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 induced 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 that the policy induces in response. 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 the actions of others means that policy outcomes are not realized instantaneously, rather they develop progressively over time. As private citizens and bureaucrats 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 today must allow for the actions of their colleagues and successors in legislatures and bureaucracies 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.[1] 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. 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. Our model omits much that is important in practice and it is not intended as a literal description of reality. Yet, by integrating politics and markets into the one framework, we can begin to understand when the dynamic force of each wins

[1] 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.

out. Successful policy 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. More work is necessary to complete our understanding of this dynamic and we hope that this paper leads to further investigations.

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.'[2] We argue that behavioral responses to policy are more broadly relevant to policymaking 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 obscure 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.[3] This connection underlies the important work of Kim (2017) on trade policy. Kim presents the striking fact that much of the variation in

[2] 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.

[3] 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.

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) 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 Limitations of Policy Instruments: The heart of our analysis is that the initial legislator has an imperfect ability to shape the actions of private citizens and bureaucrats. If the policymaker had broader tools available, specifically the ability to write precise and contingent legislation—a complete contract, in the economics parlance—she could avoid the subversive efforts of profit-maximizing firms and self-interested or constrained bureaucrats. For instance, by placing stringent conditions on takeovers or banning them outright, a legislator can better control the evolution of market structure.

This inability of the policymaker resonates with, but is distinct from, the problem of commitment in politics (Acemoglu, 2003). The legislator in our model chooses policy only once and, thus, commitment is not an issue. Rather, it is her indirect control over outcomes, and the actions of private citizens and bureaucrats in response to her policy change, that leads to the non-monotonic path of outcomes over time.

The difficulty of completely specifying contracts in market settings are well-known, and these limitations are magnified in the writing of legislation. Nevertheless, in situations where more precise legislation is possible, our model suggests the issues that a benevolent legislator must address. We note, however, that for an electorally-motivated legislator, the path of policy failure we characterize is a feature and not a bug. That the limited policy instrument increases her chances of reelection makes the limited policy instrument more, not less, attractive. We take up this and the question of institutional design in Section 3.4.3.

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 up to a market size of 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 $n_0 \leq N$. We assume that a firm enters if it is indifferent.

Market competition. The firms in the market compete in each period $t = 0, 1, 2, 3, ...$ Each firm simultaneously chooses a quantity to take to market (known as Cournot competition).[4] Firm i takes q_{it} to market in period t and the total quantity is $Q_t = \sum_i q_{it}$. The

[4]For clarity, we present the results in the context of symmetric Cournot competition. The insights of the model hold more broadly, and the proofs we provide in the appendix are done under more general market

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, at the end of 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.[5] Moreover, if one offer is rejected, the predator firm loses the ability to make takeover offers again.[6] A rejection implies, therefore, that the market structure remains constant thereafter. Denote by $n_t \leq n_0 \leq N$ 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 falls under the banner of antitrust or competition policy. We model a bureaucrat who is amenable to political pressure. Specifically, we suppose that the bureaucrat will approve a takeover application upon the firm paying lobbying cost R_n when there are n firms in the market, otherwise

conditions. Throughout the paper we note properties of Cournot that are general and those that are not. We discuss robustness and generality in Section 4.1.

[5]The firms are identical other than for the predator, so the identity of the takeover target is immaterial.

[6]This is equivalent to assuming that all firms expect that the predatory firm will make an offer to the same firm forever until the offer is accepted.

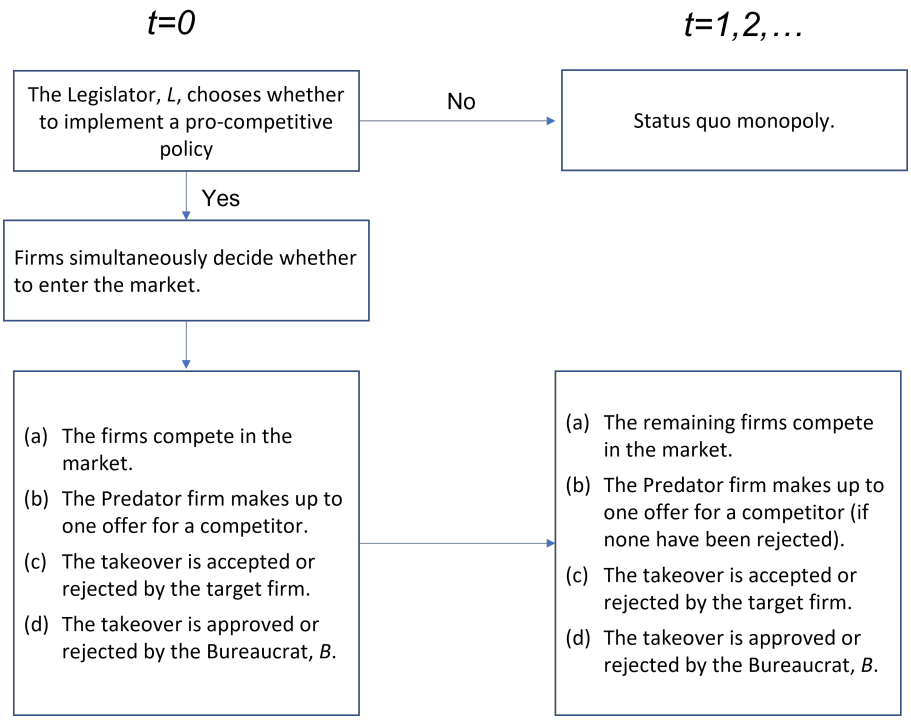

Figure 1: Timing of Policy and Market Actions

he will reject it. We assume only that the function R_n not decrease too rapidly in n.[7] We do not require that the Bureaucrat receives the payment R_n, only that the predator firms pays it (we allow for both possibilities in later results). Modeling the lobbying costs in this reduced form way allows us to focus on the strategic logic of the Legislator, L, which is our main interest here. In Section 4.1 we consider how the lobbying cost may be endogenized.[8]

Political preferences, timing, and equilibrium. The motivations of policymakers are potentially diverse, and typically combine elements of social welfare, self-interest, and ideol-

[7] A sufficient condition is that $(1-\delta)(R_n - R_{n+1}) \leq \delta\pi_{n-1} - (1+2\delta)\pi_n + (1+\delta)\pi_{n+1}$. The right hand side is positive given Cournot competition, as shown in Auxiliary Lemma 1 of the Online Appendix. This requirement is an analytic convenience rather than a fundamental requirement. The underlying logic of our result still applies even if the condition does not hold. In this case, the market may not retreat all the way back to monopoly when policy fails, rather it will stop at an intermediate level of competition. We discuss this alternative case in Section 4.1.

