes are not realized instantaneously, rather they develop progressively over time. As private citizens respond to the policy change and respond to each other, the outcome that a policy produces changes and evolves with them. As such, the outcome of a policy is better thought of as a trajectory than as a single static object.

This reality carries important implications for policymaking and the practice of politics. Policymakers must design and evaluate policies that anticipate, and allow for, the responses of private sector actors. Moreover, as policymaking itself is dynamic, policymakers must allow for the actions of their colleagues and successors who may pursue different goals or be less socially-minded than themselves.

The long arc over which policy outcomes develop also affects how voters engage with politics. The electoral cycle is short, meaning that voters must evaluate—and hold accountable—elected officials with information that is only a sample of the official’s performance in office. This, in turn, creates incentives for policymakers to distort policy such that electoral accountability rests not only on incomplete but also systematically distorted information.

The objective of this paper is to understand the interconnections between policymaking, private sector response, and political accountability. The model we develop explicitly includes the responses of private sector actors and the choices of future policymakers to a change in policy. We explore what this means for the incentives of policymakers and for the efficacy of the political process overall.

The response of private actors to policy choice is fundamental to all domains of policy, though arguably no more so than to the regulation of economic markets. The interests of the general public, politicians, and regulated firms are often at odds. We study the choice by a legislator of whether to implement a pro-competitive policy and characterize the equilibrium outcome path as the firms attempt to circumvent the intent of the policy in the face of bureaucratic oversight. The tools of economic theory allow us to characterize the incentives of individual firms, capturing the richness of interactions within the market itself, and we use this to understand the interaction of markets with

politics.

We show in this setting that the outcome of a policy varies significantly depending on the market response of firms. In fact, we show that the response of firms can be so effective as to completely undermine the intent of a policy change such that the policy leaves no lasting mark on society. Policy futility need not always be the outcome, however. In other situations the response of firms is muted, and the very same policy change can succeed in shaping market outcomes and leave a lasting impact on the economy and society.

Even when policy is doomed to failure, we show that the dynamic path to failure matters. A policy change creates a novel rent seeking opportunity. Rather than rent-seeking within politics, the opportunity that arises is in the private sector in response to the policy change. For a policy that is doomed to failure, the market-based rent seeking by firms creates an outcome path that not only appears successful in the short run, but, in fact, appears even more successful than if the policy were fated to be a success. Ironically, the short-run outcome is not only a poor indicator of long-run success, it is negatively correlated with it. This leads to the ruinous prediction that electorally-motivated legislators will be drawn to such policies. They will be drawn to doomed policies not despite their inevitable failure but precisely because of it.

Our results provide an intriguing supplement to Pierson's (2000; 2004) distinction between path dependence in markets and politics. Pierson argues that increasing returns are more prevalent in politics because of status quo lock-in and other factors. Markets, in contrast, more often possess countervailing effects that push them back toward their initial points after shocks, in a sort of Le Chatelier principle for the economic world (Samuelson, 1947). In developing a formal model, we are able to explore how political and market forces interact and balance when both are present. Our main result is to identify a threshold in market conditions that separates policy success from failure. On one side of the threshold the countervailing force in markets dominates and a policy change leaves no lasting legacy. On the other side of the threshold, the path dependence of politics is dominant, and policy change leads to permanent change in the long-run path of society. This battle between the centripetal and centrifugal forces of markets and politics, respectively, provides an enriched perspective on the design and implementation of policy change.

### **The Politics of Dynamic Outcomes: Current Debates & Historical Precedent.**

These issues underlie current debates over “Big Tech” and the power of big business. Critics in both academia and the public domain argue that lax enforcement of policy has, over time, allowed dominant companies to accumulate excessive market power. In

turn, this has allowed the dominant firms to have an outsized impact on politics and policymaking. The pairing of market and political power has given rise to calls for new policies that diminish the power of big business, including proposals to break the largest companies up into their constituent parts (see [Wu, 2018](#) for a particularly forceful account).

In this paper, we explore the politics of this choice and shed light on whether such a policy response will have the impact that is intended. The answer is not so obvious. The outcome of a policy change depends on the response of the firms themselves, as well as on the policy choices of regulators charged with enforcing the change. To know whether breaking up “Big Tech” will lead to more competition in the long run, one must know whether regulators will hold the line or succumb to political pressure and allow anti-competitive outcomes to reemerge.

The need for a deeper understanding of this dynamic is evident in the mix of policy successes and failures in the historical record. The break-up of AT&T is the most prominent example of a pro-competitive policy failing.<sup>1</sup> Initially it appeared to be a success, with AT&T replaced by the collection of “baby bells” and new entrants, such as MCI, flourishing. That success proved ephemeral, however, and over time the industry reconsolidated. Today the industry is marked by high prices and minimal competition ([Philippon, 2019](#)). There are other examples of pro-competitive policies that followed the same trajectory as did telecommunications, from airlines in the US to energy production in Australia.<sup>2</sup> In the language of [Pierson \(2000, 2004\)](#), the countervailing forces of markets dominated the path dependence of politics in these examples.

In contrast with these failures are examples when a pro-competitive policy succeeded in generating sustained competition. The most notable example, contemporaneous with AT&T, is the deregulation of trucking in the US. In this and similar cases, the path dependence of politics dominates markets and the policy change left an enduring mark on society.

The model we build is aimed at understanding why the same pro-competitive policy sometimes succeeds and sometimes fails, why failures often initially appear as successes, and what this means for the incentives of policymakers and the choice of policy. We argue that our threshold result provides a lens through which the historical record and the current debates can be understood. By integrating politics and markets into the one framework, we can understand when the dynamic force of each wins out. Successful pol-

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<sup>1</sup>Although the late 1970’s and early 1980’s are typically described as an era of deregulation, they share with current calls for increased regulation the intention of increasing competition and diminishing the market power of large firms.

<sup>2</sup>We consider several case studies from this era in detail in the discussion section of the paper.

icy reform today rests on the path-dependence of politics dominating the self-correcting nature of markets and, therefore, on which side of the threshold we lie.

### **Connections to the Literature.**

Our work connects with multiple threads of research from a variety of traditions in political science.

*Policy Outcomes and Private Sector Response:* [Peltzman's \(1975\)](#) claim that mandatory seat belt laws increased fatalities rests on the behavioral response that drivers, now feeling safe in their cars, drove more dangerously. This idea has come to be known as the 'Peltzman effect.'<sup>3</sup>

We argue that behavioral responses to policy are more broadly relevant to policy-making and that they take richer and more subtle forms. In particular, our contention is that the response of citizens to each other—as in the case of firms competing in markets—is itself an important consideration in understanding the politics of changing policy. This contrasts with the standard practice in formal theory to work with preferences in reduced form. Our model demonstrates that, while this approach has its advantages, it obscures interactions that are important to understanding policymaking in practice.

*Markets and Politics:* The link between politics and market structure was explored in [Salamon and Siegfried \(1977\)](#). Approaching the problem empirically, they demonstrate with lobbying data that the widely varying influence of industries on American politics can be tied to differences in market structure.<sup>4</sup> This connection underlies the important work of [Kim \(2017\)](#) on trade policy. Kim presents the striking fact that much of the variation in U.S. applied tariff rates occurs within industry rather than across industries, and he develops a theory of how product differentiation in markets affects lobbying behavior. Kim's (2017) argument focuses on the collective action problem within an industry and how it can be mitigated by product differentiation ([Olson, 1971](#)). We set aside the collective action problem and, in a model of homogeneous goods, show how the degree of competition is itself endogenous, how this affects the willingness to seek political influence, and what this means for policymaking.

*The Dynamics of a Policy Outcome:* The foundational work of [Pierson \(2000, 2004\)](#)

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<sup>3</sup>[Peltzman \(1975\)](#) contends that efforts to reduce risk through policy are completely undone by the behavioral response. Although a behavioral response to policy is universally accepted—and referred to generally as *risk compensation*—the degree of this response is controversial and a matter of ongoing research.

<sup>4</sup>A separate literature in economics, beginning with [Stigler \(1971\)](#), emphasizes the influence of industry on policy choices, although the role of industry structure is not developed and, in focusing on firms, de-emphasizes the agency of policymakers.

demonstrated the importance of time in politics. Our finding that the outcome of a single policy changes over time, and that the shape of this path is important to policymaking, reinforces Pierson’s insight that evaluating politics via a snapshot in time—via a slice of the outcome path—is misleading.

The influential literature on policy “feedback” explores the causal loop between policy, politics, and further policy change (Pierson, 1993, 2000, 2004; Hacker and Pierson, 2020). Our interest is related though distinct. We focus on a single choice of policy—whether to open a market to competition—and examine the evolving impact of that choice on the private sector and, thus, the policy outcome path that is produced. Feedback does occur here, although from the market to how bureaucrats implement the policy change rather than to the policy choice itself.

