A Model of Enclosures: Coordination, Conflict, and Efficiency in the Transformation of Land Property Rights*

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Abstract

Economists and historians have long debated how open-access areas, frontier regions, and customary landholding regimes transformed into private property. This paper analyzes decentralized enclosure processes using the theory of aggregative games, examining how population density, enclosure costs, potential productivity gains, and local governance capacity, including the power to demand compensation, jointly determine the mix of property regimes. Depending on the balance of these fundamentals, enclosure decisions may be strategic complements, generating abrupt tipping points and socially destructive property races, or strategic substitutes, leading to smooth transitions but insufficient enclosure when private returns fall short of social gains. While policies to strengthen customary governance or compensate displaced stakeholders can realign incentives, addressing one market failure while neglecting others can worsen welfare. Our analysis provides a unified framework for evaluating mechanisms emphasized in Neoclassical, Neo-institutional, and Marxian interpretations of historical enclosure processes and contemporary land formalization policies.

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1 Introduction

The emergence of secure and exclusive private property rights to land from systems of possession and customary tenure is widely regarded as one of history's most consequential institutional shifts. Leading thinkers, from Smith and Marx to North, have identified this transformation as central to the emergence of capitalism and modern economic growth. Yet, despite its importance, substantial debate persists around the underlying causes, social efficiency, and distributional consequences of the enclosure processes through which more clearly defined and exclusive ownership was established.[1]

Historically, these transitions have rarely been smooth. While property rights often evolve endogenously in response to changing scarcity and relative prices (Demsetz 1967; Boserup 1965), evidence from the English enclosures, the American frontier, and rural Africa suggests that displacing customary tenure was and remains resource-intensive and contentious, involving fencing, demarcation, courts, and at times violent eviction. Following Coase (1960), societies must weigh the benefits of more exclusive arrangements against the costs of defining and enforcing them, as well as the displacement of existing users.

These debates remain critical given that an estimated 2.5 billion people face land insecurity (Pearce 2016) and fewer than ten percent of developing country plots are titled (Augustinus 2003). While secure ownership offers acknowledged benefits, the transition often entails uncompensated displacement, making formalization as much a matter of redistribution and power as of technical efficiency (Deininger and Bank 2003; Alden Wily 2018).

We develop a unified framework to analyze decentralized enclosure as an aggregative game of contested property claims. Building on Weitzman (1974)'s canonical productivity benchmark, we depart from the assumption of costless enforcement. Instead, following de Meza and Gould (1992), we endogenize the enclosure decision and transition costs, allowing the boundary between property regimes to emerge as an equilibrium outcome of individual decisions.

Crucially, we depart from the open-access benchmark by recognizing that customary communities often regulate resource use through internal governance (Ostrom 1990). We introduce two institutional parameters: μ, capturing the community's capacity to regulate access to the commons, and τ, representing the ability of customary users

1. The term "enclosure" has contested meanings in economic history, at times encompassing not just changes in property but also in production organization or technology use. Our framework distinguishes technology adoption and production reorganization from property transformation while modeling how they interact.

to resist displacement or demand compensation. Following Anderson and McChesney (1994), this framing distinguishes a "trade," where enclosers compensate existing users, from a "raid," where enclosure is imposed unilaterally with limited or no compensation. Our framework shows that while economic fundamentals drive the direction of institutional change, the timing and efficiency of transitions also depend on enforcement costs and the balance of power.

The strategic nature of the enclosure decision determines whether property rights evolve gradually through a mixed regime or undergo sudden, discontinuous shifts. In our benchmark, enclosure decisions are *strategic complements* when productivity gains to enclosure are modest or nonexistent. This may trigger a destabilizing feedback loop: enclosing a parcel displaces labor which crowds onto remaining unenclosed areas, eroding the common wage and increasing the return to further enclosure. This dynamic ignites a property race. Since strategic complementarity generates multiple equilibria, we use the theory of Global Games to identify a unique risk-dominant equilibrium (Morris and Shin 2003). This characterizes the tipping points where society rushes toward full enclosure, identifying when such cascades become socially wasteful dissipative contests (Tullock 1967; Anderson and Hill 1990).

In contrast, when potential productivity gains following enclosure are sufficiently high, enclosure decisions become *strategic substitutes*. Each encloser draws labor out of the commons into more intensive production. This reduces crowding in the commons, improving the outside option for remaining users and raising the market wage, which lowers the profitability of further enclosure. In land-abundant settings, this leads to too little socially beneficial transformation.

This connects to frontier economics. Building on Domar (1970) and Wakefield (1849), we identify scenarios where high returns in unenclosed lands make labor's outside options so favorable that enclosure remains unprofitable, even where enclosers bring significant technological improvements and face limited resistance or compensation obligations. In these settings, private producers often demanded external intervention to alter the labor-land ratio, explaining why colonial states restricted access to "manufacture" the scarcity needed to make private ownership viable.

Transition efficiency depends on the balance of two opposing forces that drive a wedge between private and social returns. First, enclosure can increase social surplus by raising the marginal product of labor; yet, because enclosers cannot fully appropriate these wage gains, private returns may fall short of social returns, leading to *under-enclosure*. Second, displacement of customary users without full compensation allows enclosers to capture rents without internalizing the costs imposed on the displaced.

This subsidizes appropriation, causing private returns to exceed social returns and leading to *over-enclosure*. Our model characterizes how the economic and institutional environment determines which forces dominate.

We analyze how customary governance of the commons and compensation rights interact with enclosure costs. We derive a second-best result showing that addressing one institutional failure while neglecting others can worsen equilibrium outcomes. For example, lowering titling costs under weak customary protections can trigger a destructive raid rather than a productive transition. We show when a well-regulated customary regime can be more efficient than a private property regime established through uncompensated displacement, providing a unified logic for the diversity of property rights observed across history and culture.

The remainder of the paper is organized as follows. Section 2 reviews the related literature; Section 3 develops the model; Section 4 analyzes efficiency; Section 5 examines the interaction between institutions and the economic environment; Section 6 applies the framework to historical and contemporary settings; and Section 7 concludes.

2 Related Literature

Interpretations of the emergence and transformation of property rights vary across four dimensions: the role of conflict versus evolution; the extent to which inefficiency can arise and persist; the impact on labor displacement and inequality; and the degree to which institutional change is decentralized and emergent or imposed from above.

Early New Institutionalists (Alchian and Demsetz 1973; Demsetz 1967; North and Thomas 1973) view property rights as an evolutionary response to economic value, acknowledging that shared access persists efficiently when the costs of defining exclusive rights outweigh the benefits. As scarcity and asset values rise, however, the incentive to internalize externalities drives a transition toward private control (Boserup 1965; Coase 1960). Yet transaction costs and distributional conflicts often block such shifts (Libecap 1989). Moreover, Ostrom (1990) demonstrates that communities can resolve common-pool dilemmas without privatization, while authors like Thompson (2015) argue that resistance to enclosure often reflects a defense of the "moral economy" against the encroachment of market forces.

Later New Institutionalists like North (1990) and Acemoglu, Johnson, and Robinson (2005) emphasize how transaction costs often block efficient change, allowing elites to impose and maintain institutions that serve their narrow interests despite societal inefficiency. Historically, characterizing customary land as "waste" or inefficient in use has justified displacement, from colonial expansion to modern land formalization (Greer 2018; Barbier 2010). Whether such interventions deliver promised improvements or primarily serve as pretext for appropriation remains a central debate (Platteau 1996; Berry 1993; Borras Jr and Franco 2012; Deininger and Bank 2003).

Political Marxists emphasize class power, arguing that capitalism required expropriating the peasantry (Brenner 1976; Wood 2002), creating a landless workforce dependent on wage labor. Allen (1992) critiques this and "Tory" views (Chambers 1953) as "agrarian fundamentalism" or the belief that customary institutions are inherently backward and impede modernization. He and others argue that significant productivity growth occurred under customary systems in Britain prior to Parliamentary enclosures, suggesting those reforms were often motivated by redistributive rent capture (Allen 1982; Clark 1998; Kopsidis, Bruisch, and Bromley 2015; Platteau 1996).

