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A Big Push without Coordination Failure: Timing and Uncertainty in Structural Transformation

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Abstract: This paper reexamines the Big Push mechanism from a dynamic perspective by emphasizing timing and uncertainty rather than coordination failure. While the traditional Big Push literature attributes delayed structural transformation to complementarities across firms or industries, we reformulate the Big Push as an optimal timing problem faced by a forward-looking firm under uncertainty. The firm earns a stable profit in an incumbent market and can irreversibly switch to a new market characterized by perfect competition by incurring a sunk cost. The profitability of the new market depends on a stochastic demand parameter, generating an option value of waiting. We derive a threshold-based switching rule and show that greater uncertainty or an increase in the number of firms delays entry by increasing the value of waiting, even when the expected profitability of the new market improves over time. As a result, prolonged inertia and abrupt structural change can arise without coordination failure. The analysis offers a new interpretation of development traps and highlights the importance of timing and irreversibility in understanding structural transformation.

Keywords: Big Push, Structural Transformation, Irreversible Investment, Uncertainty, Optimal Timing

INTRODUCTION

Question of when an economy—or a firm—should undertake a large, irreversible transformation has long occupied a central place in development and industrial economics. A central insight of the classical *Big Push* literature is that coordination failures among firms or industries can trap an economy in a low-level equilibrium, even when a superior high-level equilibrium exists.

The idea originates in the seminal contribution of Rosenstein-Rodan (1943), who emphasized the need for simultaneous industrialization across sectors. This intuition was later formalized by Murphy, Shleifer and Vishny (1989), who showed how demand complementarities and increasing returns can generate multiple equilibria and justify coordinated investment or government intervention. Related mechanisms appear in models of poverty traps and development traps, such as those discussed by Azariadis (1996) and Banerjee and Duflo (2005).

Subsequent research extended the Big Push logic to broader settings. Acemoglu (2009) highlights how complementarities across technologies and institutions can generate persistent underdevelopment, while Ray (1998) provides a comprehensive synthesis of Big Push–type mechanisms in development economics. These contributions firmly establish coordination failure as the dominant explanation for delayed industrialization and structural transformation. Despite its influence, this literature exhibits two important limitations.

First, most Big Push models are static or rely on highly stylized dynamics, abstracting from uncertainty. Second, while the literature explains why a large-scale transformation may fail to occur, it pays little attention to when such a transformation should optimally take place. The timing of irreversible structural change therefore remains largely unexplored.

In parallel, a distinct strand of research studies irreversible investment under uncertainty using the real options approach. Seminal contributions by Dixit and Pindyck (1994) show that uncertainty and irreversibility generate an option value of waiting, leading firms to delay investment until sufficiently favorable conditions are realized. This insight has been applied to market entry, exit, and technology adoption decisions (e.g., Abel and Eberly, 1994). However, this literature typically focuses on individual investment problems and does not explicitly address the Big Push mechanism or the issue of structural transformation emphasized in development economics.

This paper integrates these two strands of the literature by modeling the Big Push mechanism as an optimal stopping problem under uncertainty. Rather than emphasizing coordination failures among multiple firms or industries, we consider a forward-looking firm that must decide when to irreversibly switch from an incumbent market—yielding a stable profit flow—to a new market characterized by perfect competition. The profitability of the new market depends on a stochastic demand parameter, and entry requires a sunk cost. As a result, the firm faces a trade-off between the gains from switching, the opportunity cost of abandoning incumbent profits, and the option value of waiting.

Within this framework, we derive a threshold-based switching rule. The firm optimally delays entry until the state variable crosses a critical level at which the expected benefits of entering the new market outweigh both the sunk entry cost and the foregone incumbent profit stream. Uncertainty plays a central role: greater volatility increases the option value of waiting and delays the transition, even when the expected profitability of the new market improves over time. Our analysis also shows that more intense competition, as reflected in a larger number of firms, delays the timing of the Big Push by reducing the profitability of entry and increasing the incentive to wait.

This perspective yields several novel insights. First, a Big Push–type structural transformation can occur without coordination failure. Even in the absence of strategic complementarities, uncertainty and irreversibility alone can generate prolonged inertia followed by an abrupt transition. Second, the analysis shifts the focus of the Big Push literature from simultaneity to timing, offering a new interpretation of development traps as the outcome of optimal behavior under uncertainty rather than purely coordination failures. By integrating insights from development economics and real options theory, this paper contributes to a more unified understanding of structural transformation.

The remainder of the paper is organized as follows. Section 2 presents the model. Section 3 characterizes the optimal switching rule and derives the entry threshold, and discusses the economic implications in comparison with the traditional Big Push framework. Section 4 concludes.