The formal literature on policymaking has grappled with dynamics, although in a different way. Most work, following Baron (1996) and Kalandrakis (2004), studies the endogenous path of policy, with a focus on how each change in policy shapes future preferences and winning coalitions, thereby influencing future change. In all of these models, the outcome of a policy choice is realized immediately and is unchanging, with no modeling of actors beyond politics. This contrasts with our focus on a single policy choice, a changing outcome, and the market response.

*The Difficulty of Policymaking:* Policymaking in our setting is difficult—as a policymaker must account for private sector responses—yet it is knowable. This distinguishes our approach from models of policymaking in which the mapping from policies to outcomes is unknown (Gilligan and Krehbiel, 1987; Callander, 2011). Indeed, a key point we wish to make is that a non-trivial share of this uncertainty can be eliminated by explicitly modeling the actions of non-political actors. Our threshold result (that varies in market parameters) emphasizes that what might be thought of as randomness in policy outcomes is simply a readily identifiable factor beyond the political domain. That by tracing out those steps, and the strategic considerations involved, we can better predict policy outcomes and better understand the policymaking process.

## 2 A Dynamic Model of a Policy Outcome

We present a simple dynamic model of policymaking, market response, and bureaucratic enforcement. The market is initially a monopoly with a single legacy firm. A Legislator decides whether to implement a pro-competitive policy. If she does, the market is open to entry by new firms. The firms compete for profit and (potentially) acquire each other subject to oversight by a bureaucrat. We describe each part of the model in turn.

**The politics of policy change.** At  $t = 0$  a Legislator,  $L$ , chooses whether to implement a pro-competitive policy. If she does not, the status quo of a monopolist remains in place. If the pro-competitive policy is implemented, entry into the market is open to  $N$  potential firms, where  $N$  is large. Entry decisions are made simultaneously and entry costs each new firm  $K > 0$ . The former monopolist is already in the market and therefore does not pay any entry cost. The number of firms in the market (including the former monopolist) is given by  $n_0 \leq N + 1$ . We assume that a firm enters if it is indifferent.

**Market competition.** The firms that enter the market compete in each period  $t = 0, 1, 2, 3, \dots$ . Each firm simultaneously chooses a quantity to take to market (known as Cournot competition). Firm  $i$  takes  $q_{it}$  to market in period  $t$  and the total quantity is  $Q_t = \sum_i q_{it}$ . The market price is determined by the inverse demand function which we assume is constant across periods and, for concreteness, given by  $P = a - b \cdot Q$ , where  $a, b > 0$  and  $P$  is the market price. Production is at a constant marginal cost,  $c(q) = c \cdot q$  for quantity  $q$ . Firms are profit maximizers and discount the future at the common rate  $\delta \in [0, 1)$ .

**Takeovers and market concentration.** Competition lowers the market price and, thus, is good for consumers but bad for the firms. As such, the firms would like to reduce competition by reducing the number of competitors. To capture this desire, we allow a predator firm to take over its competitors, even though this conflicts with the intent of the pro-competitive policy change. Specifically, in each period of market competition, the predator firm has the option of making a take-over offer to one competitor. The offer to each firm is take-it-or-leave-it. For convenience, we assume the predator firm is the former monopolist.<sup>5</sup> Moreover, if one offer is rejected, the predator firm loses the ability to make takeover offers again. A rejection implies, therefore, that the market structure remains constant thereafter. The takeover offer and acceptance or rejection in each period is made prior to market competition (except in period 0). Denote by  $n_t \leq n_0 \leq N + 1$  the number of firms that compete in the market in period  $t$  (including the predator firm). To avoid tedious tie-breaking, we assume that the predator firm takes over its competitors if it is indifferent.

**Lobbying and the enforcement of policy.** To restrict mergers and maintain competition, a bureaucrat,  $B$ , is charged with enforcing the policy change. This typically

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<sup>5</sup>The firms are identical other than for the predator, so the identity of the takeover target is immaterial.

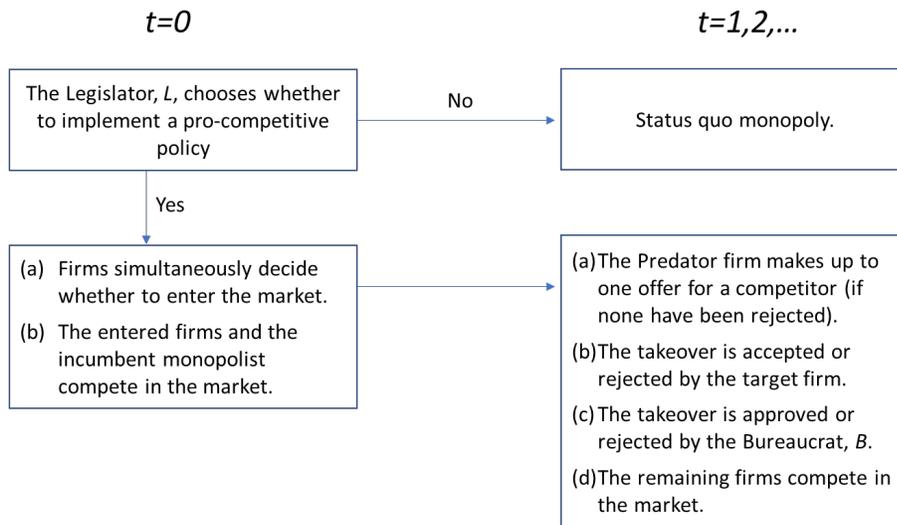


Figure 1: Timing of Policy and Market Actions

falls under the banner of antitrust or competition policy. The bureaucrat is amenable to political pressure. We model this part of the political process in reduced form. Specifically, we suppose that the bureaucrat will approve a takeover application upon the firm paying lobbying cost  $R \geq 0$ , otherwise he will reject it.<sup>6</sup> Fixing the lobbying cost at a constant amount allows us to focus on the strategic logic of the Legislator,  $L$ , which is our main interest here. The bureaucrat’s susceptibility to pressure acts as a constraint on the Legislator’s ability to increase competition in the market.

**Political preferences, timing, and equilibrium.** The motivations of policymakers are potentially diverse, and typically combine elements of social welfare, self-interest, and ideology. We will consider both when the Legislator is benevolent and seeks to maximize social welfare and when she is self-interested.

The timing of the game is given in Figure 1. We identify the unique pure strategy subgame perfect equilibrium to this game. To save on excessive notation, we will drop subscripts and arguments where it does not cause ambiguity or confusion. For ease of exposition, we collect the proofs of all formal results in the appendix.

**Comment on the model.** The model is a stylized description of political and market institutions. Our goal is to focus on the intersection of markets and politics and, in

<sup>6</sup>We do not take a stand on the motivations of the Bureaucrat. He may be self-interested and he may receive some or all of the firm’s payment directly. Alternatively, he may be publicly-minded but subject to influence or pressure from other parts of the political system, or some mix of the two. The essential ingredient is that the Predator pays  $R$  to secure approval for a takeover.

particular, to capture the interdependence between them. To do this, and keep the model tractable, we simplify other important features of the political process. Later, we will introduce and discuss several of these features, including voters and elections, and we will take up the question of how the design of political institutions can be used to ameliorate or circumvent the distortions in policymaking that our model uncovers.

### 3 Results

The model is a dynamic game and we solve it by backward induction. Before doing so, we establish several properties of market competition and antitrust enforcement that will prove essential to the analysis.