Together, these literatures suggest that transitions in property rights reflect a complex interaction between productivity gains, the effectiveness of customary governance, and the distributional power of affected groups. Our framework formalizes these dimensions by introducing parameters that capture (i) the relative productivity (TFP) gain of enclosed versus unenclosed land (θ); (ii) the effectiveness of customary governance (μ), which allows communities to generate rents without formal titling; and (iii) the ability of incumbents to resist enclosure or extract compensation (τ). A key implication is that effective customary governance can itself create valuable rents, which may paradoxically intensify incentives for inefficient, rent-shifting enclosure.

Methodologically, our framework builds on Weitzman (1974), which provides the benchmark for efficiency losses under open access, but follows de Meza and Gould (1992) in endogenizing the costly transition between regimes. This dimension is often treated as exogenous in recent macro-development studies on misallocation (Chen, Restuccia, and Santaeulàlia-Llopis 2023; Gottlieb and Grobovšek 2019). We use our parameterization to isolate the determinants of the wedge between private and social outcomes and employ global games (Morris and Shin 2003) to resolve multiple equilibria and identify precise tipping points.

From these perspectives, the transition to private property is not simply a solution to coordination failure but often a costly contest for exclusive control, where resources are expended to shift and capture existing rents. Following Tullock (1967) and Anderson and Hill (1990), such processes can result in net social loss when enforcement costs exceed productivity gains. Thus, rather than solving the inefficiency, the transition may simply exchange the tragedy of the commons for a "tragedy of enclosure," a dissipative race that consumes the social surplus. Our model identifies when enclosure leads to productive reorganization versus a dissipative raid.

These historical dynamics remain critical to modern development policy. While de Soto (2000) argues that formalizing property rights unlocks capital, critics warn that top-down titling often disrupts functional customary arrangements and concentrates ownership (Platteau 1996; Sjaastad and Cousins 2009). The empirical record supports this nuance: recent research by Heldring, Robinson, and Vollmer (2024) finds that while English enclosures did significantly increase productivity, the effects were highly sensitive to local context. Our model rationalizes this variation, showing that whether institutional change yields efficiency or dissipation depends on the specific alignment of economic and political fundamentals.

While historical and anthropological research is essential for understanding institutional nuance, formal models can serve a complementary role by clarifying mechanisms and organizing predictions.[2] Our framework formalizes several of these implicit models, giving each narrative a parameterization and identifying the conditions under which competing theoretical predictions hold.

3 Benchmark model

3.1 Technology and resources

We begin with a model of a purely agricultural economy producing a single output, say, blueberries. Production uses land and labor, with land potentially existing in one of two states: enclosed or unenclosed. Enclosed land has an owner (or owners) who can exclude others at a cost. For now, unenclosed land is in open access; anyone can gather blueberries from any parcel of this land that they can occupy by possession. Section 5 extends the model to allow for community-based regulation of access to unenclosed or "common" land.

Production in the unenclosed (or customary/common) and enclosed sectors follows Cobb-Douglas technologies:

$$\begin{aligned} \text{Unenclosed:} \quad & AF(T_c, L_c) = AT_c^{1-\alpha} L_c^{\alpha} \\ \text{Enclosed:} \quad & \theta AF(T_e, L_e) = \theta AT_e^{1-\alpha} L_e^{\alpha} \end{aligned}$$

where T_i and L_i denote land and labor in sector $i \in \{c, e\}$, A is total factor productivity, and θ captures potential productivity differences between sectors. While we adopt

2. As Hatcher and Bailey (2001, p. 1) observe, "what historians write is imbued with an awareness of theory and abstract concepts" that "resonate with the influence of grand but conflicting models."

Cobb-Douglas functions for tractability, our core comparative static results generalize to any concave, monotonic technology. This follows from aggregative game theory, where players' payoffs depend on their own action and an aggregate of all players' actions, preserving key strategic properties across functional forms (Acemoglu and Jensen 2013).

We capture relative efficiency as a Hicks-neutral TFP gap $\theta = A_e/A_c$ (where $A_c = A$). This formulation isolates the labor-intensity shifts intrinsic to property rights—avoiding the confounding effects of biased technical change—and aligns the framework with the empirical literature that seeks to estimate productivity gains from enclosure (e.g., Allen 1982, p. 943, Eq. 3).[3] When $\theta > 1$, enclosure enables technological or organizational improvements - for example, fenced plots may protect blueberries from trampling or animal foraging, or more secure property rights may incentivize investment in higher-yield varieties (Boserup 1965). When $\theta \leq 1$, enclosure offers no productivity advantage or may even reduce output, as when fencing reduces cultivable area. By modeling post-enclosure changes as homothetic transformations, we isolate how factors beyond technology drive the adoption of different production techniques on enclosed land.

The economy has fixed endowments of land ($\bar{T}$) and labor ($\bar{L}$), with population density defined as $\bar{l} = \frac{\bar{L}}{\bar{T}}$. Of these totals, if T_e units of land and L_e units of labor are employed in the enclosed sector, there will be $T_c = \bar{T} - T_e$ and $L_c = \bar{L} - L_e$ in the unenclosed sector. We denote the shares of enclosed land and labor as $t_e = \frac{T_e}{\bar{T}}$ and $l_e = \frac{L_e}{\bar{L}}$ respectively.

In the enclosed sector, competitive firms employ factors under constant returns to scale, paying market wages and land rents (in units of output). Labor freely moves between sectors until returns equalize: labor can either earn market wages in the enclosed sector or directly produce output in the unenclosed sector.

3.2 First-best labor allocation and enclosure

A social planner chooses both the share of land to enclose (t_e) and the share of labor to allocate to the enclosed sector (l_e), taking into account an output cost of c per unit of land enclosed, to maximize total output net of enclosure costs. With total land $\bar{T}$ and labor $\bar{L}$, this implies solving:

$$\max_{t_e, l_e} \quad A\left[\theta F(t_e\bar{T}, l_e\bar{L}) + F((1-t_e)\bar{T}, (1-l_e)\bar{L})\right] - ct_e\bar{T} \tag{1}$$

3. Note also that under the Cobb-Douglas functional form used to obtain closed-form solutions, factor-biased technical change is observationally equivalent to Hicks-neutral change.

where ct_eT represents enclosure costs in units of output.[4] Under Cobb-Douglas production, expressing output in units of land, we can write $\theta AF(T_e, L_e) = \theta AF(t_e, l_e) \cdot F(\bar{T}, \bar{L})$ and express the objective more compactly as:

$$\max_{t_e, l_e} \quad [\theta F(t_e, l_e) + F(1 - t_e, 1 - l_e)] \cdot A\bar{l}^{\alpha} - c \cdot t_e \tag{2}$$

where $A\bar{l}^{\alpha} = AF(\bar{T}, \bar{L})/\bar{T}$ is potential output per unit land using the non-augmented technology. Efficiency requires equating the marginal product of labor across sectors ($MP_L^e = MP_L^c$). Differentiating the objective in (2) with respect to l_e and applying our functional forms yields:

$$\theta \alpha A \left(\frac{t_e}{l_e}\right)^{1-\alpha} = \alpha A \left(\frac{1 - t_e}{1 - l_e}\right)^{1-\alpha} \tag{3}$$

Solving for l_e gives the planner's first-best labor allocation function:

$$l_e^1(t_e) = \frac{\theta^{\frac{1}{1-\alpha}} t_e}{1 + (\theta^{\frac{1}{1-\alpha}} - 1)t_e}. \tag{4}$$

This tells us, for any initial share of enclosed land t_e (which may not be the efficient choice), the share of labor l_e the planner would allocate to the enclosed sector to maximize total output.