[8] We do not take a stand on the motivations of the Bureaucrat. He may be self-interested or he may be publicly-minded but subject to influence or pressure from other parts of the political system, or some mix of the two. We return to the motivations of the policymakers in Section 3.4.3.

ogy. 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 Markov Perfect Equilibrium to this game, where the payoff-relevant states are (i) the number of firms in the market and (ii) whether the predator firm's offer has ever been rejected (by assumption, one rejection ends predation). 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.

Remark about 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 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 a market with n_t total firms is:

$$\underbrace{\pi^i_{n_t}}_{\text{profit}} = \underbrace{q^i_{n_t}}_{\text{quantity}} \underbrace{\left[a - b\left(\sum_{j \neq i} q^j_{n_t} + q^i_{n_t}\right)\right]}_{\text{price}} - \underbrace{cq^i_{n_t}}_{\text{production cost}}.$$

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

$$q^*_{n_t} = \left(\frac{a-c}{b}\right) \cdot \left(\frac{1}{n_t+1}\right) \text{ for all } i = 1, ..., n_t. \tag{1}$$

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

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

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:

$$\pi^*_{n_t} = \frac{(a-c)^2}{b} \cdot \left(\frac{1}{n_t+1}\right)^2. \tag{2}$$

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, 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

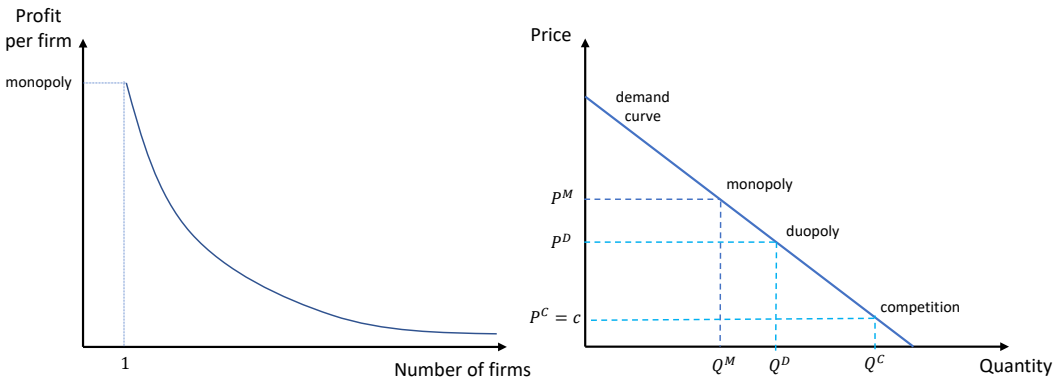

Figure 2: Market Competition, (i) profit per firm, and (ii) market equilibrium.

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 lobbying cost is a fixed amount (that varies in n). 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 thereafter face $(n_0 - 2)$ competitors. 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 so long as the lobbying cost does not decrease too rapidly in n. 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.[9] 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 $\overline{R}_2$, 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 $R_2 \leq \overline{R}_2$, where $\overline{R}_2 > 0$.*

[9]For $n_0 = 2$, the calculation in Lemma 1 forms a proper subgame of our model.

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

The threshold $\overline{n}_R$ is a function of the political influence cost, $\{R_n\}_n$.[10] As the costs of political influence increase, the profitability of takeovers decreases, $\overline{n}_R$ decreases and, therefore,

[10]The specific assumptions of our model (Cournot competition, linear demand, etc.) imply the bound $\overline{n}_R \leq 3$. More general market competition structures generate larger values of $\overline{n}_R$. As we see this specific combination of market features as only one example, illustrative of the general possibilities, we state the proposition more generally (and prove the result in greater generality in the Appendix). We discuss these possibilities in Section 4.1.

competition is sustainable with a smaller number of firms. The next corollary compares the level of sustainable competition, $\overline{n}_R$, under two different sequences of political influence costs, $\{R_n\}_n$ and $\{R'_n\}_n$. If R_n is higher than R'_n for all n, that is, if the political influence costs are higher with $\{R_n\}_n$ regardless of the number of firms in the market, then $\overline{n}_R$ is lower with $\{R_n\}_n$.

Corollary 1 *Take any $\{R_n\}_n$ and $\{R'_n\}_n$ such that $R_n \geq R'_n$ for all n. Then, $\overline{n}_R$ under $\{R_n\}_n$ is no more than $\overline{n}_R$ under $\{R'_n\}_n$.*

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.

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.[11]

Lemma 3 *If takeovers are prohibited, n_f firms will compete in the market, where n_f is decreasing in the cost of entry, K.*

[11] This is a classic result in industrial organization; see Mankiw and Whinston (1986).

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, $\overline{n}_R$, from Proposition 1.

If the free-market entry level, n_f, exceeds the threshold, $\overline{n}_R$, 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 $\overline{n}_R$, 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 $n_f > \overline{n}_R$, n_f firms enter the market and competition is stable.
(ii) If $n_f \leq \overline{n}_R$, n_f^* firms enter, where $n_f \leq n_f^* \leq \overline{n}_R$, and competition backslides to monopoly.

Case (ii) represents the situation when takeovers occur and describes 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 the total producer surplus would be if the policy 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.

Figure 3 depicts the possible paths of market competition. Suppose the political influence cost is constant in n: $R_n = R$ for all n. For low R the threshold $\overline{n}_R$ is high and initial entry is excessive, given by the gap between the free-market entry level, n_f, and the actual market entry level, n_f^*. This initially high level of competition progressively unravels over time as the predator acquires its competitors, ultimately arriving at monopoly. For high R, in contrast, $\overline{n}_R$ is lower and competition proves stable, yielding initial entry only at the free-market level, n_f. Parallel to these changes in market structure is bifurcation of lobbying behavior. In the stable high $\overline{n}_R$ industry, there is no lobbying, whereas in the low $\overline{n}_R$ industry, lobbying begins almost immediately and occurs continuously until the predator has acquired all of its competition and is a monopolist.