#### 3.1 Preliminary Results

**Market Competition.** Firm  $i$ 's profit in period  $t$  is:

$$\underbrace{\pi_{it}}_{\text{profit}} = \underbrace{q_{it}}_{\text{quantity}} \underbrace{\left[ a - b \left( \sum_{j \neq i} q_{jt} + q_{it} \right) \right]}_{\text{price}} - \underbrace{cq_{it}}_{\text{production cost}}$$

Solving for the optimal behavior of each firm  $i$ , the equilibrium quantity is:

$$q_{it}^* = \left( \frac{a - c}{b} \right) \cdot \left( \frac{1}{n_t + 1} \right) \text{ for all } i \in n_t. \quad (1)$$

The total market quantity and price in equilibrium, respectively, are then:

$$Q_t^* = \left( \frac{a - c}{b} \right) \cdot \left( \frac{n_t}{n_t + 1} \right), \quad \text{and} \quad P_t^* = a \left( \frac{1}{n_t + 1} \right) + c \cdot \left( \frac{n_t}{n_t + 1} \right).$$

Observe that quantity is increasing in  $n$ , and, correspondingly, price is decreasing. Combining these with the per-firm quantities in Equation 1, and rearranging, the profit for each firm in period  $t$  is:

$$\pi_{it}^* = \frac{(a - c)^2}{b} \cdot \left( \frac{1}{n_t + 1} \right)^2 = b \cdot (q_{it}^*)^2. \quad (2)$$

The profit of each firm is decreasing in the number of competitors, reflecting the classic logic of markets. The more competition there is, the lower the profit of each firm. It is also true that total profit in the industry decreases in the number of firms (to see this,

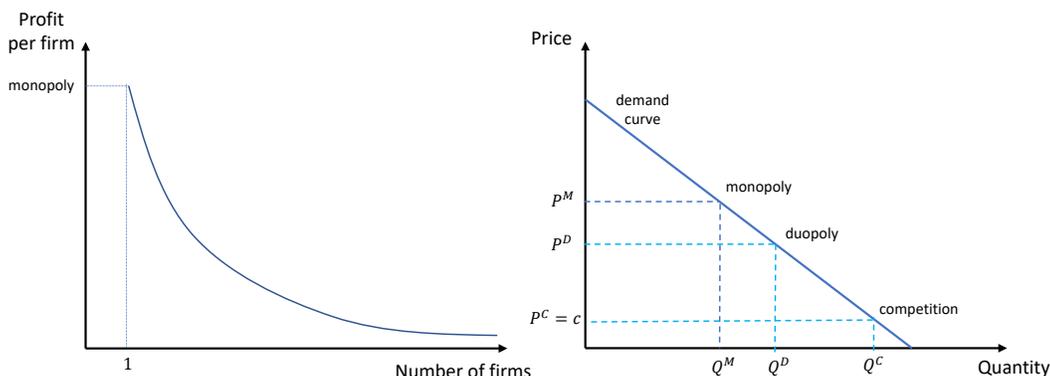


Figure 2: Market Competition, (i) profit per firm, and (ii) market equilibrium.

sum Equation 2 across  $n$  firms). The more competitors in the market, the more product is sold and, consequently, the lower is the market price.

Thus, competition is good for consumers but bad for industry profits. Overall, the benefit to consumers outweighs the loss to producers, and total *social surplus* is increasing in competition. This is the benchmark welfare criterion we will carry throughout the paper. Figure 2 depicts these results graphically. The left panel plots the profit of a single firm as the number of competitors increases. The right panel shows the demand curve and the equilibrium quantity and price for three cases: a monopoly, a duopoly, and near perfect competition with a large number of firms.

**Lobbying the Bureaucracy** The simple logic of market competition exposes why firms dislike competition. It follows that one firm taking over another is good for profit as it reduces competition. It does not follow, however, that a takeover is profitable for the firm that undertakes it. The reason is that whilst the predator must pay the full cost of the takeover, the benefit is shared across all firms remaining in the market. Total industry profit goes up after the takeover, yet the predator firm is able to capture only a fraction of that benefit.

To see when a takeover is profitable, it helps to separate the elements of the costs and the benefits. The cost of lobbying is, by assumption, independent of the number of firms. The takeover price is equal to the foregone profits of the target firm, which is given by the left panel of Figure 2 and, thus, is decreasing in the number of firms in the market. On the other side of the coin, the benefit of the takeover is the increase in profit from removing one firm, and this too decreases in the number of firms. Graphically, the benefit is the slope of the curve in the left panel of the figure.

To see how these elements balance out, consider the altered game in which the

predator can make only one takeover across all periods. Thus, the predator's choice is to compete against  $(n_0 - 1)$  other firms, or to make one takeover and face  $(n_0 - 2)$  competitors thereafter. The following result shows that the profitability of this takeover strictly decreases in the degree of competition.

**Lemma 1** *If the predator firm can make at most one takeover, the profitability of a takeover is strictly decreasing in  $n_0$ , the number of firms in the market.*

Although the takeover price is lower the more firms there are, the benefit of removing a competitor is also lower, and Lemma 1 shows that the latter effect dominates. The influence cost of lobbying does not impact this relative comparison. The result is evident in the flattening slope of the left panel of Figure 2. As the number of firms increases, the marginal benefit of removing that firm from the market rapidly converges to zero whereas the takeover price declines slowly.

A special case of Lemma 1 is a market that begins in a duopoly. A takeover from duopoly yields a monopoly.<sup>7</sup> This case differs from all others as the predator firm is able to capture the full benefit of reduced competition. With no other competitors, the predator's profit is equal to industry profit, and as industry profit goes up when a competitor is removed, the benefit to the predator exceeds the takeover price. This must be weighed against political influence costs which need to be paid to win approval for the takeover. The takeover is profitable only if the political influence costs are not too high. We define the critical level by  $R_2$ , where the subscript reflects the initial number of firms.

**Lemma 2** *A takeover in a duopoly is profitable if and only if the lobbying costs satisfy  $R \leq R_2$ , where  $R_2 > 0$ .*

### 3.2 The Dynamic Enforcement of Policy

With these pieces in place, we are now in a position to solve the game by backward induction. The above results tell us that a duopoly will transition to a monopoly if lobbying costs are not too high, but that takeovers in less competitive markets are less profitable. This leaves open the question of how competition will evolve for markets beyond duopoly.

Complicating the answer to this question is that, beyond duopoly, a takeover cannot be considered in isolation. The removal of one competitor is not the end of the story, as it puts the predator in a position to take over another firm, and another, and possibly

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<sup>7</sup>For  $n_0 = 2$ , the calculation in Lemma 1 forms a proper subgame of our model.

eventually obtaining monopoly power. Thus, even when a single takeover is unprofitable in isolation, the predator may nevertheless undertake it if the sequence of takeovers that follow is profitable.

Proposition 1 establishes in this context that market outcomes obey a simple threshold property. If the degree of competition is sufficiently high such that it is above the threshold, the predator will engage in no takeovers and competition is stable. However, if the level of competition is below the threshold, the predator firm takes over a competitor and continues until it attains monopoly status. This strategy is known in practice as an industry ‘roll up.’ The market, therefore, traverses one of two starkly different paths depending on the level of competition that initially emerges in the market.

**Proposition 1** *There exists a threshold number of firms,  $\bar{n}_R$  such that:*

- (i) *the predator firm makes no takeovers if  $n > \bar{n}_R$  and market competition is stable,*
- (ii) *the predator takes over a competitor in each period until it is a monopoly if  $n \leq \bar{n}_R$ .*

The threshold  $\bar{n}_R$  is a function of the political influence cost,  $R$ .<sup>8</sup> As the costs of political influence increase, the profitability of takeovers decreases,  $\bar{n}_R$  decreases and, therefore, competition is sustainable with a smaller number of firms. Generalizing the notation from above, denote by  $R_n$  the influence costs below which a takeover is profitable with  $n$  firms in the market. We then have the following.

**Corollary 1** *The level of sustainable competition,  $\bar{n}_R$ , is decreasing in lobbying costs,  $R$ . Alternatively, for a given number of firms,  $n$ , competition is sustainable if and only if  $R > R_n$ , where  $R_n$  is decreasing in  $n$ .*

This result highlights how market outcomes are a function of politics. The costs of political pressure not only insulate bureaucrats, but by so doing they shape market outcomes. The influence costs also feed back to the success or failure of pro-competitive policies more broadly, the question to which we now turn.

### 3.3 The Imperfect Connection of Policy to Policy Outcomes

With an understanding of how a market will evolve, we can now step back to understand the initial decision of firms whether to enter the market. To see the effect of antitrust enforcement, political influence costs, and takeovers on the entry decision, consider first the benchmark in which takeovers are prohibited.

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<sup>8</sup>The specific assumptions of our model (Cournot competition, linear demand, etc.) can be used to generate bounds on the threshold,  $\bar{n}_R$ . As we see these assumptions as modeling simplifications rather than requirements for the underlying mechanism, we do not pursue these bounds in the text. Details are provided in the Appendix.

If takeovers are prohibited, the market will be stable at the initial level of competition. In deciding whether to enter, each firm weighs the expected profit from competition against the entry cost,  $K$ . As more firms enter the market, the profits earned by each one decrease, and, at some point, competition will reach a threshold at which further entry is no longer profitable. The following lemma captures this result.<sup>9</sup>

**Lemma 3** *If takeovers are prohibited,  $n^f$  firms will enter the market, where  $n^f$  is decreasing in the cost of entry,  $K$ .*

The level of competition  $n^f$  can be considered the benchmark of free-market competition. Our interest is in how this level is altered by the prospects of takeovers and antitrust enforcement. The answer depends on the threshold,  $\bar{n}_R$ , from Proposition 1.

If the free-market entry level,  $n^f$ , exceeds the threshold,  $\bar{n}_R$ , no takeovers will be made and the firms anticipate that competition will reach a level that is self-sustaining. Thus, in this case, the logic of free-market entry carries through even to a market with imperfect antitrust enforcement.