When $\theta > 1$, we have $l_e^1(t_e) \geq t_e$ for all $t_e \in [0, 1]$, with strict inequality at interior points. The planner thus employs higher labor intensity on enclosed land than on unenclosed land, so $L_e/T_e \geq \bar{L}/\bar{T} \geq L_c/T_c$. This will contrast with the labor allocation reaction functions under decentralized enclosure situations studied below, where private enclosure reduces labor use on newly enclosed plots unless the expected productivity gain θ exceeds a high threshold θ_H.

To facilitate comparison with decentralized outcomes, we reformulate the planner's maximization problem in two steps. The planner first determines the optimal labor intensity function $l_e^1(t_e)$ for any enclosure rate t_e. This optimal labor share function (given by (4)) is substituted into the objective and the planner chooses the enclosure rate t_e, which solves:

4. Following de Meza and Gould (1992), we assume linear enclosure costs: at cost c per unit of land, an owner can establish and enforce exclusive property rights. In this formulation, c is incurred in units of output, so some amount of output can be used to enclose land. An alternative formulation would be to allow enclosure costs to depend upon labor, so we might have something like clt_e. This formulation does not fundamentally change our results, but makes aspects of our results a bit harder to see later in the paper when we affect a decomposition of the various costs and benefits from enclosure.

$$\max_{t_e} \quad z_1(t_e) - c \cdot t_e \tag{5}$$

where

$$z_1(t_e) = \left[\theta F(t_e, l_e^1(t_e)) + F(1 - t_e, 1 - l_e^1(t_e))\right] \cdot A\bar{l}^\alpha$$

which, using the functional form in (4) can be simplified to:

$$z_1(t_e) = \left[1 + \left(\theta^{\frac{1}{1-\alpha}} - 1\right) t_e\right]^{1-\alpha} \cdot A\bar{l}^\alpha$$

Enclosure is costly, so it will only be socially optimal when it enables higher productivity technology (that is, where $\theta > 1$) and effective population pressure $A\bar{l}^\alpha$ is sufficiently high relative to enclosure costs ct_e. Since, by assumption, the planner ensures efficient labor allocation across sectors (the planner perfectly regulates access to the not yet enclosed or improved areas), the enclosure decision reduces to a straightforward technology adoption decision: enclose a unit of land if and only if the output gains from technological improvement θ and associated optimal labor reallocation exceed the marginal cost c. This leads to our first result:

Lemma 1 (First-Best Enclosure)**.** *When $\theta > 1$, the planner chooses enclosure rate t_e^1 as follows:*

- ***No Enclosure:*** *$t_e^1 = 0$, when $z_1'(0) \leq c$.*
- ***Full Enclosure:*** *$t_e^1 = 1$, when $z_1'(1) \geq c$.*
- ***Partial Enclosure:*** *$t_e^1 \in (0, 1)$, when $z_1'(0) > c$, $z_1'(1) < c$, and $z_1'(t_e^1) = c$.*

When $\theta \leq 1$, the planner always chooses no enclosure.

Proof: For $\alpha \in (0, 1)$ and $\theta > 1$, the planner's benefit function $z_1(t_e)$ in equation (5) is strictly concave ($z_1''(t_e) < 0$). Therefore, to determine whether land should remain unenclosed, partially enclosed, or fully enclosed, we only need to compare the marginal benefit of enclosure $z_1'(t_e)$ with its marginal cost c at the endpoints, which determines whether $z_1(t_e) - ct_e$ is maximized at a corner or interior solution. When $\theta < 1$, $z_1(t_e)$ is strictly decreasing in t_e, making zero enclosure optimal. □

Using Lemma 1, we can map model parameters into optimal enclosure decisions. Differentiating $z_1(t_e) - ct_e$ with respect to t_e and rearranging defines a parametric region coinciding with the case in which no enclosure is socially optimal outlined by Lemma 1. We can express this as a critical threshold for population density $\bar{l}$:

$$z_1'(0) \le c \quad \Leftrightarrow \quad \bar{l} \le \left[\frac{1}{(1-\alpha)\left(\theta^{\frac{1}{1-\alpha}} - 1\right)} \cdot \frac{c}{A} \right]^{\frac{1}{\alpha}} = \bar{l}_0^1(\theta) \tag{6}$$

Similarly, the 'full enclosure' condition requires $z_1'(1) \ge c$, which yields:

$$z_1'(1) \ge c \quad \Leftrightarrow \quad \bar{l} \ge \theta^{\frac{1}{1-\alpha}} \cdot \bar{l}_0^1(\theta) = \bar{l}_1^1(\theta) \tag{7}$$

Partial enclosure is optimal for population densities between the no-enclosure threshold (6) and the full enclosure threshold (7).

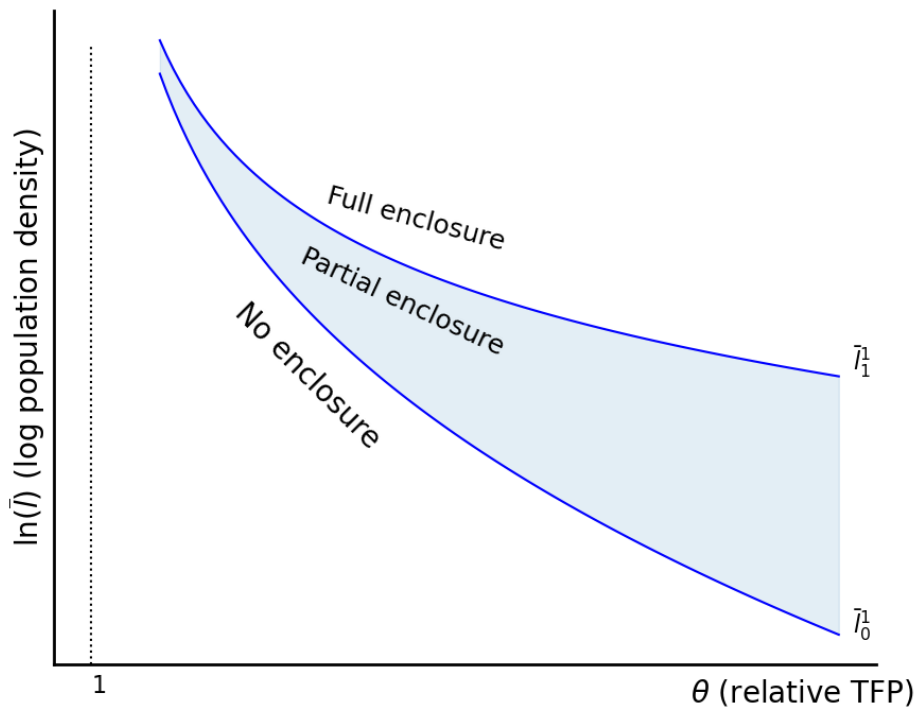

Figure 1: Socially efficient enclosure decisions as they depend on (log) population density $\bar{l}$ and expected TFP gain from enclosure θ.

Figure 1 is a graphical representation of the parametric description of Lemma 1, and shows the loci $\bar{l}_0^1$ and $\bar{l}_1^1$ plotted as solid lines in $(\theta, \ln \bar{l})$ space.[5] The shaded parameter region between the two loci corresponds to situations where partial land enclosure is optimal.

5. We plot the natural logs of the loci, for better scaling. This and all subsequent diagrams are drawn for parameters $c/A = 1$ and $\alpha = 2/3$.

This analysis suggests a Boserupian interpretation of induced agricultural intensification: when land is abundant (low $\bar{l}$), enclosure benefits fall short of costs unless potential productivity gains θ are sufficiently high. Thus, while $\theta > 1$ is necessary for enclosure to be optimal when $c > 0$, it is not sufficient. Even with productivity-enhancing enclosure ($\theta > 1$), the opportunity cost of drawing labor from the unenclosed sector plus enclosure costs may outweigh potential gains when land is abundant (low $\bar{l}$) or baseline productivity is high (high A).