It is striking that throughout both the stability of case (i) and the unraveling of case (ii), 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 persist. That is up to the firms themselves. Proposition 2 shows that the reaction of firms may not be with the same intention. In case (i) firms enter expecting to compete indefinitely, whereas in case (ii) they expect to be acquired (or acquire others) and shortly exit the market. In both cases, however, the motivation remains the same of profit maximization. It is striking that the ultimate failure of the policy to embed market competition in case (ii) not only does not

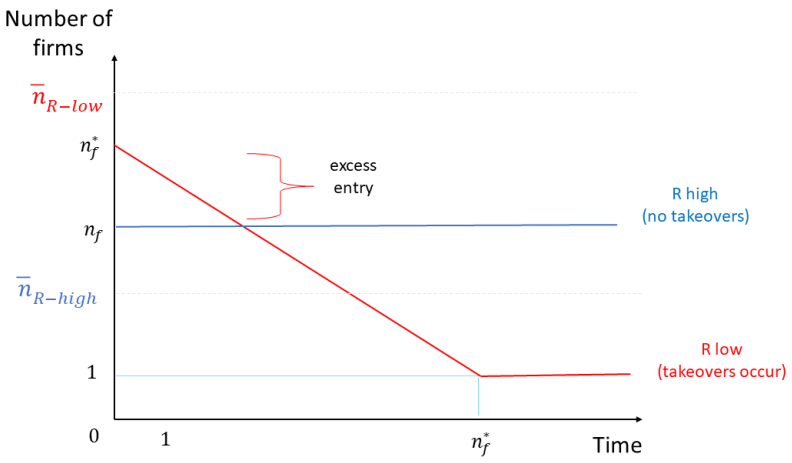

Figure 3: Market Evolution for High (in blue) and Low (in red) Lobbying Costs.

deter entry, it actually 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. Recall that the Legislator moves first and then entry happens. 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.[12]

[12]This proposition assumes that the rent R_n is not wasteful. If it is, it further lowers the social welfare under the failed competitive policy and a social welfare maximizing Legislator does not implement the pro-competitive policy if $n_f \leq \overline{n}_R$.

Proposition 3 *A social welfare maximizing Legislator will implement the pro-competitive policy if and only if* $n_f > \overline{n}_R$. *Implementing the pro-competitive policy when* $n_f \leq \overline{n}_R$ *delivers strictly lower social welfare than the status quo for the linear Cournot model if* $\delta > 0.1$. *A sufficient condition for the result to hold for general market structures is that* $\pi_{n_f}/(1-\delta) - K$ *is close to zero.*

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 for the linear Cournot model with a minimum requirement for the discount factor.[13] The excess entry for the rent seeking opportunity 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.

[13]Since the consumer benefits from entry in the short run, the requirement on the discount factor is not surprising

The sufficient condition for market structures beyond linear-Cournot requires that the profit of entering firms is sufficiently close to zero. Absent integer effects, this condition is always satisfied in equilibrium as the marginal profit of entry must be zero (recall that the expected profit of a firm that does not enter must be negative). When this condition holds, the proof of Proposition 3 is relatively straightforward. If the profit of the last-entering firm is too far from zero (and the integer effect significant), the proof of the result becomes tedious and, for some market conditions may not hold.[14]

It is important to note that Proposition 3 implies the pro-competitive policy is inefficient when $n_f \leq \overline{n}_R$ even though the Legislator is socially motivated. A benevolent Legislator cannot ensure 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. The Legislator anticipates the failure of the pro-competitive policy and, thus, optimally forgoes a policy opportunity even though 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.[15] Specifically, let there be an election after firms have entered and

[14]The intuition is that the integer effect can be so substantial that inefficiently few firms enter and that excess entry mitigates this effect.

[15]We formalize the details of this extension in the appendix, although the logic is straightforward.

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.[16]

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 have no lasting impact, the policy initially seems like a success. This burst of competition ensures the Legislator's reelection when voters evaluate policy retrospectively.[17]

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.

[16] 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.

[17] We presume that the median voter either does not own a sufficient share of the original monopolist firm that outweighs the lower price she pays, or that she disconnects her investment (likely, retirement) account from everyday expenses in her voting decision. The former is a reasonable description of the United States, and the latter may very well be true were it not.

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.[18]

[18]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.

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.[19] 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 that rises and then falls may deliver the best of both worlds to the Legislator.[20]

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.[21]

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

[19] To avoid excessive complication to the model of multiple elections, we keep this discussion informal although the extension described is straightforward.

[20] 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.

[21] 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 comes 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, and that often requires mergers and takeovers.

to political pressure. To the extent that some fraction of the lobbying expense, R_n, 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 $n_f \leq \overline{n}_R$ when he also enforces policy.*

This result leads us to the question of how the lobbying costs, R_n, 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_n 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.

4 Discussion

4.1 The Structure of Market and Political Competition

The model we analyze is deliberately simple, both for tractability and clarity. The fundamental insights do not depend on this simplification, and in this section we explore several variations and generalizations of the model.

Symmetric Cournot Competition. We have considered a particularly simple form of market competition, with linear demand, constant production costs (zero, in fact), and symmetric competition. This last assumption is important as it implies the predator firm obtains no advantage over its remaining competitors from an acquisition. This can be seen as a benchmark and, indeed, is a particularly demanding one. In practice, the predator

will grow larger than its competitors from an acquisition. This is essentially unavoidable if there are scale economies in the industry or if the acquisition includes physical plant and infrastructure, or of a competitor with particular geographic coverage (e.g., airlines). When this is the case, an acquisition is *more* profitable for the predator as it captures a larger share of the higher industry profits that arise from consolidation.

This matters for the threshold $\overline{n}_R$ that determines whether competition is stable in a market or whether it backslides to monopoly. As we note in footnote 10, the particular combination of assumptions in our model bound $\overline{n}_R$ to be no larger than three. If we relax the requirement of symmetric competition, this bound will also relax. To establish this point, in the proofs of our results we work with one general payoff function for the predatory firm, $\hat{\pi}_n$, and another general payoff function for the other firms, π_n, thereby allowing for asymmetry in competition. As we show in the appendix—see Auxiliary Lemma 1—all that is required for Proposition 1 is that the benefit of an acquisition declines in the number of firms in the market.