When free-market entry is low enough that it falls below the threshold  $\bar{n}_R$ , the prospect of takeovers does alter the logic of entry. One might conjecture that entry will be less attractive and fewer firms will compete because entering firms will be acquired by the predator firm and driven from the market anyway. However, this conjecture is wrong. In fact, the exact opposite holds true. Precisely because they anticipate being acquired, firms have even greater incentive to enter the market. Precisely because they know that the pro-competitive policy will fail and a monopoly will reemerge, firms are more willing to pay the entry cost, even though their time in the market will be short-lived.

**Proposition 2** *Market entry falls into one of two cases:*

- (i) *If  $n^f > \bar{n}_R - 1$ ,  $n^f$  firms enter the market and competition is stable.*
- (ii) *If  $n^f \leq \bar{n}_R - 1$ ,  $n^{f*}$  firms enter, where  $n^f \leq n^{f*} \leq \bar{n}_R - 1$ , and competition backslides to monopoly.*

Case (ii) describes the situation when takeovers occur and the excess entry this induces. Firms are more willing to enter the market in this case precisely because the policy will fail. They do this because the inevitability of monopoly creates a rent seeking opportunity. This is not the standard rent seeking in which firms seek benefit directly from policy, rather it is rent seeking from the eventual monopolist. Because the predator firm will attain monopoly status, its profit will be higher than it would be if the policy

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<sup>9</sup>This is a classic result in industrial organization; see [Mankiw and Whinston \(1986\)](#).

were to succeed and competition persisted. The other firms can capture some of these higher profits by entering the market and extracting a high takeover price.

This result is important for the dynamic path of the policy outcome. We saw above that the outcome of the policy can traverse two distinct paths, one in which competition is stable and the other in which competition unwinds to monopoly. Proposition 2 shows that in this latter case, the instability of competition feeds back into the initial market entry decisions. The outcome path of policy is then distorted and exaggerated, initially exhibiting excess competition before it ultimately unwinds all the way back to monopoly.

It is striking that throughout this process, the same pro-competitive policy remains in place. The implementation of the policy opens the market to competition, yet it can't force competition to occur. That is up to the firms themselves. Proposition 2 shows that the reaction of firms may not be constant. Initially firms do enter, yet when that level of competition falls below a threshold, the firms exit over time, taken over by the predator firm, and competition unwinds. That the level of competition will unwind, and that the policy change will ultimately fail, surprisingly does not deter entry, rather it encourages it.

This result reinforces the folly of evaluating policy outcomes via a snapshot in time. Proposition 2 illustrates a case in which not only is an initial snapshot not representative of an overall policy outcome, but because it is not representative, that snapshot is even more distorted. The initial policy outcome is, in fact, negatively correlated with the steady-state long run policy outcome.

## 3.4 Politics when the Policy Outcome is Contingent

The previous section presents an illustration of how the outcome of a policy depends on factors beyond the Legislator's control, and how this lack of control gives rise to non-stable and starkly divergent outcome paths. In this section, we consider how this affects the initial choice whether to implement the pro-competitive policy in several different settings. We begin with the normative benchmark of socially beneficial policymaking.

### 3.4.1 A Benevolent Legislator

Suppose the Legislator is benevolent and wants to maximize social welfare. Her optimal policy choice would seem to be straightforward: Implement the policy when it succeeds but not when it fails. The logic is clear when the policy succeeds as competition lowers the market price and increases overall welfare.

The logic when the policy fails is complicated by the fact that, while competition may not persist, consumers do benefit from lower prices while competition lasts. Countering

this benefit is that many firms pay the cost of entry only for it to be wasted as they are acquired and leave the market.

Proposition 3 shows that while the benefit to consumers can be considerable, it is dominated by the cost to the firms. Thus, implementing the pro-competitive policy when it is doomed to fail lowers overall societal welfare and a benevolent Legislator will not do it.<sup>10</sup>

**Proposition 3** *A social welfare maximizing Legislator will implement the pro-competitive policy if and only if  $n^f > \bar{n}_R - 1$ . Implementing the pro-competitive policy when  $n^f \leq \bar{n}_R - 1$  delivers strictly lower social welfare than the status quo.*

It is striking that the inefficiency of a failed policy is the result of the entry decisions of firms. This is surprising as the firms willingly choose to enter the market. They enter despite lowering societal welfare not to create value but rather to engage in rent seeking. As described in the previous section, firms enter the market knowing the policy will fail in the expectation that they will extract a high takeover price from the Predator.

Proposition 3 shows that this rent-seeking dominates any benefit to consumers. The rent seeking is so large that it dissipates the monopoly profits the incumbent would otherwise earn if the market had stayed as a monopoly. Thus, not only is a failure of the pro-competitive policy a missed opportunity in that competition does not persist, it is actually costly to society to implement the policy. Society is worse off with a burst of competition that backslides than if it had just remained in monopoly the entire time.

This result is based on the strategic interaction between the firms. Thus, it would not appear if we had reduced the private sector to a “representative” firm. By modeling the behavior of individual firms in the market, we identify the rent-seeking that goes on between them. Modeling only a representative firm would miss the fact that what is in the interests of an individual firm is not in the interests of all firms collectively. Tracing from here back to policymaking, we can see how rent-seeking in the market affects the choice of policy.

It is important to note that Proposition 3 represents an inefficient outcome even though the Legislator is acting in the best interests of society. A benevolent Legislator does not attain an efficient outcome as she has only imperfect control over outcomes and must take into account the less-benevolent responses of other actors. That the Bureaucrat succumbs to political influence undermines the Legislator’s ability to shape policy outcomes. As a result, the Legislator must forgo a policy opportunity in some

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<sup>10</sup>As one period of market competition occurs before takeovers are allowed, takeovers are rendered moot if the players are myopic. For the model to be meaningful, we set a minimum on the discount rate of  $\delta > 0.1$  that we assume hereafter.

circumstances even when that policy could work in principle, because she anticipates correctly that it won't work in practice.

### 3.4.2 An Imperfect Electorate

The bureaucracy is not the only imperfection that a legislator must deal with. In practice, she also faces an imperfect electorate, one that processes information incompletely and with bias.

One classic view of political behavior is that voters vote retrospectively, evaluating how their welfare has been impacted in recent times and voting or not for incumbents accordingly (Fiorina, 1981). Consider then an extension of the model in which we add an electorate that votes retrospectively.<sup>11</sup> Specifically, let there be an election after firms have entered and competition has begun, but before any takeovers have occurred; i.e., at the end of the  $t = 0$  period. Retrospective voting implies that a voter will reelect an incumbent if her utility is higher after the policy change than before; if not, she throws the incumbent from office and replaces her with a new legislator.<sup>12</sup>

Retrospective voting creates an incentive for an incumbent to improve the welfare of her constituents. In principle, this accountability is meant to improve policymaking. When a policy outcome follows a non-monotonic path, however, this incentive breaks down and political accountability fails to work. In fact, if the Legislator is, in the classic parlance, “office motivated,” that is she is motivated purely by winning elections, then the incentive for good policymaking not only breaks down, it reverses. The Legislator is drawn to the pro-competitive policy not only when it succeeds but also when it fails.

**Proposition 4** *An office-motivated Legislator facing an electorate that votes retrospectively will always choose the pro-competitive policy.*

An office-motivated Legislator will be drawn to the pro-competitive policy because, even when doomed to failure, the policy initially seems like a success. This burst of competition ensures the Legislator's reelection when voters evaluate policy retrospectively.

This result provides a new interpretation for the many failures of competition policies in practice. Rather than view them as worthwhile but failed experiments, Proposition 4 implies that they were deliberate failures, that the Legislator would have chosen these policies even though she knew they would fail because of the non-monotonic outcome paths that they generate.

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<sup>11</sup>We formalize the details of this extension in the appendix, although the logic is straightforward.

<sup>12</sup>We are presuming that this evaluation is through the lens of one's own personal experience, as in the well-known “pocket book” view of voting.

In fact, combined with the excess entry property of Proposition 2, pro-competitive policies are more attractive when they fail than when they succeed. This is an unnerving conclusion. It reinforces the oft-lamented myopic behavior of legislators caused by the shorter-electoral cycle (Pierson, 2000, 2004). That policy outcomes are a dynamic path rather than a static point implies that, not only will myopia-induced legislators be drawn to policies with quick benefits, they will be drawn to flawed policies, ones that are doomed to failure, because the outcome trajectory initially rises and then falls, and the fall, when it comes, is left to future generations.

The pro-competitive policy does eventually fail, of course, and voter evaluations can change. The long run impact on politics will depend on how voters evaluate the changing outcome. If they make their evaluations period-to-period then the backsliding in competition will cause an electoral backlash against the Legislator, and she may be thrown from office, albeit after she has already won the first election.