Consider an economy initially below the $\bar{l}_0^1$ threshold where no enclosure is optimal. If population growth pushes density $\bar{l}$ above this threshold, the marginal social return to enclosure now exceeds its cost, leading the planner to enclose some land and operate it at higher labor intensity. However, since drawing labor from the unenclosed sector incurs increasing marginal costs, the planner at first encloses only enough land to efficiently accommodate the population increase.

3.3 Decentralized enclosure processes

Each unit of land has a potential encloser who can, at cost c units of output, establish exclusive rights. Following Weitzman (1974) and de Meza and Gould (1992), we initially assume enclosers do not compensate displaced users. In Section 5.2 we extend the model to settings where enclosers must pay compensation or overcome resistance.[6]

Upon enclosure, each unit of land enters a competitive formal sector employing technology $\theta F(T, L)$. This sector pays competitive factor returns: land earns a rental rate r equal to its marginal product $MP_T^e = \theta A F_T$, while labor earns a wage $w = MP_L^e$.[7]

In equilibrium, labor mobility ensures that labor must be indifferent between sectors. The usual assumption is that labor earns average product on common land, so in equilibrium $AP_L^c = w_e = MP_L^e$. This implies $MP_L^c < MP_L^e$ and the classic result of higher-than-efficient labor intensity, or "overcrowding," on open access land, also known as the "tragedy of the commons" (Dasgupta and Heal 1979; Cornes and Sandler 1996; Baland and Platteau 1996).

Some additional interpretation of the $AP_L^c = MP_L^e$ condition is helpful for better understanding our results. When allocating across sectors, labor can be seen as choosing between a market wage, and simultaneously working and establishing possessory rights on open access land. With symmetric ability to contest possession, the L_c units of labor

6. More elaborate contest functions and strategic aspects of enforcing claims can be readily incorporated. See Baker (2003, 2008) and Hafer (2006), and the discussion in Section 5.1.

7. This formulation is equivalent to enclosers either directly hiring labor and earning profits or charging competitive access tolls to laborers (see Weitzman (1974, p. 230)).

spread evenly across T_c units of unenclosed land. Each unit of labor thus operates T_c/L_c units of land. By Euler's theorem and constant returns production, average product $AP_L^c = F(T_c, L_c)/L_c$ decomposes into labor's marginal product plus implied rents from possessed land:

$$AP_L^c = MP_L^c + MP_T^c \cdot \frac{T_c}{L_c} \tag{8}$$

Equation (8) suggests the labor allocated to the commons can be seen as establishing possession over a share of land and then earning an informal wage of MP_L^c on this land. This expression becomes critical to understanding the interaction between institutions and enclosure incentives.

For our Cobb-Douglas specification, the equilibrium condition $AP_L^c = MP_L^e$ becomes:

$$\theta\alpha A\left(\frac{t_e}{l_e}\right)^{1-\alpha} = A\left(\frac{1-t_e}{1-l_e}\right)^{1-\alpha} \tag{9}$$

This equilibrium condition yields the *labor reaction function* which determines the share of labor l_e allocated to the enclosed sector for any enclosure rate t_e:

$$l_e^0(t_e) = \frac{(\alpha\theta)^{\frac{1}{1-\alpha}} t_e}{1 + \left((\alpha\theta)^{\frac{1}{1-\alpha}} - 1\right) t_e} \tag{10}$$

The term $(\alpha\theta)^{\frac{1}{1-\alpha}}$ multiplied by t_e in the numerator of the labor reaction function (10) differs from the similar term $\theta^{\frac{1}{1-\alpha}}$ in the planner's labor allocation function (4), with $(\alpha\theta)^{\frac{1}{1-\alpha}} \leq \theta^{\frac{1}{1-\alpha}}$. Consequently, at any interior enclosure rate $t_e \in (0,1)$, the decentralized equilibrium allocates strictly less labor to enclosed land than the planner would choose, so $l_e^0(t_e) < l_e^1(t_e)$.

Unlike the planner's optimal labor allocation function (4), which is always concave whenever enclosure occurs, the labor reaction function (10) may be either convex or concave in the presence of enclosure. Specifically, by inspection of the numerator of (10), when $(\alpha\theta)^{\frac{1}{1-\alpha}} < 1$, $l_e^0(t_e)$ is convex to the origin; otherwise it is concave. This qualitative difference proves critical for the model's behavior and can be characterized by a threshold value θ_H:

Definition (High-TFP Threshold)**.** *Let $\theta_H = \frac{1}{\alpha}$ denote the threshold where $(\alpha\theta)^{\frac{1}{1-\alpha}} =$ 1. Then:*

When $\theta \geq \theta_H$: ***enclosure introduces high-TFP gains and enclosed land employs more labor per unit land*** $(l_e > t_e)$

When $\theta < \theta_H$: ***enclosure introduces low-TFP gains and enclosed land employs less labor per unit land*** ($l_e < t_e$)

This distinction proves critical for comparison of equilibria. Note that the low-TFP case includes situations where $\theta < 1$, implying productivity losses from enclosure.

The private return to enclosure equals the marginal product of land, which depends on the labor reaction function:

$$r(t_e) = \theta \cdot AF_T(t_e\bar{T}, l_e^0(t_e)\bar{L}) \tag{11}$$

Substituting the labor reaction function (10) into the parametric form of (11) yields:

$$r(t_e) = \theta \cdot (1-\alpha) \cdot A\bar{l}^{\alpha} \cdot \left(\frac{(\alpha\theta)^{\frac{1}{1-\alpha}}}{1 + ((\alpha\theta)^{\frac{1}{1-\alpha}} - 1)t_e} \right)^{\alpha} \tag{12}$$

Atomistic potential enclosers compare this rental rate to the enclosure cost c, choosing to enclose when $r(t_e) > c$. In a Nash equilibrium, each would-be encloser makes a best-response enclosure decision taking others' enclosure actions (as well as labor reactions) as given. Since these actions affect payoffs only through the aggregate enclosure rate t_e, this process has the structure of an aggregative game (see Acemoglu and Jensen 2013). The nature of this game changes fundamentally depending on whether enclosure introduces high or low-TFP gains.

Proposition 1 (Strategic Interactions in Enclosure Decisions)**.** *When:*
$\theta \geq \theta_H$ *enclosure decisions are strategic substitutes;* $r'(t_e) \leq 0$.
$\theta < \theta_H$ *enclosure decisions are strategic complements;* $r'(t_e) > 0$.

Proof: The rental rate function $r(t_e)$ in (12) inherits its properties from the labor reaction function (10). We have $r'(t_e) < 0$ when $(\alpha\theta)^{\frac{1}{1-\alpha}} > 1$, or equivalently, $\theta > \frac{1}{\alpha}$, coinciding with the definition of high-TFP gains to enclosure. Similarly, $r'(t_e) > 0$ when $\theta < \frac{1}{\alpha}$, in the low-TFP gains to enclosure region. □

This result reveals a fundamental dichotomy in decentralized enclosure processes. In high-TFP economies ($\theta > \theta_H$), enclosure decisions are strategic substitutes as the marginal return $r(t_e)$ decreases with aggregate enclosure. This leads to equilibrium behavior characterized in:

Proposition 2 (Decentralized Enclosure with High-TFP gains)**.** *When $\theta > \theta_H$, pure strategy equilibria are characterized by:*

- ***No enclosure:*** *$t_e^* = 0$, when $r(0) < c$.*

- ***Full enclosure:*** *$t_e^* = 1$, when $r(1) \geq c$.*

- ***Partial enclosure:*** *$t_e^* \in (0, 1)$, when $r(0) > c$, $r(1) < c$, and $r(t_e^o) = c$.*

Proof: Whenever $\theta > \theta_H$ or $(\alpha\theta)^{\frac{1}{1-\alpha}} > 1$, differentiation of (10) shows $r'(t_e) < 0$, and $r''(t_e) > 0$. The results follow from comparing $r(t_e)$ with c at the boundaries and interior points. □

While this high-TFP case yields equilibria qualitatively similar to the first-best outcomes in Lemma 1, the low-TFP case ($\theta < \theta_H$) produces starkly different results. Here, enclosure decisions become strategic complements as $r(t_e)$ *increases* with aggregate enclosure. As noted by Vives (2005) and Acemoglu and Jensen (2013), aggregative games with strategic complementarity can lead to multiple equilibria and coordination failures, as we show in the next Proposition.