The generality of the proofs, in particular Auxiliary Lemma 1, also implies that the logic of our results hold for different styles of market competition. If competition is instead Bertrand competition with differentiated products, Stackleberg, or if market price is set in some other way, then as long as Auxiliary Lemma 1 holds and market power increases in market concentration, our results will continue to hold.[22]

Predators and Acquisitions. Another simplifying assumption is that there is a single predator and that takeovers end with a single rejection. If either of these assumptions is relaxed, the price paid in takeovers will increase. Adding a second predator creates competition between them, shifting bargaining power to the target firms. Similarly, allowing

[22]Bertrand competition with homogeneous products and symmetric costs presents a problem of commitment as the entry cost is sunk and profit is zero other than in monopoly. A different bargaining structure between the predator and target firms would avoid this problem. See the following discussion point.

bargaining to be an ongoing process (that doesn't end with a rejection) empowers the target firm to hold out for a higher price later, giving it more ability to extract a higher price from a predator today. Both of these changes would lead to more entry into the market.

In contrast, however, spreading out the monopoly rents to the target firms makes takeovers less attractive to a predator firm and lowers the threshold $\overline{n}_R$. Uncertainty over which of the predator firms is ultimately victorious and obtains monopoly rents will lower the threshold further. Counter-intuitively, therefore, making predatory takeovers easier by empowering more firms will actually make the pro-competitive policy more likely to succeed.

Lobbying costs. Our results hold for lobbying costs that may vary in the number of firms as long as the costs do not decrease too rapidly in competition. How the costs vary in practice is an open question. A reasonable argument is that the costs increase as a market becomes more concentrated, particularly as it approaches monopoly. The antitrust literature presents many examples of competition regulators reluctant to approve "mergers-to-monopoly" (Mermelstein et al., 2020) and so we would expect influence costs for such mergers to be high. This relationship is consistent with the empirical pattern that lobbying expenditures increase in market concentration (Bombardini and Trebbi, 2020; Cowgill, Prat and Valletti, 2021).[23]

The underlying logic of our model continues to hold even if the increase in lobbying cost is particularly sharp as the industry approaches monopoly (as we note in footnote 7). In this case, the predator may be willing to engage in early takeovers but not find it worth the cost to move from oligopoly to monopoly, and the unwinding process will stop at a lower, but not monopoly, level of competition. In such a situation, policy may fail but the degree of failure will not be complete. This prospect will feed back to the market entry decision as the chance of being acquired and receiving a high price as one of the final acquisitions

[23]This pattern is evident also in recent theoretical results (Callander, Foarta and Sugaya, 2022; Cowgill, Prat and Valletti, 2021).

disappears. In turn, the prospect of stopping short of monopoly profits will leave a predator less inclined to engage in unprofitable early takeovers, lowering the threshold $\overline{n}_R$.

In the influential lobbying model of Grossman and Helpman (1994) it is the policymaker who holds the bargaining power, and the cost of influence is a function of the firms' willingness to pay rather than imposed exogenously. Such a formulation is possible within our framework and would be an interesting extension. That said, there is good reason to think such an auction mechanism is less applicable in the context of competition policy. In trade policy, as in many other policy domains, it is difficult for firms from different industries and segments of society to collude together so as to weaken the bargaining power of the policymaker. Such firms do not have the ongoing relationship that can facilitate collusion, and in the short run, they would find it difficult to commit to the necessary transfers to share the rents, particularly if, as in Grossman and Helpman (1994), the awarding of political protection is a single-winner auction. Both of these problems are mitigated in competition policy. Not only are the predator and target firms literally binding themselves together into a single entity over time, they can explicitly negotiate transfers between them within the acquisition price.

Endowing the Bureaucrat with all of the bargaining power also creates a commitment problem. Because the Bureaucrat can then extract the profits of the final takeovers to monopoly, the predator would be unwilling to engage in early unprofitable takeovers, thereby lowering the threshold $\overline{n}_R$. The threshold would remain the same, or perhaps increase, if the predator and Bureaucrat can find a way to share rents across time. If they could, the Bureaucrat would, perversely, subsidize early unprofitable takeovers to shape market competition into a form so that he could extract excess rents as the industry approaches monopoly.

4.2 Policy Failures and Institutional Solutions

The contribution of our model is to provide an explanation for a particular type of policy failure *and* conditions that ensure it won't happen. It is an unfortunate reality that examples of pro-competitive policies that generated a burst of competition only to revert to monopoly are not difficult to find. From the classic example of AT&T, to airline deregulation in the U.S. and elsewhere, to energy deregulation in Australia, many industries in many countries have followed the same non-monotonic path.

Within the confines of the model, the explanation is that electorally-minded legislators benefit from the non-monotonic path and that they choose pro-competitive policies not despite their inevitable failure but because of it.

An alternative explanation, outside of our model, is that policymakers are socially-minded but simply have made mistakes (again and again). Perhaps surprisingly, there seems to be truth to this rationale. The evidence for policy failures as mistakes is clearest in the history of airline deregulation in the United States. The intent of the policy was very clearly to increase competition. As stated in the enacting statute itself, the goal of deregulation was "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)

Despite this, Alfred Khan, the MIT economist known informally as the 'father of airline deregulation' and who had predicted an increase in competition, was surprised by both the extent of new entry and its subsequent reversal: "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 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 (1988, p. 318).[24]

Although both events took Kahn by surprise, they are consistent with our model, particularly for an industry with such a large cost of entry and limited number of potential competitors. Yet the good news for Khan and other socially-minded policymakers is that pro-competitive policies can succeed. The history of the trucking industry in the United States is such an exemplar.[25] Notably, consistent with the predictor of policy success in our model, the entry costs into the trucking industry are considerably lower than into the airline industry, and the burst of entry following deregulation much larger.

Our model provides a framework with which to predict in which industries pro-competitive policies will succeed and in which industries they will fail (adjusted as necessary, of course, to fit to the market and regulatory context of each case). Moreover, our model suggests features of the institutional environment that will make it more likely that a pro-competitive policy succeeds. We consider several of the possibilities here.

Bureaucratic Structure & Processes. Our model formalizes the two stages necessary for effective policy change: The political will to change legislation and the willingness of the bureaucracy to enforce that change over time. This latter stage, in particular, requires the bureaucrat to resist political pressure.[26] 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.

