

Temporary Subsidies, Irreversible Expansion, and Firm Exit in Asymmetric Markets

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Abstract

Temporary production subsidies are used to promote competition in concentrated industries with persistent cost asymmetry. A common policy assumption is that short-run expansion by higher-cost firms will translate into durable competitive pressure once support is withdrawn. This paper shows why that implication need not hold. In a market where a low-cost incumbent disciplines prices both before and after intervention, a temporary marginal-cost subsidy can rationally induce a higher-cost firm to expand by incurring irreversible fixed costs, even though the subsidy does not improve its long-run competitive position. When the subsidy expires and marginal costs revert, unchanged price discipline combined with higher fixed obligations can render continued operation unprofitable, leading to exit. The analysis isolates a simple mechanism through which temporary subsidies can generate short-run competitive gains while reducing long-run firm viability. Although motivated by recent policy interventions in meatpacking, the mechanism applies more broadly to asymmetric markets in which cost advantages persist and expansion decisions are irreversible.

Keywords

Temporary Subsidies, Cost Asymmetry, Firm Exit, Market Structure, Bertrand Competition, Meatpacking Industry

1. Introduction

Recent U.S. industrial policy has increasingly relied on temporary, cost-based interventions to promote entry and expansion in highly concentrated markets. In the meatpacking sector, for example, federal programs such as the Meat and Poultry Processing Expansion Program (MPPEP) and Local Meat Capacity Grant (Local MCap) have sought to increase competition by subsidizing production costs

at smaller and independent processors. These interventions are often justified by the expectation that short-run increases in output and capacity will translate into more competitive market structures over the long run.

This logic is intuitive. By reducing marginal costs, temporary subsidies encourage firms to expand output and, in some cases, invest in additional capacity. Greater short-run production is commonly interpreted as evidence that policy has succeeded in strengthening competitors relative to dominant incumbents. Yet it is far less clear whether such short-run gains imply improved long-run firm viability, particularly in markets characterized by persistent cost asymmetries.

This paper studies a setting in which a small firm competes against a low-cost incumbent that disciplines the market price both before and after a temporary subsidy. The small firm receives a per-unit production subsidy for a single period and may respond by expanding output and undertaking an irreversible fixed-cost investment that increases its scale of production. Once the subsidy expires, marginal costs revert to their original level, while any fixed costs incurred during expansion remain. The analysis focuses on the firm's private incentives to expand and the conditions under which subsidy-induced expansion may undermine long-run viability.

The model deliberately abstracts from strategic pricing and general equilibrium considerations in order to isolate a simple mechanism. Expansion during the subsidy period may be privately optimal even when post-subsidy operating margins are insufficient to sustain the expanded scale of production. In such cases, temporary cost relief can induce rational expansion that increases the likelihood of exit once the subsidy expires. The results highlight a limitation of temporary cost-based interventions in asymmetric markets: short-run competitive gains do not necessarily translate into durable improvements in long-run firm survival.

The model generates a clear empirical implication: temporary subsidies that induce capital-deepening expansions without reducing marginal costs should increase the probability of exit once program support expires, particularly in environments where dominant incumbents continue to discipline price. Although the present paper is purely theoretical, this prediction provides a testable hypothesis for future empirical work.

2. Literature Review

2.1. Policy Motivation and Cost Asymmetries in Meatpacking

Recent federal initiatives in the U.S. meat and poultry sector have directed temporary financial support toward smaller and regional processors, with the aim of reducing market concentration, increasing competitive resilience, and encouraging capacity expansion. These policies are motivated by long-standing structural features of the industry. A substantial body of USDA work documents persistent consolidation and scale economies in meatpacking, with large incumbent firms operating at lower costs and continuing to discipline national prices, while smaller rivals face higher marginal costs and thinner operating margins (MacDonald et

al., 2000; MacDonald & Ollinger, 2000; MacDonald, 2014). Related analysis shows that policy interventions in this sector can meaningfully affect production costs and welfare outcomes when layered onto existing structural asymmetries (Krumel Jr., 2017). Policy discussions therefore frame temporary subsidies as a means of facilitating modernization and expanding short-run processing capacity. At the same time, more recent industry analyses (MacDonald, 2024; Keller, MacDonald, & Paudel, 2024; Paudel & Keller, 2025) suggest that these cost advantages remain structurally durable, raising questions about whether subsidized expansions can be sustained once direct support is withdrawn.