Proposition 3 (Decentralized Enclosure with Low-TFP gains)**.** *In the low-TFP gains region, equilibria are characterized by:*

- ***No enclosure*** *is the unique dominant strategy equilibrium when $r(1) < c$.*

- ***Full enclosure*** *is the unique dominant strategy equilibrium when $r(0) > c$.*

- ***Multiplicity*** *(either full or no enclosure) when $r(0) < c$ and $r(1) > c$.*

Proof. When there are low-TFP gains, $(\alpha\theta)^{\frac{1}{1-\alpha}} < 1$ and $r(t_e)$ is strictly increasing in t_e. Thus, if $r(1) < c$, no encloser has an incentive to enclose even under the best circumstances, as $r(t_e) < r(1) < c$ for all t_e. Conversely, if $r(0) > c$, enclosure always pays off as $r(t_e) > r(0) > c$ for all t_e. When $r(0) < c < r(1)$, either equilibrium is possible. □

The contrast between Propositions 2 and 3 reflects fundamentally different labor market responses to enclosure. In low-TFP economies, enclosed land employs less labor than the same plot when unenclosed. This labor displacement lowers equilibrium wages, raising labor utilization and rental rates across all land, and the return to further enclosures. Conversely, in high-TFP economies, each enclosure raises labor demand enough to increase plot-level employment, drawing in labor and reducing crowding on unenclosed land. While this raises wages, it reduces returns to further enclosure.

Substituting $t_e = 0$ into (11) we find an expression for the threshold level of population density $\bar{l}$ above which enclosure becomes attractive ($r(0) > c$):

$$r(0) \geq c \quad \Leftrightarrow \quad \bar{l} \geq \frac{1}{(\alpha\theta)^{\frac{1}{1-\alpha}}} \left[\frac{c}{\theta A} \cdot \frac{1}{(1-\alpha)} \right]^{\frac{1}{\alpha}} = \bar{l}_0^d \tag{13}$$

Similarly, the region where $r(1) \geq c$ holds defines a critical region where full enclosure will occur:

$$r(1) \geq c \quad \Leftrightarrow \quad \bar{l} \geq \left[\frac{c}{\theta A} \cdot \frac{1}{(1-\alpha)} \right]^{\frac{1}{\alpha}} = \bar{l}_1^d \tag{14}$$

The relative position of these thresholds depends on whether TFP gains are high or low. Under low-TFP gains, strategic complementarity implies the $r(1) > c$ threshold lies above the $r(0) > c$ threshold, creating the possibility of multiple equilibria. These thresholds are plotted in Figure 2. The two loci cross at $\theta_H = \frac{1}{\alpha}$ which separates the high and low-TFP regions.

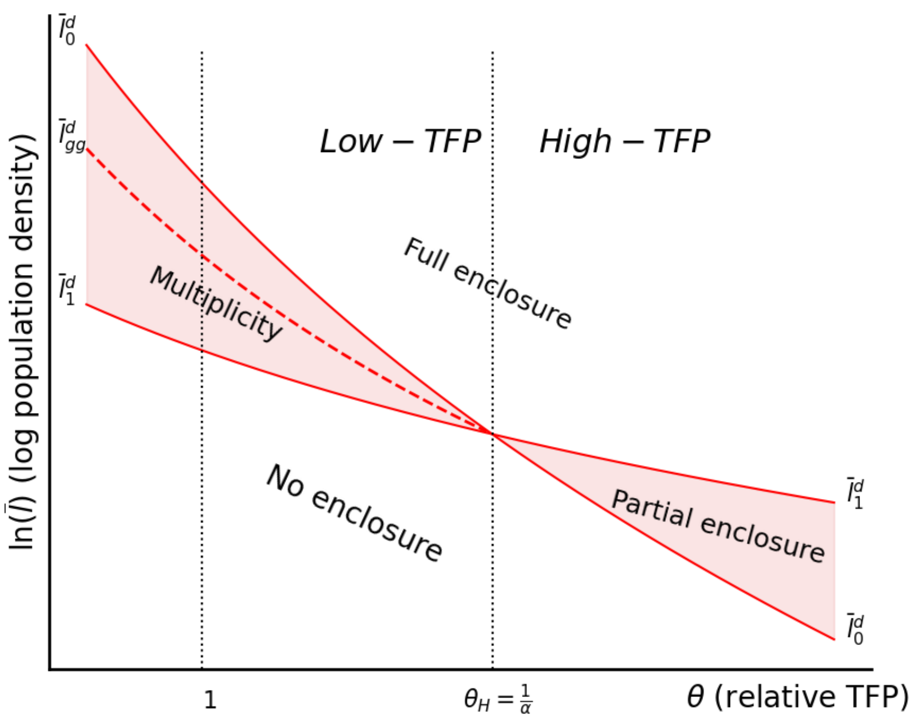

Figure 2: Decentralized enclosure equilibria.

In the high-TFP region between these thresholds, partial enclosure emerges as a stable equilibrium. However, in the low-TFP region, both no enclosure and complete enclosure can be Nash equilibria,[8] as detailed in Proposition 3. When no land is enclosed so $t_e = 0$, it is privately unprofitable for any one claimant to enclose land, yet each would find it profitable to enclose if all others did as well. In such environments, small changes in beliefs about others' enclosure decisions could trigger rapid transitions between property regimes, leading to sudden changes in output and distribution. In this region, one might wish to deploy a more refined equilibrium selection criterion, as we now suggest.

3.4 Multiple equilibria and global games

The theory of Global Games (Carlsson and van Damme 1993; Morris and Shin 2003) provides a natural framework for selecting between the full- and no-enclosure equilibria in the low-TFP region multiple equilibria region. Consider introducing small uncertainty about the TFP parameter θ, drawn from a continuous distribution over the interval $(0, \theta_H)$. Potential enclosers observe a private signal $x = \theta + \sigma\varepsilon_i$, where ε has mean zero, finite variance, and finite support. As σ approaches zero, parametric uncertainty about θ vanishes but strategic uncertainty remains. As Morris and Shin (2003) demonstrate, this leads to a unique cutoff strategy in Nash equilibrium: players enclose if and only if θ exceeds some threshold θ^*, resulting in full enclosure whenever $\theta \geq \theta^*$.[9]

The cutoff θ^* is determined by the θ at which a potential claimant is indifferent between enclosing or not, given a uniform expectation about the fraction of others enclosing (i.e., a Laplacian belief about the enclosure decisions of others). Specifically, θ^* solves:

$$\int_0^1 \left[(\alpha\theta)^{\frac{1}{1-\alpha}} \frac{(1-\alpha)}{\alpha} \cdot A\bar{l}^{\alpha} \cdot (1 + \left((\alpha\theta)^{\frac{1}{1-\alpha}} - 1\right) t_e)^{-\alpha} - c\right] dt_e = 0$$

This condition can be simplified to show that full enclosure is the risk-dominant equilibrium when:

8. An unstable interior equilibrium with partial enclosure also exists.

9. The global games solution applies under standard conditions Morris and Shin (2003, Sections 2.1–2.2). The payoff function r must be continuous, non-decreasing in t_e and θ, and admit a unique threshold θ at which $r - c = 0$ under uniform beliefs. The parameter space must also contain dominance regions in which enclosure or non-enclosure is optimal regardless of others' actions; in Figure 2, these lie horizontally to the left and right of the shaded region labelled "multiplicity."

$$E[r(t_e) - c] \geq 0 \quad \Leftrightarrow \quad \bar{l} \geq \left[\frac{c}{\theta A} \cdot \frac{1 - (\alpha\theta)^{\frac{1}{1-\alpha}}}{(\alpha\theta)^{\frac{\alpha}{1-\alpha}} - (\alpha\theta)^{\frac{1}{1-\alpha}}} \right]^{\frac{1}{\alpha}} = \bar{l}^d_{gg} \tag{15}$$

The locus is plotted as a dashed red line $\left(\bar{l}^d_{gg}\right)$ in Figure 2. In the low-TFP region, full enclosure emerges above this threshold, while no enclosure prevails below it.