[24] See also, "I doubt that most of us were fully prepared for the explosion of entry . . . of the last ten years." (Kahn, 1988, p. 316)

[25] As Feitler, Corsi and Grimm (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 ..." This explosion in competition has persisted to the present day and profit margins have remained low at just 3-5 percent (Costello, 2013, p. 198).

[26] 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)."

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_n), 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.[27]

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 20$^{\text{th}}$ 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_n that it takes to have a takeover approved. Other mechanisms to influence and manipulate R_n 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_n. 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_n.

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 mak-

[27]The selection of less self-interested individuals may also become easier.

ing 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-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 $\overline{n}_R$, the additional entry is sustainable, leading to policy success. This possibility reinforces our argument that economic variables matter for the practice of politics.

Final Remark. In addition to institutional features that can facilitate policy success, it is worth noting features that may appear promising but generate only a Pyrrhic victory. One such example, as noted in footnote 21, is to prohibit takeovers altogether. Although this would avoid the inefficient market unraveling identified in our model, it would block the efficient takeovers that are outside our model but occur frequently in practice. To avoid throwing out the baby with the bathwater, pro-competitive policies must provide specific standards for which takeovers are allowed and which are not, as we noted in the introduction.

This would require considerable expertise to be located within the legislative branch rather than the executive, in contrast to practice in the United States and many other countries.[28]

This highlights the complexity of the market-politics interaction and the trade-offs necessary in the design of competition policy. These challenges are clear to some policymakers but not all.[29] 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 highlights that implementing policy does not end the game and provides a first step toward understanding how the incentives of policymakers, both legislators and bureaucrats, interact with firms competing in markets.

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

[28] Howell and Moe (2016) provides a particularly forceful argument to this effect based on an agenda-setting argument.

[29] 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."

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."[30] This is a question to focus the minds of academics and, indeed, all citizens.

[30] Callander, Foarta and Sugaya (2022) explores the feedback loop between market and political power.

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Appendix

A Results from Section 3.1

a Market Equilibrium under Cournot Competition

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

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

Therefore, the problem for the firm in period t is to choose $q_{n_t}^i$ to maximize $\pi_{n_t}^i$, taking as given the quantities produced by the other firms:

$$q_{n_t}^i = \frac{a - b\sum_{j \neq i} q_{n_t}^j - c}{2b}. \tag{3}$$

Adding this condition up with respect to i yields

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

Solving this for the total quantity $\sum_{i=1}^{n_t} q_{n_t}^i$ 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 $\sum_{j \neq i} q_{n_t}^j = Q_{n_t} - q_{n_t}^i$, (3) implies that each firm produces

equilibrium quantity

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

Thus the equilibrium profit per firm equals

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

Finally, the consumer surplus equals

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

and the producer surplus is

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

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

b 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

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

So

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

Then, notice that $\Delta\pi_{n_t}$ is a decreasing function of n_{t-1}. Thus, the profitability of a takeover is strictly decreasing in the number of firms, n_{t-1}.

c Proof of Lemma 2

In a duopoly, the profit of the predator firm in a duopoly is π_2. After a takeover, it obtains monopoly profit π_1. Thus, the predator prefers to do the takeover if

$$\delta\frac{\pi_1-\pi_2}{1-\delta}-R_2\geq\delta\frac{\pi_2}{1-\delta}. \tag{7}$$

By (4), this condition is equivalent to

$$R_2\leq\frac{1}{36}\frac{\delta\cdot(a-c)^2}{b\cdot(1-\delta)}\equiv\overline{R}_2.$$

B Results from Sections 3.2-3.4

a General Market Properties

For the proofs to our main results, we allow more general payoff functions. In particular, we assume that, when there are n firms in the market, the payoff for the original monopolist is $\hat{\pi}_n$, the payoff for an entrant is π_n, and consumer surplus is CS_n. Note that PS_n is now $\hat{\pi}_n+(n-1)\pi_n$. We assume CS_n is increasing in n and both $\hat{\pi}_n$ and π_n are decreasing in n. With symmetric Cournot payoffs, the payoff functions satisfy two conditions, which will be summarized in two Auxiliary Lemmas. These lemmas provide general conditions on firm profit functions, consumer surplus, and producer surplus under which our results hold. In the proof of propositions, we will refer to those Auxiliary Lemmas but will not rely on the Cournot payoff structure. The mechanism of our model therefore does not rely on the

specifics of symmetry, Cournot competition, linear demand, constant marginal cost etc. Any market setting where the profit functions satisfy the conditions of our Auxiliary Lemmas will deliver the same results. The gist of these conditions is summarized intuitively below.

Auxiliary Lemma 1 provides conditions under which a predator that does not gain from acquiring a firm when there are m firms in the market will also not gain from acquiring a firm when there are more than m firms in the market. To arrive at this conclusion, we need to consider what happens when the predatory firm compares two options: not to make any acquisition versus to acquire one firm only. If this calculus indicates no acquisition when there are m firms, it must also indicate no acquisition when there are $m+1$ firms.

Auxiliary Lemma 2 states the standard results that having more firms in the market leads to lower producer surplus (the first condition of the lemma) but higher social welfare (the second condition of the lemma), ignoring firm entry costs. The final requirement is that the relative gain in consumer surplus from opening up a monopoly to a market of size m firms is lower than the total cost needed to sequentially make take-it-or-leave offers to acquire each of the m firms within one period, assuming no discounting by the firms.

As long as these conditions are satisfied, the proofs to all Propositions obtain.

b Auxiliary Lemmas

We establish two Auxiliary Lemmas which show that the firm profits, consumer surplus and producer surplus under Cournot competition satisfy two key properties. We will refer to these properties in the proofs of our results.

Auxiliary Lemma 1 *Suppose R_m is constant in m. Profit functions under symmetric Cournot competition satisfy the following relationship for each $m \geq 2$: If*

$\delta\left(\hat{\pi}_{m-1} - \hat{\pi}_m\right) - \pi_m - (1-\delta) R_m < 0$, *then* $\delta\left(\hat{\pi}_m - \hat{\pi}_{m+1}\right) - \pi_{m+1} - (1-\delta) R_{m+1} < 0$.

As will be evident from the proof, the conclusion is robust even if R_m depends on m, as long as the dependence is small, as stated in footnote **??**.