Two observations from this experience motivate the model that follows. First, cost asymmetries in concentrated processing industries tend to persist rather than dissipate quickly. Second, policy efforts often encourage temporary expansion by higher-cost firms without materially narrowing the underlying cost gap relative to dominant incumbents. The question this paper addresses is whether such temporary support can meaningfully reshape long-run competition, or whether it may instead generate expansions that are not viable once external support is removed.

2.2. Bertrand Competition, Irreversibility, and Temporary Policy Support

In markets with asymmetric costs, equilibrium outcomes are anchored by the cost structure and capacity choices of dominant firms, limiting the ability of higher-cost rivals to influence prices through their own output decisions. This logic is central in canonical treatments of oligopoly behavior (Tirole, 1988; Vives, 1999) and has been formalized in work examining price competition with asymmetries in marginal costs, capacity, or fixed commitments, including analyses of Bertrand and Bertrand-Edgeworth environments (Deneckere & Kovenock, 1996; Marquez 1997; Demuyne et al., 2019). The framework developed here builds on this intuition by adopting a reduced-form representation in which prices are effectively disciplined by the low-cost incumbent.

The analysis also relates to the broader literature on investment under irreversibility and firm responses to temporary policy interventions. A large body of work emphasizes that sunk costs, capacity commitments, and uncertainty create asymmetric consequences for expansion and contraction, so that short-run incentives may induce durable long-run obligations (Pindyck, 1991; Dixit & Pindyck, 1994). While this literature typically focuses on investment timing, real options, and entry-exit decisions under uncertainty, the mechanism highlighted here is closely related: when a dominant incumbent continues to discipline price, temporary cost relief can raise short-run operating profitability without altering the long-run forces determining firm viability. In such settings, it may be privately optimal for higher-cost firms to expand during the subsidy period, even while this expansion increases the likelihood of exit once support is withdrawn and fixed obligations remain.

The model is therefore intentionally stylized. By abstracting from strategic pricing responses and instead linking temporary marginal cost relief, irreversible expansion, and persistent price discipline, the analysis isolates a transparent mechanism through which temporary subsidies may generate visible short-run expansion while increasing, rather than reducing, long-run exit risk in asymmetric markets.

3. The Model

We consider a market with two types of firms: a dominant incumbent firm with low marginal cost and a smaller regional firm with higher marginal cost. Firms compete in prices in a national market characterized by persistent cost asymmetry. The incumbent's cost advantage allows it to discipline the national market price both before and after any policy intervention. The smaller firm takes the market price as given and chooses output conditional on that price.

3.1. Market Environment

Consider a market for a homogeneous good served by a dominant low-cost incumbent and a smaller higher-cost firm. The market operates over three periods, indexed by $t \in \{1, 2, 3\}$. Aggregate demand is represented by an inverse demand function $P(Q)$ where total output in period t is given by:

$$Q_t = Q_L + q_t, \quad (1)$$

with Q_L denoting output supplied by the incumbent and q_t denoting output supplied by the small firm¹.

The incumbent has constant marginal cost normalized to zero and sets a national market price \bar{p} that is taken as given by the small firm. Normalizing the incumbent's marginal cost to zero is without loss of generality and does not affect the results. The small firm has constant marginal cost $c > 0$. Cost asymmetry is persistent and reflects durable technological or organizational advantages enjoyed by the incumbent. Throughout the analysis, the small firm is assumed to be a price taker with respect to \bar{p} . This pricing environment is intended as a reduced-form representation of markets in which dominant firms discipline prices both before and after policy intervention. This assumption is appropriate in settings with approximately homogeneous products and dominant producers whose pricing is effectively insensitive to small-firm output, so that changes in the small firm's quantity have no material effect on the national price.

We assume that the dominant incumbent is sufficiently large and cost-advantaged that it continues to discipline the national market price at \bar{p} , even if the smaller firm temporarily expands output. This assumption reflects concentrated industries with clear price leadership, where incremental adjustments by fringe firms do not meaningfully shift equilibrium pricing. The entrant's capacity re-

¹In the context of the motivating meatpacking industry, Q_L can be thought of representing the Big Four producers and q_t is a small local producer.

mains small relative to total market output, so its expansion is insufficient to induce price adjustment. The analysis is therefore explicitly conditional on environments where price discipline by dominant incumbents persists².