3.5 Comparative statics

The analysis and figures above help to describe how the equilibrium mix of property regimes – the amount of land allocated to open-access or enclosed plots – will change with key environmental parameters, including population density $\bar{l}$ and the potential for technological improvement after enclosure θ. These variables appear on the vertical and horizontal axes of Figures 1, 2, and all subsequent figures.

The base-level total factor productivity parameter A and the cost per unit land of enclosure c also matter for enclosure decisions. These parameters enter as c/A in all the boundary loci of enclosure decisions (expressions 6, 7, 13, 14, and 15). An increase in c generates an upward vertical displacement of all loci, making enclosure less likely, all else equal. Similarly, an increase in the base-level total factor productivity A generates a downward vertical displacement, making enclosure more likely. We analyze the effect of additional policy and institutional variables in Section 5.

4 The Social efficiency of private enclosure decisions

Figure 3 superimposes the private enclosure decision regions of Figure 2 on the social planner decision regions of Figure 1. This reveals where private and social enclosure decisions diverge and hence where decentralized equilibrium allocations $(t^*_e, l^0_e(t^*_e))$ fall short of potential output. Evidently, for many parameter configurations, decentralized enclosure produces efficient outcomes. These configurations are represented by most unshaded regions of the figure. For economies with low TFP gains and low population density (the lower left region of Figure 3), the absence of private enclosure matches the social planner's choice. Similarly, for economies with high population density and high TFP gains (upper right region), decentralized processes efficiently achieve full enclosure.

Figure 3 also shows that private equilibria may generate either too much or too little enclosure, and that enclosure may be complete even when none should occur. To the left of the TFP threshold θ_H on the diagram, enclosure decisions are strategic complements (Proposition 1), leading to corner outcomes of complete or no enclosure (Proposition 3).

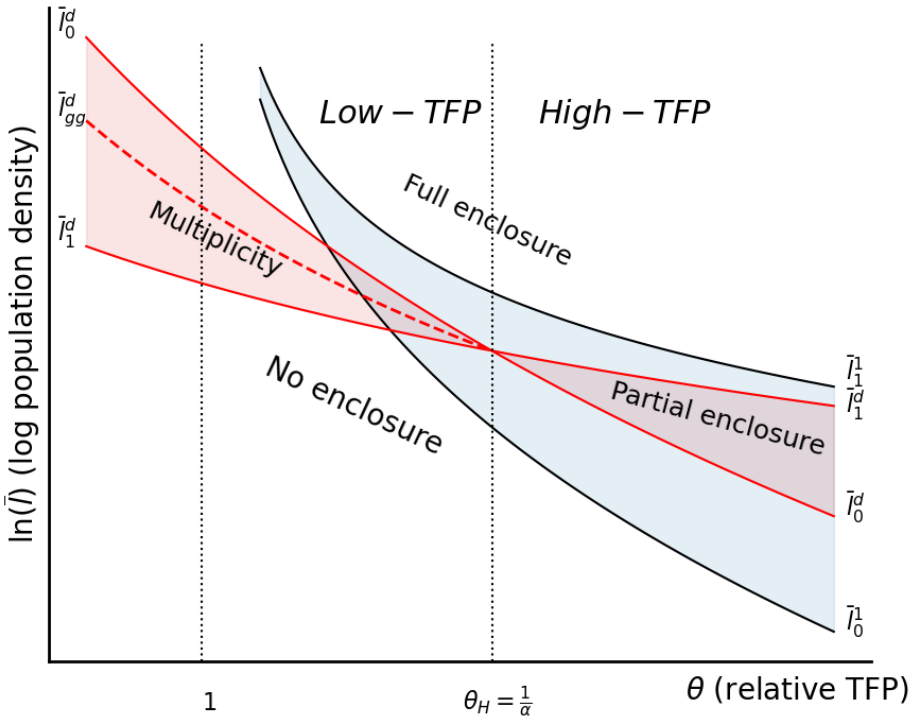

Figure 3: Optimal and Decentralized Enclosures Compared. Red-shaded areas describe regions with partial private enclosure or multiple equilibria. Blue-shaded regions describe socially optimal partial enclosure.

Any enclosure raises the return to further enclosure, which may trigger a cascade toward inefficient full enclosure, perhaps even when $\theta < 1$ and enclosure induces technical regress. Under Global Games equilibrium selection, complete enclosure occurs above the red-dashed $\bar{l}_{gg}^d$ locus even when the economy lies below the blue-shaded region in which enclosure is optimal. Complementarity in enclosure decisions may also result in no enclosure occurring when some should occur. Near the θ_H line, blue-shaded areas appear below the dashed locus; here some enclosure is socially desirable, and the impact of complementarity is that the enclosure process is prevented from starting.

To the right of the θ_H line on figure 3, where enclosure decisions are strategic substitutes, equilibrium enclosures may again be excessive or deficient. In the blue-shaded region above $\bar{l}_0^1$ but below $\bar{l}_0^d$, some enclosure should occur but in equilibrium none does. Conversely, in the region below $\bar{l}_1^1$ yet above $\bar{l}_1^d$, enclosure is complete even though partial enclosure is optimal. Inefficiencies arise for these parameter configurations because enclosure decisions fail to internalize the social value forfeited by the displaced interests, which we discuss in section 5.

4.1 Are decentralized enclosures second-best?

While we can identify where private and social enclosure rates diverge, evaluating these divergences requires a more nuanced policy benchmark than the first-best optimum. The decentralized economy faces labor misallocation problems that the first-best planner simply assumes away. Governments often control which land areas can be enclosed through settlement or zoning laws that delineate where land claims will be recognized and registered. However, these same governments may be unable to prohibit squatting or regulate access to unenclosed frontier regions and informal settlement areas.[10] A more policy-relevant benchmark is therefore a constrained planner who chooses enclosure rates but cannot regulate labor entry.

To establish this second-best optimum, let $z_0(t_e)$ describe output per unit land achievable at different enclosure rates t_e, subject to the constraint that labor moves freely into any remaining unenclosed land until equilibrium condition (8) or (9) holds. We incorporate this constraint by substituting the labor reaction function $l^0(t_e)$ from (10) into the planner's objective (1):

$$z_0(t_e) = \left[\theta F(t_e, l_e^0(t_e)) + F(1 - t_e, 1 - l_e^0(t_e))\right] \cdot A\bar{l}^\alpha \tag{16}$$

After some simplification, the constrained planner's overall objective can be written using our parametric form as:

$$z_0(t_e) - c \cdot t_e = \frac{\theta(\alpha\theta)^{\frac{\alpha}{1-\alpha}} t_e + (1 - t_e)}{(1 + \left((\alpha\theta)^{\frac{1}{1-\alpha}} - 1\right) t_e)^\alpha} \cdot A\bar{l}^\alpha - c \cdot t_e \tag{17}$$

This differs qualitatively from the unconstrained output function $z_1(t_e)$ in (5). While $z_0(t_e) = z_1(t_e)$ at the endpoints $t_e = 0$ and $t_e = 1$ where no labor misallocation occurs, $z_0(t_e)$ lies below $z_1(t_e)$ at all interior points since labor is misallocated relative to the first-best optimum.

The constrained-efficient enclosure policy regions follow from analyzing the properties of $z_0(t_e) - c \cdot t_e$. As before, the optimal solution depends on the shape of this objective function. Proposition 4 characterizes the key results.

10. U.S. land policy from colonial times through the 19th century struggled to prevent squatters from settling beyond official frontier lines (see e.g. Murtazashvili 2013; Alston, Harris, and Mueller 2012). Similar challenges have characterized urban development from Lima to Dar es Salaam (de Soto 2000).