Another possibility is that voters' retrospective evaluations focus on the policy change itself even over a longer horizon—i.e., is the voter better off with the policy change than without it? If this is the case, then even a pro-competitive policy doomed to failure will produce a string of electoral victories for the Legislator. This is because the voters are better off with any degree of competition, and thus even if competition backtracks, voters are better off and will continue to support the incumbent Legislator.

Even when the retrospective evaluation is period-to-period, the backlash against the incumbent Legislator from a failed policy may not materialize. To punish the Legislator, voters must connect the actions of the Bureaucrat to the initial policy choice by the Legislator, possibly taken years before, and hold the Legislator responsible. This is a difficult attribution problem, one that is particularly acute in separation-of-power systems.<sup>13</sup>

If voters blame the Bureaucrat for backsliding competition and reward the Legislator for a policy choice that increases competition, the same perverse incentives that underlie Proposition 4 are present. An office motivated Legislator would be drawn to the pro-competitive policy as, not only would she be reelected initially, she would not be punished in any future elections for the backsliding in competition that she knows is coming.<sup>14</sup> Indeed, this logic suggests the even more perverse possibility that the Legislator, if from a different party to the elected executive, may benefit if she adopts a policy that sets the bureaucrat up to fail. In this case, the trajectory of the policy outcome

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<sup>13</sup>Misattribution may reflect cognitive limitations of the voters, although it need not. It could solely be due to the difficulty in the problem that voters face. In a labyrinthine political system, it is challenging to discern which official is responsible for which outcome.

<sup>14</sup>To avoid excessive complication to the model of multiple elections, we keep this discussion informal although the extension described is straightforward.

that rises and then falls may deliver the best of both worlds to the Legislator.<sup>15</sup>

### 3.4.3 Institutional Design: Allocation of Authority

The design of political institutions offers one potential respite to the distortions and inefficiencies unearthed here. For instance, Proposition 3 is built upon the premise that the Legislator must account for the imperfect implementation of the policy. If the Legislator controlled enforcement herself, this distortion would not arise. A benevolent Legislator who also controlled the bureaucracy would be able to implement policy efficiently. She would always adopt the pro-competitive policy and reject all takeover applications.<sup>16</sup>

This solution unravels if the Legislator is instead self-interested. In that case, unifying authority over policy adoption and implementation magnifies the distortions in policy rather than remove them. When the Legislator controls enforcement, she is the one who is subject to political pressure. To the extent that some fraction of the lobbying expense,  $R$ , accrues to the person with authority over the takeovers, the Legislator benefits from holding this power and facing this pressure. This benefit, in turn, makes the pro-competitive policy more attractive to her precisely when it is doomed to fail as it is in that case that takeovers will be approved.

**Proposition 5** *To a self-interested Legislator, the pro-competitive policy is strictly more attractive if  $n^f \leq \bar{n}_R - 1$  when he also enforces policy.*

This result leads us to the question of how the lobbying costs,  $R$ , are set. We have so far taken them as fixed. As the level affects the firms' decisions to launch takeovers, a Legislator who benefits from these attempts may optimally set  $R$  to make the failure of the policy more likely. That is, the Legislator may structure the political process so that policy fails more often than it otherwise would if it is she who benefits from that failure.

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<sup>15</sup>This logic also holds if voters simply do not pay attention to takeovers. This is not unreasonable given takeovers typically generate little media coverage and occur much later and relatively far removed from the legislative context.

<sup>16</sup>This may lead one to think that an equally effective remedy is to simply prohibit takeovers. Within the confines of the model this may improve outcomes, but in practice it would come with its own large costs. The model does not include innovation or organizational efficiencies, two factors that are known to necessitate Schumpeter's (1942) "creative destruction" that makes market economies perform well.

## 4 Discussion

### 4.1 Two Case Studies

In this section we present two cases studies to demonstrate the relevance of our model for practice. These case studies, along with the AT&T example in the introduction, show the vastly different outcomes that are possible following a pro-competitive policy change. Digging into the cases also allows us to see the frustrated hopes of reformers. In some cases it was the elected officials who were frustrated as their policy reforms were unwound in the market if not in the legislature. In many cases, it was the advisors who were frustrated, surprised by the importance of politics to the evolution of market structure.<sup>17</sup>

**Airline Deregulation.** One of the principle targets of pro-competitive reformers in the 1970’s was the airline industry in the United States. The Airline Deregulation Act of 1978 removed the barriers to entry to the industry and eliminated the Civil Aeronautics Board’s (CAB) authority over airline routes and fares. The stated goal of the legislation was to improve market efficiency by increasing competition. Specifically, “The encouragement of entry into air transportation markets by new air carriers, the encouragement of entry into additional air transportation markets by existing air carriers, and the continued strengthening of small air carriers so as to assure a more effective, competitive airline industry” and the avoidance of “unreasonable industry concentration, excessive market domination, and monopoly power.” (U.S.C. 95-504, 1978, p.1706-1707)

The opening of the airline industry to competition was met with much optimism and, initially at least, much success. Indeed, Alfred Kahn, the MIT economist known informally as the ‘father of airline deregulation’ and who had predicted an increase in competition, was surprised by the extent of new entry: “I doubt that most of us were fully prepared for the explosion of entry . . . of the last ten years.” (Kahn, 1988, p. 316)

Kahn’s surprise is predicted by our model given his purely economic evaluation of entry. This prediction is paired in the model with a second prediction that, when excess entry occurs, it does so precisely because it will be reversed. This prediction, too, was borne out in practice. Describing the trend in 1988—a trend that continued over subsequent decades and has accelerated in recent years—Kahn (1988, p. 318) writes: “Just as one of the most pleasant surprises of the early deregulation experience was the large-scale entry of new, highly competitive carriers, so probably the most

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<sup>17</sup>We focus here on examples from the United States, though the point is relevant broadly. Deregulation of the Australian energy market and the ensuing market evolution parallels the experience in telecommunications and airlines in the US; see Roger (2022) for an extensive account.

unpleasant one has been the reversal of that trend—the departures of almost all of them, the reconcentration of the industry both nationally ... and at the major hubs ...”

Kahn was surprised twice—at both the rise and at the fall of market competition—because, despite his economic genius, he did not appreciate the political context in which markets operate. That the rise-and-fall dynamic was possible once politics was endogenized came to him only in retrospect: “The concentration process reflected also what many of the advocates of deregulation would characterize as a lamentable failure of the administration to enforce the policies of the antitrust laws—to disallow a single merger...” (Kahn, 1988, p. 318)

**Trucking Deregulation.** Just as the success or failure of market competition cannot be understood in purely economic terms, it also cannot be understood purely in political terms. The example of trucking deregulation in the United States shows that competition policy can sometimes succeed. Thus, the exact same policy can produce diametrically different outcomes depending on characteristics of the market beyond the political domain.

Trucking deregulation in the U.S. occurred contemporaneously with airline deregulation in the deregulatory era of the late 1970’s and early 1980’s. The trucking market was opened up with passage of the Motor Carrier Act of 1980 and a wave of new firms entered the market. As Feitler et al. (1997, p. 159) documents, “While there were 18,045 for-hire, interstate regulated firms in 1980, this number increased to 45,791 in 1990 and to 54,629 in 1993—a tripling of firms in a 13 year time period ...”

In contrast to airlines and telecommunications, this rise in competition proved persistent. Freight rates have stayed well below regulation-era levels and the industry has remained highly competitive, with tens of thousands of operators and profit margins of just 3-5 percent (Costello, 2013, p. 198).<sup>18</sup>

The cause of the different outcome in trucking can be understood through our model. Trucking differs from airlines (and telecommunications and energy generation) in that the start-up equipment costs are lower and the efficient scale of business much smaller. With lower entry costs, thousands of new firms entered the trucking industry post-deregulation. This dwarfs the dozen or so new airlines that were started. Consistent with our model, the level of entry in trucking cleared the threshold for self-sustainable competition and competition proved stable over time. In trucking it was simply not profitable for a predator to take over a competitor as it would require too many takeovers before any meaningful market power was obtained. As a result, the exact same pro-

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<sup>18</sup>There has been considerable turnover in the industry throughout this period, with less efficient firms leaving and replaced by more efficient operators.

competitive policy produced a very different outcome in trucking than it did in airlines.

The trucking example shows that it is possible for the increasing returns properties of politics to overcome the Le Chatelier-like forces within markets and leave a lasting mark on society. The combined examples reinforce the argument in this paper that to understand a policy change and the outcome it produces, one must understand two domains, that within and that beyond politics. Most critically, we must also understand how these domains interact with each other.