BASIC MODEL

We consider symmetric firms that currently operate in an incumbent market and earn constant profit flow $m > 0$ per period, which represents returns from a traditional sector, such as agriculture, informal activities, or an established low-productivity industry. Remaining in this sector is always feasible and entails no uncertainty, but it offers limited growth potential. Entering a new market therefore involves not only paying a sunk cost, but also irreversibly abandoning a stable and safe source of income. The opportunity cost associated with the loss of the incumbent profit creates a natural force of inertia that discourages premature structural transformation. In this sense, the incumbent sector serves as an outside option that anchors the economy in a low-level equilibrium, even when a more productive sector becomes increasingly attractive. By incurring a sunk cost $I > 0$, each firm can irreversibly switch to the new market in which n symmetric firms engage in perfect competition. By letting x_i and *P* denote firm *i*'s output and market price, respectively, we specify the inverse demand function as

$$P = a - b\sum_{i=1}^{n} x_i\,, \tag{1}$$

where a is a demand parameter that follows a geometric Brownian motion governed by equation (2) and b is a positive constant.

$$da(t) = \mu a(t)\,dt + \sigma a(t)\,dz(t) \qquad (2),$$

with drift μ and volatility σ. We specify firm *i*'s cost, $C_i(x_i)$, as

$$C_i(x_i) = cx_i^2, \tag{3}$$

where *c* is a positive constant. Thus, firm i's instantaneous profit is described as

$$\pi_i(t) = P(t)x_i(t) - cx_i(t)^2. \tag{4}$$

Since each firm behaves as a price taker in this market, the first-order condition implies $x_i(t) = P(t)/(2c)$. Under symmetry, we have

$$Q(t) = \sum_{i=1}^{n} x_i\,(t) = n\frac{P(t)}{2c}. \tag{5}$$

Hence, market clearing yields

$$x_i^* = \frac{a}{2c + bn}; \tag{6}$$

$$P^* = \frac{2ac}{2c + bn}. \tag{7}$$

We have firm *i*'s post-entry flow profit as

$$\pi_i(x_i^*) = \frac{a^2 c}{(2c+bn)^2}. \tag{8}$$

In the following, letting *K* as

$$K \equiv \frac{d}{(2c+bn)^2}, \tag{9}$$

we express as π_i as

$$\pi_i(a) = Ka^2. \tag{10}$$

SWITCHING OPTION AND STOCHASTIC DEMAND

Let entry occur at time τ. If we let ρ denote discount rate, the value of entry is

$$\int_{\tau}^{\infty} e^{-\rho(t-\tau)} \left(\pi\big(a(t)\big) - m\right) dt - I. \tag{11}$$

Thus, the entry payoff as a function of the current state a is

$$G(a) = \frac{\pi(a) - m}{\rho} - I = \frac{Ka^2 - m}{\rho} - I. \tag{12}$$

Let $V(a)$denote the value of waiting when the current demand level is a. In the continuation region, $V(a)$ satisfies

$$\rho V(a) = \mu a V'(a) + \frac{1}{2}\sigma^2 a^2 V''(a). \tag{13}$$

The solution takes the form

$$V(a) = Aa^{\beta}, \tag{14}$$

where β is the positive root of

$$\frac{1}{2}\sigma^2\beta(\beta - 1) + \mu\beta - \rho = 0, \tag{15}$$

that is,

$$\beta = \frac{-\left(\mu - \frac{1}{2}\sigma^2\right) + \sqrt{\left(\mu - \frac{1}{2}\sigma^2\right)^2 + 2\sigma^2\rho}}{\sigma^2}, \tag{16}$$

which is greater than 1, and is the standard positive root that arises in real options models with geometric Brownian motion and reflects the elasticity of the option value with respect to the underlying state variable.

Optimal entry occurs when $a(t)$reaches a critical threshold a^*, determined by value matching condition, (17), and smooth pasting condition (18):

$$V(a^*) = G(a^*); \tag{17}$$

$$V'(a^*) = G'(a^*). \tag{18}$$

Assuming β>2, each firm's optimal policy is to enter the new market at the first time t such that $a(t) \geq a^*$, where

$$a^* = \sqrt{\frac{\beta}{\beta - 2} \cdot \frac{m + \rho I}{K}}, \tag{19}$$

All firms face the same stochastic process $a(t)$ and identical payoff structures.

We now examine how uncertainty affects the optimal timing of entry into the new market. In the absence of uncertainty, the firm would enter as soon as the instantaneous gain from switching exceeds the sunk entry cost and the foregone incumbent profit stream. Under uncertainty, however, the firm holds a real option: by waiting, it preserves the possibility of entering later under more favorable conditions while avoiding irreversible losses if demand turns out to be low. This option value of waiting fundamentally alters the entry decision and implies that the firm may optimally postpone entry even when the expected profitability of the new market is improving over time. Since an increase in σ reduces a^*, we have the following proposition 1.

Proposition 1

Greater uncertainty increases the option value of waiting and delays the timing of the Big Push.