Proposition 4 (Second-best Enclosure)**.** *A constrained planner who chooses the optimal enclosure rate subject to the labor reaction rule $l_e^o(t_e)$ from (10) faces a convex objective function in a low-TFP gain economy and a concave one in a high-TFP economy. In the low-TFP economy, the constrained planner chooses:*

- ***No enclosure:*** $t_e^c = 0$*, when* $z_0(1) - c \leq z_0(0)$
- ***Full enclosure:*** $t_e^c = 1$*, when* $z_0(1) - c \geq z_0(0)$

In the high-TFP economy, the constrained planner chooses:

- ***No enclosure:*** $t_e^c = 0$ *when* $z_0'(0) \leq c$
- ***Full enclosure:*** $t_e^c = 1$ *when* $z_0'(1) \geq c$
- ***Partial enclosure:*** $t_e^c \in (0, 1)$ *when* $z_0'(0) > c$ *and* $z_0'(1) < c$

Proof: The shape of the planner's objective function $z_0(t_e) - ct_e$ in (16) depends on $(\alpha\theta)^{\frac{1}{1-\alpha}}$. From equation (17), when $\theta < \theta_H$ or $(\alpha\theta)^{\frac{1}{1-\alpha}} < 1$ (low-TFP), the objective is a quotient of a linear function and a concave decreasing function, making it convex. When $(\alpha\theta)^{\frac{1}{1-\alpha}} > 1$ or $\theta > \theta_H$ (high-TFP), it is a quotient of a linear function and a concave increasing function, making it concave. The optimal policy follows directly from these properties: in the convex case, we compare the function values at endpoints; in the concave case, we can find interior solutions by examining derivatives. □

From Proposition 4, in the low-TFP economy, full enclosure yields higher net output when $z_0(1) - c \geq z_0(0)$. This occurs when:

$$z_0(1) - c \geq z_0(0) \quad \Leftrightarrow \quad \bar{l} \geq \left[\frac{c}{A}\frac{1}{\theta - 1}\right]^{\frac{1}{\alpha}} = \bar{l}^s \tag{18}$$

where the superscript s denotes second-best decision thresholds.

In the high-TFP economy, the constrained planner's concave objective yields different thresholds. Enclosure becomes optimal when $z_0'(0) > c$, requiring:

$$z_0'(0) \geq c \quad \Leftrightarrow \quad \bar{l} \geq \left[\frac{c}{A}\frac{\alpha}{\left((\alpha\theta)^{\frac{1}{1-\alpha}}(1+\alpha) - \alpha\right)} \cdot \frac{1}{(1-\alpha)}\right]^{\frac{1}{\alpha}} = \bar{l}_0^s \tag{19}$$

Full enclosure becomes optimal when $z_0'(1) > c$:

$$z_0'(1) \geq c \quad \Leftrightarrow \quad \bar{l} \geq \left[\frac{c}{\theta A} \cdot \frac{1}{(1-\alpha)}\right]^{\frac{1}{\alpha}} = \bar{l}_1^s \tag{20}$$

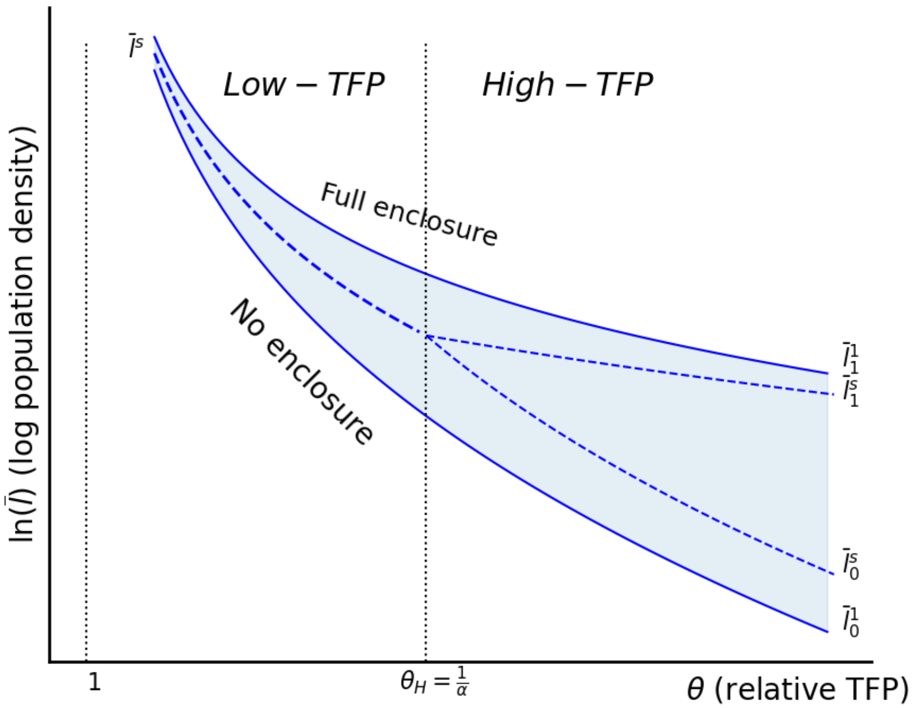

Figure 4: First-best and second-best enclosure as functions of population density and expected TFP gain θ.

Between these thresholds, partial enclosure is second-best optimal. Notably, the full enclosure threshold $\bar{l}_1^s$ in (20) coincides with the decentralized threshold l_1^d in (14) for high-TFP economies (Proposition 2).

Figure 4 shows the boundaries of second-best enclosure regions (dashed blue lines $\bar{l}^s$, $\bar{l}_0^s$, and $\bar{l}_1^s$) superimposed on the first-best boundaries from Figure 1. The constrained planner differs from the unconstrained planner in two ways. First, for economies above $\bar{l}_0^1$ but below $\bar{l}^s$ and $\bar{l}_0^s$, the constrained planner avoids initiating enclosures because the resulting labor misallocation would exceed productivity gains. Second, for economies above $\bar{l}^s$ and $\bar{l}_1^s$ but below $\bar{l}_1^1$, the constrained planner chooses full enclosure to eliminate costly labor misallocation, while the first-best planner maintains some unenclosed land.

Figure 5 overlays the constrained planner's decision regions on the decentralized economy's enclosure regions from figure 2, with first-best regions shown in lighter shading. Two types of inefficiency emerge. First, excessive and catastrophic private enclosure occurs in the red-hatched region (above $\bar{l}_{gg}^d$ and below $\bar{l}^s$), where decentralized processes lead to full enclosure despite higher net output under no enclosure. Second, insufficient enclosure appears in the blue-hatched region (right of θ_H, below $\bar{l}_1^s$, above $\bar{l}_0^s$). Within this region, the more finely hatched area between $\bar{l}_0^s$ and $\bar{l}_0^d$ represents a coordination failure—no enclosure occurs despite the potential for higher net output.