The small firm's behavior differs across the three periods. In periods 1 and 3, it takes the incumbent-disciplined national price as given and chooses output to maximize operating profits at its baseline marginal cost c . In period 2, a temporary per-unit subsidy reduces its effective marginal cost, increasing the marginal profitability of output. During this subsidy period, the firm may also choose to undertake an irreversible scale expansion by incurring a fixed cost F , which increases its feasible scale of operation in subsequent periods without altering post-subsidy marginal costs.

3.2. Timing and Policy Intervention

In period 2 only, the small firm receives a per-unit production subsidy $s > 0$, which reduces its effective marginal cost from c to $c - s$, where we assume $0 < c - s < c$. The subsidy is temporary and fully anticipated by the firm. No subsidy is available in periods 1 or 3.

In addition to choosing output in each period, the small firm may elect to expand its scale of production in period 2 by incurring a fixed cost $F > 0$. The fixed cost F is an incremental fixed obligation associated with expansion beyond the firm's initial scale of operation. Expansion is a discrete and irreversible investment that permanently increases the firm's feasible scale of operation. If the firm expands, it must service the fixed cost F in all subsequent periods. If it does not expand, its scale remains unchanged. Any baseline fixed costs that are common across periods are normalized away, since they do not affect output choices or the comparison between expanding and not expanding.

Expansion should be interpreted as creating an ongoing financial commitment rather than a one-time sunk expenditure. In concentrated processing industries, capacity expansions typically involve debt service, long-term equipment leasing, or recurring maintenance and compliance costs that must be serviced each period. We therefore treat F as a recurring fixed obligation associated with operating at the expanded scale, and it remains relevant for the firm's shutdown decision once the subsidy expires.

Although the fixed obligation F recurs in each period following expansion, it is not contingent on output within a period and therefore does not affect marginal production decisions; it functions as a fixed cost in every period rather than a variable cost.

3.3. Small Firm's Problem

In periods 1 and 3, when no subsidy is available, the small firm chooses output to

²In practice, expansion by smaller regional processors may exert modest downward price pressure within their local operating regions. Our analysis is conducted at the national level, where pricing is anchored by dominant incumbents whose scale and cost advantages make these local effects negligible in determining the disciplined price \bar{p} .

maximize operating profits given the market price \bar{p} :

$$q_1 \in \arg \max_{q \geq 0} (\bar{p} - c)q . \quad (2)$$

In period 2, the firm chooses output taking the subsidy into account:

$$q_2 \in \arg \max_{q \geq 0} (\bar{p} - (c - s))q . \quad (3)$$

We assume that feasible output in any period is bounded by technological or capacity constraints, so the firm's optimal output is finite and increasing in the per-unit margin. Let q_1 denote the firm's optimal output in periods 1 and 3 when no expansion has occurred, and let q_2 denote its optimal output in period 2 given the subsidy and its chosen scale of production.

3.4. Expansion Decision

Expansion affects the firm's feasible scale of output but does not alter marginal costs. Without expansion, the firm's feasible output is bounded above by its pre-existing capacity, while expansion relaxes this constraint by increasing the maximum feasible output level. Because feasible output remains bounded but increases with capacity, the firm's operating scale is increasing in the per-unit margin but finite in every period. Let q_2^E denote the optimal output in period 2 if the firm expands, and let q_2^N denote the optimal output in period 2 if it does not expand. The firm expands in period 2 if the increase in operating profits during the subsidy period is sufficient to cover the fixed cost:

$$(\bar{p} - (c - s))(q_2^E - q_2^N) \geq F . \quad (4)$$

This comparison should be interpreted as a forward-looking decision: the firm undertakes expansion only when subsidy-period incremental operating profits are sufficient to justify committing to a recurring fixed obligation F going forward.

Because the subsidy is temporary, expansion does not affect the firm's marginal cost or pricing environment in period 3.

3.5. Exit

In period 3, the firm again faces marginal cost c and market price \bar{p} . If the firm did not expand, its period-3 operating profits are:

$$\pi_3 = (\bar{p} - c)q_1 . \quad (5)$$

If the firm expanded in period 2, it must service the fixed cost F in period 3. Let q_3 denote the firm's optimal output in period 3 following expansion. Period-3 profits are then given by:

$$\pi_3 = (\bar{p} - c)q_3 - F . \quad (6)$$

If post-subsidy operating profits net of fixed costs are negative, the firm exits the market. Exit is irreversible and reflects the firm's inability to cover fixed obligations under post-subsidy conditions, not a change in pricing behavior or cost rankings.