## 4.2 The Design of Political Institutions

The dynamic in which the market backslides to monopoly represents a policy failure. Society ends up with the worst of both worlds in which consumers gain little benefit and producers dissipate the profit of monopoly through excess entry.

This outcome is not unavoidable. One policy option is to simply not open the market to competition. Instead, legislators may opt to regulate the incumbent monopolist, capping prices to improve market efficiency or taxing the monopolist and distributing its surplus more broadly across society. These policy alternatives bring their own implementation challenges, yet the difficulties are cast in more favorable light given the backsliding dynamic identified here.

A better option is to instead alter the design of political institutions to make policy work better. Changing the political institution can move the critical threshold between policy success and failure, thereby changing the policy outcome that is generated. The importance of formal mechanisms is evident to some policymakers though not all.<sup>19</sup> A US Congressional Committee report into telecommunications reform in the 1990's (U.S. Congress, 1994, p. 25) attributed the policy failure to “nerves,” offering the entreaty: “The Judiciary Committee has resolved that the Government not lose its nerve once again and allow an industry born in monopoly to be reborn in monopoly.” More important than nerves are the incentives that government officials face. Our model offers potentially fruitful suggestions for institutional design so that legislators and bureaucrats have the right incentives to act in the public interest. We briefly consider several possibilities.

**Bureaucratic Structure & Processes.** Our model formalizes the two stages necessary for effective policy change: The political will to change legislation and the incentive to enforce that change over time by the bureaucracy. This latter stage, in particular,

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<sup>19</sup>The Australian Government's [Productivity Commission \(2005, p. 172\)](#) argued that: “Hence, mechanisms that can help to lock in the gains of previous competition related and other reforms should be a central component of the procedural framework attaching to any future reform agenda.”

requires the bureaucrat to resist political pressure.<sup>20</sup> One option that we considered earlier is to integrate the roles of Bureaucrat and Legislator. This works well if the policymaker is benevolent, but exacerbates the problem if she is not.

Another option is to go in the opposite direction and distance the Bureaucrat from the Legislator and from the political process generally. To the extent that the Bureaucrat is motivated by the public interest but succumbs to political pressure if applied sufficiently (given by the value  $R$ ), removing the Bureaucrat from politics may ensure policy is implemented as intended and, therefore, give the Legislator more confidence in passing pro-competitive policies in the first place.<sup>21</sup>

This has been the approach of the European Union where much of the bureaucracy, and the competition regulator specifically, operates at the European level separated from the domestic political pressure of self-interested legislators. Philippon (2019) argues that this separation has allowed the bureaucrats of the European Union to implement competition policy effectively (see also Gutierrez and Philippon, 2019). Moreover, he contends that this institutional effectiveness has, in a reversal of the experience of the 20th century, produced more competitive markets in the EU than in, what he calls the “inventor of antitrust,” the United States.

Removing the Bureaucrat from politics has the effect of increasing the effective level of  $R$  that it takes to have a takeover approved. Other mechanisms to influence and manipulate  $R$  are also available. For instance, simply “throwing sand into the gears” of bureaucratic policymaking, slowing it down or increasing the logistical burden, serves to increase  $R$ . This reduces the profitability of takeovers and, if it changes the threshold between policy success and failure, potentially alters the long-run outcome of policy for the better. This is evident in the threshold in Corollary 1 as the number of firms necessary for policy success is decreasing in  $R$ .

This logic resonates with the famous argument of Moe (1989) that bureaucratic inefficiency is intentional. However, whereas Moe argues the deliberate inefficiency serves to benefit the bureaucrats themselves, in our setting the inefficiency helps legislators. By making legislation more costly to subvert within the bureaucracy, legislators have more ability to shape the private sector response and achieve their intended outcome.

**Cost of Market Entry.** The cost of market entry,  $K$ , is typically considered a market variable outside the domain of political institutions. Yet it too can be influenced by the design of political institutions. Policy around market competition need not be all-or-

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<sup>20</sup>Alan Fels, an essential figure in Australian economic reform, identified this problem: “The politics is hard. There is massive pressure from business not to act. . . . Look around the world and you see many examples of competition bodies that succumbed to these pressures.” (Kelly, 2009, p. 150).”

<sup>21</sup>The selection of less self-interested individuals may also become easier.

nothing, and can involve restrictions on entry whether directly or indirectly through the imposition of costs.

The impact of changing the costs of market entry follows the bureaucratic sand-in-the-gears logic described above, although it works in the opposite direction. The cost of market entry affects the number of firms that enter a market, whereas the lobbying cost affects the number of firms that leave, and so market outcomes can be improved if the cost of entry is lower, as shown in Lemma 3.

The effect of lowering entry costs is felt only around the threshold for market success. Should entry increase but remain below the threshold, the market will still backslide to monopoly. In this case the benefit of lower costs is dissipated by even more excess entry. However, if entry crosses the threshold,  $\bar{n}_R$ , the additional entry is sustainable, leading to policy success. This possibility reinforces our argument that economic variables matter for the practice of politics.

## 5 Conclusion

The focus of our analysis has been on competition policy although the underlying logic is broadly applicable. Outcomes in every area of politics are only partially within the control of legislators. This is as true, for example, in the structure of publicly funded education as it is in the regulation of markets. Legislators can at most set the guidelines and provide incentives, and it is up to private sector actors to determine how behavior—and, thus, policy outcomes—are formed.

Our paper has shown that imperfect control fundamentally shapes policymaking and the practice of politics. In the context of competition policy, we have shown how the success or the failure of policy can turn on variables that lie well outside politics. By understanding this relationship, we can better see the levers of control that do exist within political institutions, whether in the legislative or executive branches.

The issues we address have a long history in market evolution in the US and around the world, and are perhaps no more relevant than they are today with the rise of “Big tech” and the concentration of market power this has created. Political competition today rests increasingly on policies that require regulatory enforcement and are subject to market forces. The days of command-and-control policy is well in the past. The question of how “Big Tech” should be regulated turns on how “Big Tech” itself will respond and how subsequent policymakers will act over time. Our model provides a framework with which to think about this dynamic, to evaluate policy proposals, and to understand the practice of politics when what we observe in the political domain is only part of what matters.

A broader question to which our work contributes is the role of business in society. We have focused on profit-motivated firms who act in the political domain as a means-to-an-ends of greater profit. It is also possible that political ends are the primary motivation. This suggests the pernicious possibility that market power serves the goal of political power rather than the other way around. A dangerous dynamic is when these two goals reinforce each other, with market power begetting political power that begets more market power and so on. As US Representative David N. Cicilline, Chair of the Subcommittee on Antitrust, Commercial and Administrative Law concluded ([U.S. Congress, 2020](#), p. 76-77): “Because concentrated economic power also leads to concentrated political power, this investigation also goes to the heart of whether we, as a people, govern ourselves, or whether we let ourselves be governed by private monopolies.” This is a question to focus the mind of academics and, indeed, all citizens.

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# Appendix

## A Preliminaries

In period  $t \geq 0$ , given the number of firms  $n_t \geq 1$ , the market demand is  $P = a - b \sum_{i=1}^{n_t} q_{it}$ . Firm  $i \in \{1, \dots, n_t\}$  maximizes its expected profit,  $\sum_{\tau=t}^{n_t} \delta^\tau \cdot \pi_{i\tau}$ , where the profit each period is

$$\pi_{it} = \left[ a - b \left( \sum_{j \neq i} q_{jt} + q_{it} \right) - c \right] \cdot q_{it}.$$

Notice that the choice of production  $q_{it}$  only affects the profit in period  $t$  (there are no savings in this model) and therefore the problem for the firm is to choose  $q_{it}$  to maximize  $\pi_{it}$ , taking as given the quantities produced by the other firms:

$$q_{it} = \frac{a - b \sum_{j \neq i} q_{jt} - c}{2b}. \quad (3)$$

Adding this condition up with respect to  $i$  yields

$$\sum_{i=1}^{n_t} q_{it} = \frac{a - b(n_t - 1) \sum_{i=1}^{n_t} q_{it} - c}{2b}.$$

Solving this for the total quantity  $\sum_{i=1}^{n_t} q_{it}$  and substituting it to the demand function implies that the total market quantity and price in period  $t$  are given by

$$Q_{n_t}^* = \frac{a - c}{b} \cdot \frac{n_t}{n_t + 1}, \quad \text{and} \quad P_{n_t}^* = a \cdot \frac{1}{n_t + 1} + c \cdot \frac{n_t}{n_t + 1}.$$

Moreover, noting that  $\sum_{j \neq i} q_{jt} = Q_{n_t} - q_{i,t}$ , (3) implies that each firm produces equilibrium quantity

$$q_{i,t}^* = q_{n_t} = \frac{1}{n_t + 1} \frac{a - c}{b}, \quad \forall i \geq 1, t \geq 0.$$

Thus the equilibrium profit per firm equals

$$\pi_{n_t} = \frac{1}{b} \frac{(a - c)^2}{(n_t + 1)^2}. \quad (4)$$

Finally, the consumer surplus equals

$$CS_{n_t} = \int_0^{Q_{n_t}^*} (a - bQ - P_{n_t}^*) dQ = \frac{(a - c)^2}{2b} \cdot \frac{n_t^2}{(n_t + 1)^2}, \quad (5)$$

and the producer surplus is

$$PS_{n_t} = n_t \cdot \pi_{n_t} = \frac{(a-c)^2}{b} \cdot \frac{n_t}{(n_t+1)^2}. \quad (6)$$

Notice that the equilibrium values for  $P_n$ ,  $Q_n$ ,  $\pi_n$ ,  $CS_n$ , and  $PS_n$ , only depend on the number of firms in the market,  $n \geq 1$ .