Proof. With constant $R_n = R$ for all n and symmetric payoffs, the conclusion of this auxiliary lemma is equivalent to "if $\delta\pi_{m-1} - (1+\delta)\,\pi_m - (1-\delta)\,R < 0$, then $\delta\pi_m - (1+\delta)\,\pi_{m+1} - (1-\delta)\,R < 0$."

If $\delta\pi_m - (1+\delta)\,\pi_{m+1} < 0$, then $\delta\pi_m - (1+\delta)\,\pi_{m+1} - (1-\delta)\,R < 0$ always holds. Otherwise, $\delta\pi_m - (1+\delta)\,\pi_{m+1} \geq 0$ implies $\delta \geq \frac{2m+m^2+1}{2m+3}$ with Cournot payoffs. Note that

$$\begin{aligned}(\delta\pi_{m-1} - (1+\delta)\,\pi_m) - (\delta\pi_m - (1+\delta)\,\pi_{m+1}) &= (\delta\pi_{m-1} + (1+\delta)\,\pi_{m+1} - (1+2\delta)\,\pi_m) \\ &= (1+2\delta)\,(a-c)^2 \left(\frac{\delta}{1+2\delta}\frac{1}{m^2} + \frac{1+\delta}{1+2\delta}\frac{1}{(m+2)^2} - \frac{1}{(m+1)^2}\right).\end{aligned}$$

Since $\frac{d}{d\delta}\left(\frac{\delta}{1+2\delta}\frac{1}{m^2} + \frac{1+\delta}{1+2\delta}\frac{1}{(m+2)^2}\right) = \frac{4}{m^2(1+2\delta)^2}\frac{m+1}{(m+2)^2} > 0$, it suffices to prove that the last term is positive given $\delta = \frac{2m+m^2+1}{2m+3}$. Simple algebra leads to

$$\left.\frac{\delta}{1+2\delta}\frac{1}{m^2} + \frac{1+\delta}{1+2\delta}\frac{1}{(m+2)^2} - \frac{1}{(m+1)^2}\right|_{\delta=\frac{2m+m^2+1}{2m+3}} = \frac{1}{m^2\,(m+1)^2}\frac{2m^2+4m+1}{2m^2+6m+5} > 0,$$

as desired. ■

Auxiliary Lemma 2 *The profit, consumer surplus, and producer surplus under symmetric Cournot competition satisfy the following conditions:*

1. *PS_m is decreasing in m and $\lim_{m\to\infty}\pi_m = 0$,*
2. *$CS_m + PS_m$ is increasing in m,*
3. *For each $m \geq 2$, $CS_m - CS_1 - \sum_{k=2}^{m}\pi_m < 0$.*

The third inequality is illustrated graphically in Figure 1.

Proof. Consider the values of (CS_m, PS_m, π_m) based on symmetric Cournot competition given in (4), (5), and (6). Then, PS_m is decreasing in m, $\lim_{m\to\infty} \pi_m = 0$, and $CS_m + PS_m$ is increasing in m. Next the inequality $CS_m - CS_1 - \sum_{k=2}^{m} \pi_m \leq 0$ follows from two pieces of algebra: first, if $m \in \mathbb{R}$, then $\frac{d}{dm}\left(CS_m - CS_1 - \sum_{k=2}^{m} \pi_k\right) \leq 0$; and second, $CS_m - CS_1 - \sum_{k=2}^{m} \pi_k\big|_{m=2} < 0$. ■

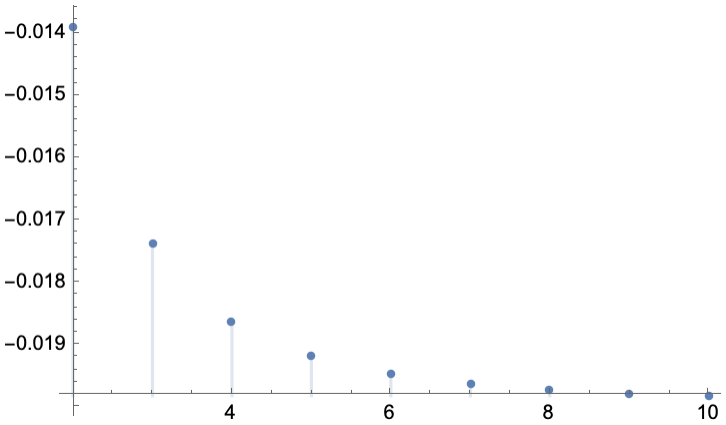

Figure 4: The plot of $CS_m - CS_1 - \sum_{k=2}^{m} \pi_k$ for $m = 2, .., 10$. We normalize $(a-c) = 1$.

c Proof of Proposition 1

Suppose that there are n firms in the market. Let $V_{n,m}$ be the predator firm's additional benefit of conducting takeovers until there are $m < n$ firms left in the market, compared to its payoff of not conducting a takeover:

$$V_{n,m} := \frac{\delta^{n-m}}{1-\delta}\hat{\pi}_m + \sum_{k=m+1}^{n} \delta^{n-k}\hat{\pi}_k - \sum_{k=m+1}^{n} \delta^{n-k}\frac{\pi_k}{1-\delta} - \sum_{k=m+1}^{n} \delta^{n-k}R_k - \frac{\hat{\pi}_n}{1-\delta}.$$

In particular, the benefit of conducting takeovers until it establishes monopoly is

$$V_{n,1} := \frac{\delta^{n-1}}{1-\delta}\hat{\pi}_1 + \sum_{k=2}^{n} \delta^{n-k}\hat{\pi}_k - \sum_{k=2}^{n} \delta^{n-k}\frac{\pi_k}{1-\delta} - \sum_{k=2}^{n} \delta^{n-k}R_k - \frac{\hat{\pi}_n}{1-\delta}. \tag{8}$$

Note that

$$V_{n,m-1} - V_{n,m} = \frac{\delta^{n-m}}{1-\delta} \left(\delta \left(\hat{\pi}_{m-1} - \hat{\pi}_m \right) - \pi_m - (1-\delta) R_m \right)$$

and

$$V_{n,1} - \delta V_{n-1,1} = \frac{1}{1-\delta} \left(\delta \left(\hat{\pi}_{n-1} - \hat{\pi}_n \right) - \pi_n - (1-\delta) R_n \right). \tag{9}$$