3.6. Equilibrium

An equilibrium consists of a national price \bar{p} set by the low-cost incumbent and an output and expansion decision by the small firm that maximizes profits in each period given that price and the policy environment. Because the incumbent's pricing rule is unaffected by the subsidy, all equilibrium variation arises from the small firm's output and expansion decisions.

4. Results

This section characterizes equilibrium outcomes before, during, and after the subsidy period.

4.1. Baseline Outcome before and after the Subsidy

In period 1, the incumbent sets and sustains the national market price at \bar{p} . Taking this price as given, the small firm chooses output q_1 to maximize operating profits. By Equation (2), its period-1 operating profits are $\pi_1 = (\bar{p} - c)q_1$. When $\bar{p} > c$, the small firm earns positive operating profits and remains active in the market.

When the subsidy expires in period 3, the small firm's marginal cost returns to c , while the underlying cost asymmetry between firms remains unchanged. The incumbent therefore continues to discipline the national price at the same \bar{p} . The small firm therefore faces the same optimization problem as in period 1 and chooses the same output level q_1 . By Equation (2), its operating profits in period 3 are $(\bar{p} - c)q_1$. Absent changes in fixed costs, equilibrium prices, output, and operating profits are identical in periods 1 and 3.

Proposition 1 (Pre- and Post-Subsidy Pricing)

In equilibrium, the national market price is identical in periods 1 and 3 and is determined by the low-cost incumbent firm. The temporary subsidy does not affect the equilibrium price before or after the subsidy period.

Proof.

In periods 1 and 3, the small firm takes the market price as given. By Equation (2), its operating profits in period 1 are $\pi = (\bar{p} - c)q_1$.

Where \bar{p} is the price set and disciplined by the incumbent. The period 3 decision problem is identical to the period 1 problem, since the subsidy does not apply in period 3 and the incumbent's pricing behavior is unchanged. Therefore, by Equation (2) again, period 3 operating profits are given by $(\bar{p} - c)q_1$.

Because neither the incumbent's cost structure nor the national pricing discipline is affected by a temporary subsidy to the fringe firm, the equilibrium price is unchanged once the subsidy expires. ■

4.2. Short Run Output Expansion under the Subsidy

In period 2, the subsidy reduces the small firm's effective marginal cost from c to $c - s$, increasing its operating margin relative to periods 1 and 3. By Equation (3), the firm's period-2 operating profits are $\pi_2 = (\bar{p} - (c - s))q_2$. Expansion is attrac-

tive only if the additional operating surplus created during the subsidy period is sufficient to cover the recurring fixed obligation F generated by expansion. By Equation (4), expansion occurs if and only if: $(\bar{p} - (c - s))(q_2^E - q_2^N) \geq F$.

Proposition 2 (Subsidy-Induced Expansion)

If the subsidy increases the firm's operating margin sufficiently that the incremental profits generated in period 2 cover the recurring fixed obligation F , the small firm expands during the subsidy period. Otherwise, the firm does not expand.

Proof.

With the subsidy in place, the firm chooses its period-2 output to maximize operating profits under the lower effective marginal cost $c - s$. By Equation (3), this yields the higher operating margin $(\bar{p} - (c - s))$. Expansion is optimal only if the gain in operating surplus associated with moving from q_2^N to q_2^E during the subsidy period is at least as large as the resulting fixed obligation F . This condition is exactly the inequality in Equation (4). When it holds, expansion raises profits; when it does not, expansion is strictly dominated. Therefore, expansion occurs if and only if Equation (4) is satisfied. ■

4.3. Post-Subsidy Viability and Firm Exit

If the firm expands in period 2, it enters period 3 with the same disciplined market price \bar{p} and baseline marginal cost c but it must now service the recurring fixed obligation F generated by expansion. By Equation (5), its period-3 operating profits are $\pi_3 = (\bar{p} - c)q_3 - F$. Exit occurs whenever the operating surplus generated at the disciplined price is insufficient to cover this fixed obligation. By Equation (6), the small firm exits in period 3 whenever $(\bar{p} - c)q_3 < F$.

Proposition 3 (Post-Subsidy Exit)

If the operating surplus generated in period 3 is insufficient to cover the fixed obligation created by expansion, the small firm exits when the subsidy expires. If the surplus is sufficient to cover the obligation, the firm remains in the market.