## B Proofs

### B.1 Proof of Lemma 1

A takeover reduces the number of firms in period  $t$  from  $n_{t-1}$  to  $n_t = n_{t-1} - 1$ . Thus, the profit for the predator firm is

$$\frac{1}{1-\delta} \Delta \pi_t = \frac{1}{1-\delta} \frac{1}{b} \left[ \frac{(a-c)^2}{n_{t-1}^2} - \frac{(a-c)^2}{(n_{t-1}+1)^2} \right].$$

So

$$\frac{1}{1-\delta} \Delta \pi_t = \frac{1}{1-\delta} \frac{(a-c)^2}{b} \frac{(2n_{t-1}+1)}{n_{t-1}^2 (n_{t-1}+1)^2}.$$

Then

$$\frac{\partial \Delta \pi_t}{\partial n_{t-1}} = -2 \frac{(a-c)^2}{b} \frac{3n_{t-1}^2 + 3n_{t-1} + 1}{n_{t-1}^3 (n_{t-1}+1)^3} < 0.$$

Thus, the profitability of a takeover is strictly decreasing in the number of firms,  $n_{t-1}$ .

### B.2 Proof of Lemma 2

In a duopoly, the profit of the predator firm in a duopoly is  $\pi_2$ . After a takeover, it obtains monopoly profit  $\pi_1$ . Thus, the predator prefers to do the takeover if

$$\frac{\pi_1 - \pi_2}{1-\delta} - R \geq \pi_2. \quad (7)$$

By (4), this condition is equivalent to

$$R \leq \frac{1}{36} \frac{(a-c)^2}{b \cdot (1-\delta)} \equiv R_2.$$

### B.3 Proof of Proposition 1

Suppose that there are currently  $n$  firms in the market. Suppose also that, once there are  $n-1$  firms, takeovers happen until there are  $m$  firms left in the market. Then, a

takeover that takes the market from  $n$  to  $n - 1$  firms is optimal if and only if

$$\frac{\delta^{n-m-1}}{1-\delta}\pi_m + \sum_{k=m+1}^{n-1} \delta^{n-k-1}\pi_k - \sum_{k=m+1}^n \frac{1}{1-\delta}\delta^{n-k}\pi_k - \sum_{k=m+1}^n \delta^{n-k}R \geq \frac{1}{1-\delta}\pi_n.$$

Since  $\sum_{k=m+1}^n \delta^{n-k} = \frac{1-\delta^{n-m}}{1-\delta}$ , this is equivalent to a value of the takeover  $V_{n,m}$  which must satisfy

$$V_{n,m} \equiv \frac{\delta^{n-m-1}}{1-\delta^{n-m}}\pi_m + \frac{1-\delta}{1-\delta^{n-m}} \sum_{k=m+1}^{n-1} \delta^{n-k-1}\pi_k - \frac{1}{1-\delta^{n-m}} \sum_{k=m+1}^n \delta^{n-k}\pi_k - \frac{1}{1-\delta^{n-m}}\pi_n \geq R. \quad (8)$$

Note that we have

$$V_{n,m} = \frac{1-\delta}{1-\delta^{n-m}} \left( \frac{\pi_{n-1} - 2\pi_n}{1-\delta} \right) + \delta \frac{1-\delta^{n-m-1}}{1-\delta^{n-m}} V_{n-1,m} \quad (9)$$

and

$$V_{n,m-1} = \frac{(1-\delta)\delta^{n-m}}{1-\delta^{n-m+1}} \left( \frac{\pi_{m-1} - 2\pi_m}{1-\delta} \right) + \frac{1-\delta^{n-m}}{1-\delta^{n-m+1}} V_{n,m}. \quad (10)$$

**Claim 1** *For each  $n$ , if there are  $n$  firms in the market, the current takeover is optimal if and only if  $V_{n,1} \geq R$ .*

**Proof.** For each  $n$ , (10) implies that  $V_{n,m}$  is a convex combination of  $\frac{\pi_{m-1} - 2\pi_m}{1-\delta}$  and  $V_{n,m}$ . Since  $V_{n,n-1} = \frac{\pi_{n-1} - 2\pi_n}{1-\delta}$  and  $\frac{\pi_{m-1} - 2\pi_m}{1-\delta}$  is decreasing in  $m$  as long as  $\frac{\pi_{m-1} - 2\pi_m}{1-\delta} \geq 0$ , if  $V_{n,m} \geq 0$  for some  $m$ , then  $V_{n,1} \geq V_{n,m}$  for all  $m$ . ■

Thus, a takeover happens if and only if  $V_{n,1} \geq R$ . Therefore, the threshold exists if (i)  $V_{n,1}$  is decreasing in  $n$  while  $V_{n,1}$  is positive, (ii) if  $V_{n,1}$  is negative, then it will be negative for all  $n' \geq n$ , and (iii)  $V_{n,1}$  is negative for sufficiently large  $n$ . The following two claims establish the result.

**Claim 2**  *$V_{n,1}$  is decreasing in  $n$  as long as  $V_{n,1} \geq 0$ , and once  $V_{n,1} \leq 0$ , then  $V_{n',1} \leq 0$  for all  $n' \geq n$ .*

**Proof.** (9) implies that  $V_{n,1}$  is a convex combination of  $\frac{\pi_{n-1} - 2\pi_n}{1-\delta}$  and  $V_{n-1,1}$ . Since  $V_{2,1} = \frac{\pi_1 - 2\pi_2}{1-\delta}$  and  $\frac{\pi_{n-1} - 2\pi_n}{1-\delta}$  is decreasing in  $n$  as long as  $\frac{\pi_{n-1} - 2\pi_n}{1-\delta} \geq 0$ , the result holds. ■

**Claim 3** *For any parameter values, we have  $V_{4,1} < 0$  and hence  $\bar{n}_R \leq 3$ .*

**Proof.** By (4), the sign of  $V_{4,1}$  equals

$$\begin{aligned} & \text{sign} \left( \delta^{4-2} \frac{1}{(1+1)^2} + (1-\delta) \sum_{k=2}^{4-1} \delta^{4-k-1} \frac{1}{(k+1)^2} - \sum_{k=2}^4 \delta^{4-k} \frac{1}{(k+1)^2} - \frac{1}{(4+1)^2} \right) \\ &= \text{sign} \left( \frac{1}{36} \delta \left( 1 - \frac{1}{2} \delta \right) - \frac{7}{400} \right). \end{aligned}$$

Since  $\max_{0 \leq \delta \leq 1} \delta \left( 1 - \frac{1}{2} \delta \right) \leq \frac{1}{2}$ , we have  $\frac{1}{36} \delta \left( 1 - \frac{1}{2} \delta \right) - \frac{7}{400} \leq \frac{1}{36} \times \frac{1}{2} - \frac{7}{400} < 0$  and hence  $V_{4,1} < 0$ . ■

## B.4 Proof of Lemma 3

A firm will enter the market as long as

$$\sum_{\tau=0}^{\infty} \delta^{\tau} \cdot \pi_{i\tau} - K \geq 0.$$

Given  $n$  firms (constant over time given no takeovers) and Cournot competition, this means  $\pi_n / (1 - \delta) \leq K$ , or equivalently

$$\frac{1}{1 - \delta} \frac{1}{b} \frac{(a - c)^2}{(n + 1)^2} \geq K.$$

Since the former monopolist is already in the market, we have

$$n^f = \lfloor \sqrt{\frac{(a - c)^2}{(1 - \delta) b K}} \rfloor - 1$$

and  $n^f$  is decreasing in  $K$ .

## B.5 Proof of Proposition 2

By Proposition 1, for  $n^f \geq \bar{n}_R - 1$ , the market is stable and  $n_1 = n_2 = \dots$ . Then, by Lemma 3,  $n^f$  firms enter the market.