Let $\overline{n}_R$ be the largest n such that $V_{n',1} \geq 0$ for all $n' \leq n$. Since $V_{\overline{n}_R,1} \geq 0$ and $V_{\overline{n}_R+1,1} < 0$, for $n = \overline{n}_R + 1$, we have $\delta \left(\hat{\pi}_{n-1} - \hat{\pi}_n \right) - \pi_n - (1-\delta) R_n < 0$. Auxiliary Lemma 1 implies $\delta \left(\hat{\pi}_{n-1} - \hat{\pi}_n \right) - \pi_n - (1-\delta) R_n < 0$ for all $n \geq \bar{n}_R + 1$. Thus, $V_{n,1} < 0$ implies $V_{n+1,1} < 0$ for all $n \geq \overline{n}_R + 1$. Therefore, we have $V_{n,1} \geq 0$ if and only if $n \leq \overline{n}_R$. We will prove the following two claims:

Claim 1 *If $n \leq \overline{n}_R$, then takeovers happen until the market reaches monopoly.*

Proof. Follows from backward induction: If $n \leq \overline{n}_R$, then $V_{n',1} \geq 0$ for all $n' \leq n$. In particular, if there are two firms (assuming $2 \leq \overline{n}_R$), a takeover happens. Given this, if there are three firms (assuming $3 \leq \overline{n}_R$), a takeover happens, and so on. ■

Claim 2 *If $n > \overline{n}_R$, then a takeover never happens.*

Proof. We will prove that $V_{n,m} < 0$ for all $m \leq n-1$.

Suppose otherwise: there exists $m \leq n-1$ with $V_{n,m} \geq 0$. Since $n > \overline{n}_R$ implies $V_{n,1} < 0$, there must exist m with $V_{n,m} \geq 0$ but $V_{n,m-1} < 0$. This implies that (i) a takeover happens until there are m firms in the market and (ii) $\delta \left(\hat{\pi}_{m-1} - \hat{\pi}_m \right) - \pi_m - (1-\delta) R_m < 0$. By Auxiliary Lemma 1, (i) implies $\delta \left(\hat{\pi}_m - \hat{\pi}_{m+1} \right) - \pi_{m+1} - (1-\delta) R_{m+1} < 0$. Then, when takeovers continue until there are $m+1$ firms left, the benefit of reducing the number of firms from $m+1$ to m is

$$\frac{\delta}{1-\delta} \hat{\pi}_m + \hat{\pi}_{m+1} - \frac{\pi_{m+1}}{1-\delta} - R_{m+1} - \frac{\hat{\pi}_{m+1}}{1-\delta} = \frac{1}{1-\delta} \left(\delta \left(\hat{\pi}_m - \hat{\pi}_{m+1} \right) - \pi_{m+1} - (1-\delta) R_{m+1} \right) < 0.$$

Thus, the predatory firm does not have an incentive to reduce the number of firms from $m+1$ to m, which is a contradiction of (ii). ■

d 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), this means $\pi_n/(1-\delta) \geq K$. With π_n decreasing in n and $\lim_{n\to\infty} \pi_n = 0$, it follows that there exists a maximum $n_f < \infty$ such that $\pi_n/(1-\delta) \geq K$. Note that n_f is decreasing in K since π_n decreasing in n.
Under Cournot competition, the explicit condition is

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

Therefore, the stable number of firms in the market must satisfy

$$n_f = \lfloor \sqrt{\frac{(a-c)^2}{(1-\delta)\, bK}} \rfloor - 1.$$

e Proof of Proposition 2

By Proposition 1, for $n_f > \overline{n}_R$, the market is stable and $n_0 = n_1 = n_2 = ...$ Then, by Lemma 3, n_f firms enter the market.
Suppose $n_f \leq \overline{n}_R$. Then it must be that $n_f^* \leq \overline{n}_R$. To see why, notice that if more than $\overline{n}_R$ firms enter, then the market is stable. Moreover, since $n_f \leq \overline{n}_R$, each of these firms must make a profit less than K from operating in the market (as no takeovers happen). Hence, entry would not be optimal above $\overline{n}_R$.

We next show that $n_f^* \geq n_f$. Since n_f is the threshold where $\pi_n/(1-\delta) \leq K$ (see Section d), it suffices to show that the entrant's profit is higher if takeovers happen than if the market is stable.

The payoff of a non-predatory firm upon entry when n total firms are in the market is

$$W(n,\delta) = \sum_{k=2}^{n} \delta^{n-k} \frac{k}{n} \pi_k + \frac{1}{1-\delta} \frac{1}{n} \sum_{k=2}^{n} \delta^{n-k} \pi_k. \tag{10}$$

Note that, with probability k/n, the entrant still is in the market when there are k firms; and from ex ante perspective, the entrant is acquired in period k with probability $1/n$. Then, with π_{n_t} decreasing in n_t (as shown in (4) under Cournot competition or assumed for a general payoff function), we have $W(n,\delta) \geq \pi_n/(1-\delta)$. Hence, an entrant's expected profit is higher than when the market is stable at $n_t = n$ for all t. Thus, the number of entrants satisfies $n_f \leq n_f^*$.

f Proof of Proposition 3

The first statement obtains immediately: if $n_f > \overline{n}_R$, then the market is stable with n_f firms and hence the pro-competitive policy increases social welfare. Thus, we focus on proving that implementing the pro-competitive policy delivers strictly lower social welfare than the status quo. For this, we first show that the result obtains for general markets under the conditions of Auxiliary Lemma 2 and if $\pi_{n_f}/(1-\delta) - K$ is near zero. Then, we show that the result holds for linear Cournot.

The social welfare when there are n firms in total in period 0 equals

$$SW(n) = \frac{\delta^{n-1}}{1-\delta} (CS_1 + PS_1) + \sum_{k=2}^{n} \delta^{n-k} (CS_k + PS_k) - (n-1) K. \tag{11}$$

Then, the change in social welfare from adopting the pro-competitive policy is given by

$$\begin{aligned}\Delta_{SW}(n) &= \frac{\delta^{n-1}}{1-\delta}\left(CS_1+PS_1\right)+\sum_{k=2}^{n}\delta^{n-k}\left(CS_k+PS_k\right)-\left(n-1\right)K-\frac{1}{1-\delta}\left(CS_1+PS_1\right)\\ &=\sum_{k=2}^{n}\delta^{n-k}\left(CS_k+PS_k-CS_1-PS_1-\left(n-1\right)\frac{1-\delta}{1-\delta^{n-1}}K\right).\end{aligned}$$

We prove that $\Delta_{SW}(n)<0$ when $n=n_f^*$.