Proposition 1 formalizes the central role of uncertainty in generating delayed structural transformation. Greater volatility raises the value of the option to wait, making immediate entry less attractive despite higher expected future profits. As a result, the firm requires a more favorable realization of the demand parameter before switching to the new market, which postpones the timing of entry. This mechanism does not rely on any coordination failure or strategic interaction among firms; it emerges solely from irreversibility and uncertainty. Consequently, prolonged inertia and sudden structural change can arise as the outcome of fully rational behavior in a perfectly competitive environment. Since an increase in n reduces a^*, we also have the following proposition 2.

Proposition 2

An increase in the number of firms intensifies competition and delays the timing of the Big Push.

Proposition 2 highlights a key distinction between our mechanism and the traditional Big Push logic. In the present framework, the delay in structural transformation is not driven by coordination failure or the inability of firms to internalize complementarities. Instead, it arises from a standard real options effect: more intense competition lowers the flow payoff from entry, which increases the value of waiting and shifts the optimal entry threshold. As a result, even in an economy with perfectly competitive markets and a unique equilibrium at every point in time, the timing of the Big Push is postponed as number of firms increases. This reinforces the central message of the paper that large-scale and abrupt structural change can emerge from optimal individual behavior under uncertainty, rather than from failures of coordination across agents.

CONCLUSION

This paper has revisited the Big Push mechanism from a dynamic and forward-looking perspective. While the traditional Big Push literature emphasizes coordination failures among multiple industries under certainty, we have shown that a Big Push–type structural transformation can arise as an optimal timing decision of a single firm operating under uncertainty. By formulating the problem as an irreversible switching decision with stochastic profitability, the analysis highlights the central role of option values and intertemporal trade-offs.

The model delivers a simple threshold rule for entry into the new market. A firm optimally delays switching until the expected profitability advantage of the new market becomes sufficiently large to compensate for both the sunk entry cost and the opportunity cost of abandoning a stable incumbent profit flow.

Uncertainty increases the option value of waiting, thereby lowering the entry threshold and postponing the transition to the new market. This result implies that prolonged inertia and delayed structural change need not reflect coordination failures or market imperfections; they may instead be the outcome of fully rational behavior. In addition, we showed that stronger competition—captured by a larger number of firms—delays the Big Push by reducing the profitability of entry into the new market.

These findings offer a new interpretation of development traps and delayed industrialization. Even in the absence of strategic complementarities across firms or sectors, uncertainty and irreversibility can generate outcomes that resemble those emphasized in the Big Push literature.

In this sense, the paper identifies a *Big Push without coordination failure*, shifting the focus from simultaneity to timing. This perspective complements existing theories by providing a micro-founded explanation for why large-scale transformations may occur abruptly, yet only after a prolonged period of apparent stagnation.

The analysis also has policy implications. Policies aimed at accelerating structural transformation should not only address coordination problems but also reduce uncertainty or lower the effective irreversibility of investment. Measures such as reducing policy uncertainty, improving the predictability of market conditions, or reducing the number of firms can advance the timing of the transition, even when coordination failures are absent.

Several extensions offer promising directions for future research. Allowing for multiple heterogeneous firms with endogenous entry could restore strategic interactions and generate richer dynamics. Incorporating learning, spillovers or policy interventions would also enable a closer comparison with canonical Big Push models. Finally, extending the framework to a general equilibrium setting could shed light on economy-wide consequences of delayed structural transformation.

Overall, this paper demonstrates that the essence of a Big Push lies not only in coordination, but also in timing under uncertainty. Recognizing this distinction broadens our understanding of structural change and opens new avenues for integrating development economics with the real options approach to investment.

REFERENCES

[1] Abel, A. B., & Eberly, J. C. (1994). A unified model of investment under uncertainty. American Economic Review, 84(5), 1369–1384.

[2] Acemoglu, D. (2009). Introduction to modern economic growth. Princeton, NJ: Princeton University Press.

[3] Azariadis, C. (1996). The economics of poverty traps part one: Complete markets. Journal of Economic Growth, 1(4), 449–486.

[4] Banerjee, A. V., & Duflo, E. (2005). Growth theory through the lens of development economics. In P. Aghion & S. N. Durlauf (Eds.), Handbook of Economic Growth (Vol. 1A, pp. 473–552). Amsterdam: Elsevier.

[5] Dixit, A. K., & Pindyck, R. S. (1994). Investment under uncertainty. Princeton, NJ: Princeton University Press.

[6] Murphy, K. M., Shleifer, A., & Vishny, R. W. (1989). Industrialization and the Big Push. Journal of Political Economy, 97(5), 1003–1026.
[7]Ray, D. (1998). Development economics. Princeton, NJ: Princeton University Press.

[8] Rosenstein-Rodan, P. N. (1943). Problems of industrialisation of Eastern and South-Eastern Europe. Economic Journal, 53(210/211), 202–211.