Suppose  $n^f \leq \bar{n}_R - 1$ . We have  $n^{f*} \leq \bar{n}_R - 1$ . To see why, if more than  $\bar{n}_R - 1$  firms enter, then the total number of firms exceeds  $\bar{n}_R$  and the market is stable. Given  $n^f \leq \bar{n}_R - 1$ , an individual firm obtains a less profit than  $K$ .

We next show that  $n^{f*} \geq n^f$ . Since  $n^f$  is a threshold for  $\pi_{n+1} / (1 - \delta) \leq K$  (see Appendix B.4), it suffices to show that the entrant's profit is higher if a takeover happens than if the market is stable.

Suppose  $n - 1$  firms enter and hence the total number of firms in the market originally is  $n$ . When the market is stable,  $n_t = n$  for all  $t$ . By contrast, suppose a firm is taken over in period  $k \leq n - 1$ . Since the firm is paid  $\pi_{n_k} / (1 - \delta)$  upon a takeover, its payoff is as if it competes in the market with  $n_1 = n - 1$ , ...,  $n_{k-1} = n - k + 1$ , and  $n_t = n - k$

for all  $t \geq k$ . Since  $n_t < n$  for all  $t$  and  $\pi_{n_t}$  is decreasing in  $n_t$  by (4), its profit is higher than the case in which the market is stable at  $n_t = n$  for all  $t$ . Since this comparison holds for all possible  $k = 1, \dots, n - 1$ , the profit is higher if a takeover happens.

## B.6 Proof of Proposition 3

If  $n^f \leq \bar{n}_R - 1$ , by Proposition 1, the market is stable and  $n_1 = n_2 = \dots = n^f + 1$ . Thus, the policymaker chooses to implement the pro-competitive policy if  $\frac{1}{1-\delta}(CS_{n^f+1} + PS_{n^f+1} - CS_1 - PC_1) - n^f \cdot K \geq 0$ . Given the derivations in Section A, this is equivalent to

$$\frac{1}{1-\delta} \frac{(a-c)^2}{2b} \cdot \frac{(n^f+1)(n^f+3)}{(n^f+2)^2} - n^f \cdot K \geq \frac{1}{1-\delta} \frac{3(a-c)^2}{8b}. \quad (11)$$

The entrant earns a profit no less than  $K$  upon entry if  $n \leq n^f$ , so we have

$$\frac{1}{1-\delta} \frac{1}{b} \frac{(a-c)^2}{(n^f+2)^2} \geq K,$$

and

$$\begin{aligned} & \frac{1}{1-\delta} \frac{(a-c)^2}{2b} \cdot \frac{(n^f+1)(n^f+3)}{(n^f+2)^2} - n^f \cdot K \\ & \geq \frac{1}{1-\delta} \frac{(a-c)^2}{2b} \cdot \frac{(n^f+1)(n^f+3)}{(n^f+2)^2} - n^f \cdot \frac{1}{1-\delta} \frac{1}{b} \frac{(a-c)^2}{(n^f+2)^2}. \end{aligned}$$

Thus, a sufficient condition for (11) is

$$\frac{1}{1-\delta} \frac{(a-c)^2}{2b} \cdot \frac{(n^f+1)(n^f+3)}{(n^f+2)^2} - \frac{1}{1-\delta} \frac{(a-c)^2}{b} \frac{n^f}{(n^f+2)^2} \geq \frac{1}{1-\delta} \frac{3(a-c)^2}{8b}.$$

This simplifies

$$(n^f)^2 + 4n^f \geq 0.$$

Thus, (11) holds for all  $n^f \geq 1$ .

If  $n^f \leq \bar{n}_R - 1$ , by Proposition 1, takeovers happen every period under the pro-competitive policy, starting with  $n^{f*}$  entrants in period 0.

Since Claim 3 implies  $\bar{n}_R \leq 3$ , we analyze the following two cases:  $n^{f*} = 1, 2$ .

For  $n^{f*} = 1$ , one firm enters and that firm is acquired at the beginning of period 1. Thus, the social welfare under deregulation minus the social welfare under monopoly equals

$$\Delta^{SW} = \delta \frac{CS_1 + PS_1}{1-\delta} + (CS_2 + PS_2) - K - \frac{CS_1 + PS_1}{1-\delta}. \quad (12)$$

By Proposition 2, we have  $n^f \leq n^{f*}$  and hence  $\frac{PS_3}{3(1-\delta)} < K$ . Thus,

$$\begin{aligned}\Delta^{SW} &\leq CS_2 + PS_2 - \frac{1}{3(1-\delta)}PS_3 - (CS_1 + PS_1) \\ &= \frac{1}{2b}2\frac{(a-c)^2}{(2+1)^2}(2+2) - \frac{1}{3(1-\delta)}\frac{1}{b}3\frac{(a-c)^2}{(3+1)^2} - \frac{1}{2b}\frac{(a-c)^2}{(1+1)^2}(1+2) \\ &= -\frac{1}{144b(1-\delta)}(a-c)^2(10\delta-1).\end{aligned}$$

For  $n^{f*} = 2$ , the social welfare under deregulation minus the social welfare under monopoly equals

$$\Delta^{SW} = \delta^2\frac{CS_1 + PS_1}{1-\delta} + \delta(CS_2 + PS_2) + (CS_3 + PS_3) - 2 \cdot K - \frac{CS_1 + PS_1}{1-\delta}.$$

By Proposition 2, we have  $n^f \leq n^{f*}$  and hence  $\frac{PS_4}{4(1-\delta)} < K$ . Thus, given Section A,

$$\begin{aligned}\Delta^{SW} &\leq \delta(CS_2 + PS_2) + (CS_3 + PS_3) - \frac{2}{4(1-\delta)}PS_4 - (1+\delta)(CS_1 + PS_1) \\ &= \delta\frac{1}{2b}2\frac{(a-c)^2}{(2+1)^2}(2+2) + \delta\frac{1}{2b}3\frac{(a-c)^2}{(3+1)^2}(3+2) \\ &\quad - \frac{2}{4(1-\delta)}\frac{1}{b}4\frac{(a-c)^2}{(4+1)^2} - (1+\delta)\frac{1}{2b}1\frac{(a-c)^2}{(1+1)^2}(1+2) \\ &= -\frac{1}{7200b(1-\delta)}(a-c)^2(3875\delta^2 - 6575\delta + 3276).\end{aligned}$$

Since  $3875\delta^2 - 6575\delta + 3276 > 0$  given  $6575^2 - 4 \cdot 3875 \cdot 3276 < 0$ , this is negative. Therefore, the social welfare under deregulation is strictly less than the social welfare under monopoly.

## B.7 Proof of Proposition 4

Consider the following electoral model. At the end of period 0, there is an election where a voter decides whether to keep the current Legislator or to replace her with an identical legislator. The voter's utility is given by the consumer surplus:

$$u_t^v = CS_{n_t}. \quad (13)$$

The voter acts retrospectively, with her reference utility being that under the status quo monopoly policy at the beginning of period  $t$ . Therefore, the voter reelects the legislator if

$$CS_{n_0} > CS_1. \quad (14)$$

An office-motivated Legislator chooses the policy that will maximize her probability of re-election. The retrospective voter compares her period 0 utility (the consumer surplus) under the Legislator's policy to the consumer surplus under the monopoly status quo at the beginning of period 0. Then, the Legislator will be re-elected if and only if she implements the pro-competitive policy, since

$$\int_0^{Q^*} (a - bQ - P^*) dQ > \int_0^{Q^M} (a - bQ - P^M) dQ. \quad (15)$$

. Thus, the office-motivated Legislator always chooses the pro-competitive policy in period 0 and is re-elected.

## B.8 Proof of Proposition 5

Consider the case when the policymaker also enforces antitrust and places relative weight  $\alpha$  on rents  $R$  and weight  $(1 - \alpha)$  on the social surplus generated by the policy. The problem for the policymaker then reduces to choosing the pro-competitive policy whenever

$$\begin{aligned} \alpha \cdot R + (1 - \alpha) \cdot \left[ \sum_{t=0}^{n^{f^*}-1} \delta^t \frac{1}{2} \frac{(a-c)^2}{b} \frac{n_t^2}{(n_t+1)^2} + \frac{1}{b} \frac{(a-c)^2}{(n_t+1)^2} - \frac{1}{1-\delta} \frac{1}{b} \frac{(a-c)^2}{(n_t+2)^2} \right] \\ > (1 - \alpha) \cdot \frac{1 - \delta^{n^{f^*}}}{1 - \delta} \frac{3}{4} \frac{(a-c)^2}{2b}. \end{aligned}$$

Then, as  $\alpha \rightarrow 1$  (the policymaker is self-interested), the inequality is satisfied whenever  $R > 0$ .