Proof.

Once the subsidy expires, the firm faces the same disciplined price \bar{p} and baseline marginal cost c as in period 1, but unlike period 1, it must now service the recurring fixed obligation F . By Equation (5), its viability depends on whether post-subsidy operating surplus $(\bar{p} - c)q_3$ exceeds F . When the condition in Equation (6) holds, operating profits are negative and exit is strictly preferred. When the inequality does not hold, remaining in the market yields non-negative profits. Therefore, exit occurs if and only if Equation (6) is satisfied. ■

5. Discussion and Robustness

The mechanism is most transparent in environments where a dominant incumbent disciplines price and the subsidized firm is effectively a price taker. However, it is useful to consider how the qualitative implications may extend to alternative market structures.

In settings with product differentiation or spatial competition, the incumbent's pricing response to small-firm expansion would likely be attenuated, but not eliminated. If the price response is weak, the core logic remains: temporary cost relief can rationally induce expansion that becomes financially fragile once support is removed. When product differentiation is limited and cross-price elasticities are high, a monopolistically competitive environment would closely approximate the Bertrand-style price discipline assumed here, leaving the qualitative mechanism unchanged.

In Cournot-type quantity competition, the incumbent would partially adjust output in response to the subsidized firm's expansion. This would mitigate, but not necessarily eliminate, the exit risk. As long as post-subsidy prices do not rise sufficiently to cover the newly created fixed obligation, the firm may still undertake expansions that are ex post unsustainable.

In Stackelberg or price-leadership environments, the incumbent may strategically internalize the entrant's expansion when setting price. Even then, the basic insight can persist when the incumbent continues to anchor industry pricing and expansion obligations remain fixed.

Briefly, in a standard Cournot framework or in a price-leadership setting where the incumbent's pricing partially responds to the fringe firm's expansion, subsidy-induced capacity increases would be partially absorbed into market price dynamics. However, unless the resulting price adjustments fully compensate for the newly created fixed obligation, the core result remains: expansion can be privately optimal under subsidy yet unsustainable once support expires. A full formal treatment of these alternative strategic environments is left to future work.

6. Conclusion

This paper examines how temporary production subsidies affect competition and firm survival in markets characterized by persistent cost asymmetry. Using a simple price competition framework, the analysis shows that short-run cost relief can increase output and competitive activity during the subsidy period without altering the long-run forces that discipline prices. When underlying cost advantages remain fixed, equilibrium prices before and after intervention continue to be set by low-cost incumbents.

The core mechanism in the model is the interaction between temporary marginal-cost relief and irreversible expansion. Higher-cost firms may rationally choose to expand during the subsidy period by incurring additional fixed costs, even though the subsidy does not improve their long-run competitive position. Expansion is privately optimal because temporary cost relief raises operating profits over the subsidy window. Once the subsidy expires, marginal costs revert while fixed obligations remain. If baseline operating profits are insufficient to cover those commitments, continued operation becomes unprofitable and the firm exits.

In these settings, exit does not reflect firm error, distorted expectations, or intensified post-subsidy competition. Instead, it follows from the incentives created

by temporary support operating against unchanged market conditions.

Although motivated by recent developments in meatpacking, the same logic applies in other concentrated industries where dominant firms discipline prices and expansion decisions require irreversible commitments. The simplicity of the framework is intentional and it helps keep the focus on the mechanism through which temporary marginal-cost support can rationally lead to expansion followed by exit.

An important direction for future empirical research is to evaluate this mechanism directly. If subsidized firms that expand scale without narrowing underlying cost disadvantages exhibit elevated exit risk once subsidies end, this would provide direct support for the theoretical channel identified here. Assessing this prediction across comparable policy environments would help gauge the practical relevance and external validity of the framework developed in this paper.

From a welfare perspective, the effects of temporary production subsidies are ambiguous. In the short run, the subsidy increases output among subsidized firms and can expand processing capacity, benefiting consumers through greater availability and potentially lower effective prices. In this sense, consumers unambiguously benefit during the subsidy period. However, if subsidized expansion induces irreversible fixed-cost commitments that cannot be sustained once the subsidy expires, subsequent firm exit may increase concentration and reduce competitive pressure in the long run. The net welfare consequences therefore depend on the relative magnitude and duration of short-run gains compared to longer-run effects on market structure, particularly in settings where underlying cost advantages held by dominant incumbents persist.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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