By Auxiliary Lemma 2, CS_k+PS_k is maximized at $k=n$. Thus, it suffices to show that

$$CS_n+PS_n-CS_1-PS_1-\left(n-1\right)\frac{1-\delta}{1-\delta^{n-1}}K<0.$$

Suppose $\frac{\pi_{n_f}}{1-\delta}-K=0$. Then, since $n_f\leq n_f^*$, we have $\frac{\pi_n}{1-\delta}-K\leq 0$ and thus $\left(n-1\right)\frac{1-\delta}{1-\delta^{n-1}}K\geq\left(n-1\right)\pi_n$. Therefore, it in turn suffices to show that

$$CS_n+\left(n-1\right)\pi_n+\hat{\pi}_n-CS_1-\hat{\pi}_1-\left(n-1\right)\pi_n<0,$$

or $CS_n-CS_1-\hat{\pi}_1+\hat{\pi}_n<0$.

Given $V_{n,1}$ defined in (8), let

$$v_n\left(\delta\right)=\delta^{n-1}\hat{\pi}_1+\left(1-\delta\right)\sum_{k=2}^{n}\delta^{n-k}\hat{\pi}_k-\sum_{k=2}^{n}\delta^{n-k}\pi_k-\sum_{k=2}^{n}\delta^{n-k}\left(1-\delta\right)R_k-\hat{\pi}_n$$

be the benefit of acquisitions normalized by $(1-\delta)$. Claim 3 below will prove that $v_n\left(\delta\right)$ is increasing in δ if $v_n\left(\delta\right)\geq 0$. Since $n\leq n_R$, we have $v_n\left(\delta\right)\geq 0$ and hence $v_n(1)\geq 0$. Thus,

$$\hat{\pi}_1-\hat{\pi}_n\geq\sum_{k=2}^{n}\pi_k.$$

Therefore, we have

$$CS_n - CS_1 - \hat{\pi}_1 + \hat{\pi}_n \leq CS_n - CS_1 - \sum_{k=2}^{n} \pi_k,$$

which is negative given Auxiliary Lemma 2, as desired.

It now remains to prove Claim 3:

Claim 3 *$v_n'(\delta) \geq 0$ if $v_n(\delta) \geq 0$ for all n and $\delta \geq 0$.*

Proof. We prove the claim by mathematical induction with respect to n. For $n = 2$, we have $v_2(\delta) = \delta(\hat{\pi}_1 - \hat{\pi}_2) - \pi_2 - (1-\delta) R_2$ and hence

$$v_2'(\delta) = \hat{\pi}_1 - \hat{\pi}_2 + R_2 \geq 0.$$

Suppose this holds for each $k = 2, ..., n-1$. Recall that, by (9), we have

$$v_{n,1}(\delta) = \delta v_{n-1}(\delta) + \delta(\hat{\pi}_{n-1} - \hat{\pi}_n) - \pi_n - (1-\delta) R_n.$$

Thus,

$$v_{n,1}'(\delta) = v_{n-1}(\delta) + \delta v_{n-1}'(\delta) + (\hat{\pi}_{n-1} - \hat{\pi}_n) + R_n.$$

Given Proposition 1, $v_n(\delta) \geq 0$ implies $v_{n-1}(\delta) \geq 0$ and hence by the inductive hypothesis, we have $v_{n-1}'(\delta) \geq 0$. Thus, we have $v_{n,1}'(\delta) \geq 0$, as desired. ■

Note that we assume that the rent paid by the predatory firm to the regulator, R_k, is not wasteful—it is just a transfer as far as social welfare is concerned. That is, even if the rent is not wasteful, the pro-competitive policy delivers lower social welfare. If the rent is wasteful, then the same conclusion clearly holds.

Cournot case

Finally, we show that the result holds under Cournot competition if $\delta > 0.1$. First, we prove that for the case of Cournot competitin, $\overline{n}_R$ is bounded by 3.

Claim 4 *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 $V_{4,1} < 0$. ■

We now prove Proposition 3, one by one for each possible $n_f^* \leq \overline{n}_R \leq 3$. If $n^{f*} = 1$, there is no entry, social welfare does not change. Thus, we focus on $n^{f*} = 2, 3$.

For $n^{f*} = 2$, one firm enters and that firm is acquired at the end of period 0. Thus, social welfare under deregulation minus the social welfare under monopoly equals

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

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

$$\begin{aligned} \Delta^{SW} &\leq CS_2 + PS_2 - \frac{1}{3(1-\delta)}PS_3 - (CS_1 + PS_1) \\ &= \frac{1}{2b}2\frac{(a-c)^2}{(2+1)^2}(2+2) - \frac{1}{3(1-\delta)}\frac{1}{b}3\frac{(a-c)^2}{(3+1)^2} - \frac{1}{2b}\frac{(a-c)^2}{(1+1)^2}(1+2) \\ &= -\frac{1}{144b(1-\delta)}(a-c)^2(10\delta - 1) < 0 \end{aligned}$$

as long as $\delta > 0.1$.

For $n^{f*} = 3$, social welfare under deregulation minus social welfare under monopoly equals

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

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

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

Since $3875\delta^2 - 6575\delta + 3276 > 0$ given $6575^2 - 4 \cdot 3875 \cdot 3276 < 0$, this is negative.

Therefore, social welfare under deregulation is strictly less than social welfare under monopoly.

In total, for each possible n_f^*, linear Cournot gives us the desired result.

g 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 $u_t^v = CS_{n_t}$. 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 $CS_{n_0} > CS_1$. 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 $CS_{n_f^*} > CS_1$ (this follows from the first two conditions in Auxiliary Lemma 2). Thus, the office-motivated Legislator always chooses the pro-competitive policy in period 0 and is re-elected.

h Proof of Proposition 5

Consider the case when the policymaker also enforces antitrust and places relative weight α 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 $\alpha \cdot \sum_{k=2}^{n_f^*} \delta^{n_f^*-k} R_k + (1-\alpha) \cdot SW(n_f^*) > SW(1)$, where $SW(n_f^*)$ is the social welfare under deregulation, defined in (11). Thus, for all $\{R_n\}_n$, for sufficiently large $\alpha < 1$ (the policymaker is self-interested), the inequality is satisfied.