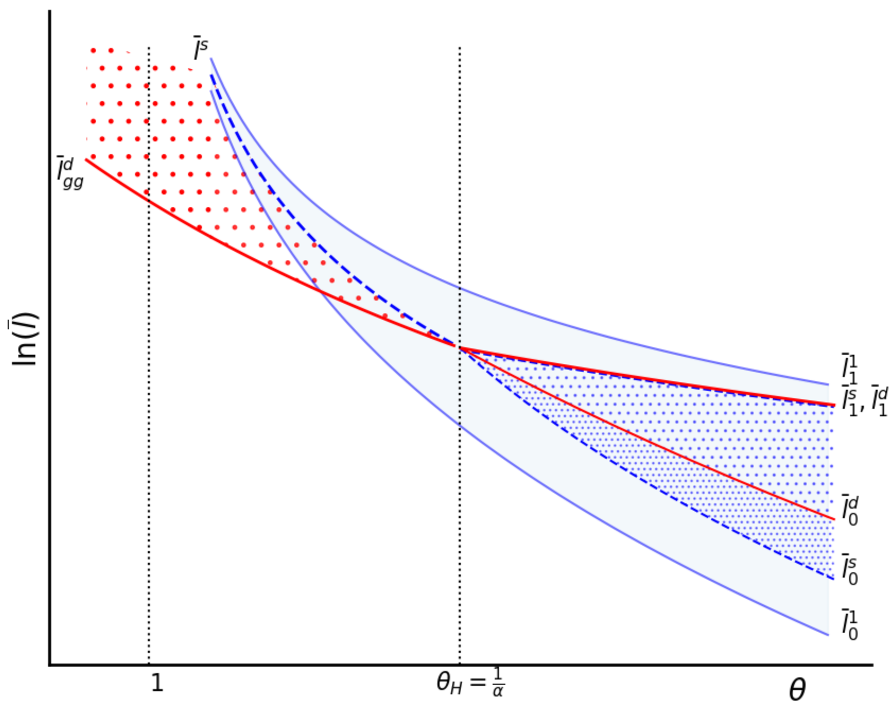

Figure 5: Comparing decentralized and second-best outcomes. Red-hatched regions, where $\theta < \theta_H$, show excessive enclosure; blue-hatched regions, where $\theta > \theta_H$, show insufficient enclosure.

This analysis reveals two distinct patterns of inefficiency. First, in low-TFP gain economies ($\theta < \theta_H$), marginal parameter shifts can trigger sudden enclosure cascades. An economy near the $\bar{l}_{gg}^d$ locus may be efficiently unenclosed, yet slight increases in population density $\bar{l}$ or TFP gain θ can trigger a race to enclose, even when the unenclosed state remains first- and second-best efficient. Such races are particularly deleterious when $\theta < 1$ and enclosure directly reduces productivity. We thus distinguish the classic tragedy of the commons, defined by rent dissipation *in* the resource (Gordon 1954), from a tragedy of enclosure, defined by rent dissipation *for* the resource (Tullock 1967; Anderson and Hill 1990). In the latter, inefficiency stems from uncompensated capture: because the encloser's incentive includes the transfer of customary rents, the private return exceeds the social gain, driving a dissipative race where enforcement costs c

consume any surplus from efficiency gains. Our global games approach identifies these precise parametric boundaries, generalizing earlier work on dissipative property races (Anderson and Hill 1990) and institutional "cusp catastrophes" (de Meza and Gould 1992).

A qualitatively different inefficiency emerges in high-TFP economies ($\theta > \theta_H$). In the hatched region above $\bar{l}_0^s$ but below $\bar{l}_1^d$, coordination failures lead to suboptimal enclosure. Most strikingly, between $\bar{l}_0^s$ and $\bar{l}_0^d$, the decentralized economy fails to initiate any enclosure despite clear potential gains in net output.

4.2 Sources of Inefficiency

To pinpoint the sources of inefficiency, consider the net social marginal benefit of enclosure from a constrained planner's perspective. The derivative of the planner's second-best objective function, $z_0'(t_e) - c$, can be decomposed as:[11]

$$z_0'(t_e) - c = \underbrace{\theta F_T^e A\bar{f}}_{\text{private return}} - \underbrace{F_T^c A\bar{f}}_{\text{displaced rents}} + \underbrace{(\theta F_L^e - F_L^c) A\bar{f} \cdot \frac{dl_e^0}{dt_e}}_{\text{labor reallocation gain}} - c \qquad (21)$$

Private enclosers compare only their gross return $\theta F_T^e A\bar{f}$ against the enclosure cost c, ignoring the other two components in equation (21).

The first ignored component is the value of displaced rents. Absent enclosure, the land is not idle; it generates output under customary tenure, with rents $F_T^c A\bar{f}$ captured by existing users through possession. Because enclosers appropriate these rents without compensation, they enclose whenever $\theta F_T^e A\bar{f} > c$, even when the net social return $(\theta F_T^e - F_T^c)A\bar{f}$ falls short of c. This drives excessive enclosure.

The second ignored component is the labor reallocation gain. In the unenclosed sector, labor enters to capture possession rents, until the average product equals the market wage. This drives the marginal product F_L^c below that of the enclosed sector θF_L^e. Enclosure releases workers from this low-productivity congestion. But private enclosers pay the full market wage ($w = \theta F_L^e$) regardless of workers' inefficiency, so they fail to capture this efficiency dividend. This drives insufficient enclosure.

The balance of these two opposing forces determines the social efficiency of decentralized enclosure. When the displaced rents effect dominates, enclosers capture more than the social surplus and the decentralized process leads to inefficiently high levels of enclosure. This characterizes economies in the red-hatched regions of Figure 5 be-

11. Recall from (16) that $z_0(t_e) = \left[\theta F(t_e, l_e^0(t_e)) + F(1 - t_e, 1 - l_e^0(t_e))\right] \cdot AF(\bar{T}, \bar{L})/\bar{T}$. In the expression, $A\bar{f} = AF(\bar{T}, \bar{L})/\bar{T}$ denotes potential output per unit of land with no land enclosure

low the high-TFP threshold. Conversely, when the labor reallocation effect dominates, enclosers capture less than the social surplus and the decentralized economy produces inefficiently low levels of enclosure, as seen in the blue-hatched regions to the right of the high-TFP threshold. In the next section we introduce institutional parameters that can close these wedges.

5 The extended model

The benchmark model follows the literature in making two strong simplifying assumptions: (1) that unenclosed areas are characterized by unregulated open-access and (2) that enclosures occur without compensation to existing or potential customary users. The decomposition in equation (21) revealed that these assumptions generate two distinct wedges between private and social returns: the displaced rents that enclosers capture without cost, and the labor productivity gain not captured by the encloser. We now relax these assumptions by introducing two parameters, μ and τ, that modify these wedges to capture the diversity of institutional arrangements observed historically and across cultures. Parameter $\mu \in [0, 1]$ captures the degree to which communities can regulate access to the commons, while $\tau \in [0, 1]$ captures the extent to which customary users must be compensated for displacement. We interpret these as two dimensions of power: μ represents the community's internal capacity to regulate access and reduce rent dissipation, while τ represents the external power of customary users to resist displacement or extract compensation from enclosers. When both parameters equal one, private enclosure decisions align with social efficiency. Intermediate values provide useful framing for a variety of historical episodes and policy debates.

5.1 The regulated commons

Real-world customary regimes differ markedly from pure open access. Our benchmark model, like much of the literature on the "tragedy of the commons," treats the customary sector as an unregulated resource characterized by excessive entry and rent dissipation. Yet empirical research emphasizes that many customary systems are neither open access nor chronically mismanaged (Ostrom 1990; Bromley 1992). Communities regulate entry and use through membership restrictions, plot rights, and internal markets that may even allow for rental or conditioned transfers (Baland and Platteau 1996; Goldstein et al. 2018; Onoma 2009). We now extend the model to take this institutional variation seriously.

We capture the effectiveness of local customary institutions such as village chiefs, land councils, and community norms, with a governance parameter $\mu \in [0, 1]$. Economically, μ measures the degree to which land rents are decoupled from physical possession. A higher μ indicates that institutional enforcement substitutes for physical occupation, allowing households to maintain claims without continuous presence. This parameter suggests two useful interpretations. First, as tenure security: when $\mu = 0$ rights are purely possessory, and a household must actively occupy land to maintain its claim; but as μ rises, governance institutions recognize and enforce claims, allowing households to capture rents without as much investment in 'guard labor' or excessive cultivation. A second, mathematically equivalent, interpretation is that community authorities charge an implicit access fee equal to μ of the land rent, with proceeds redistributed or invested in valued local public goods. Under either interpretation, labor market equilibrium requires:

$$w_e - w_c = (1 - \mu) \cdot r_c \cdot \frac{T_c}{L_c} \tag{22}$$

The term on the right is the possession rent, or the portion of land rents that can only be captured by physically deploying labor in the customary sector. The term on the left - the wage gap - is the difference between marginal products in the enclosed and common sector, respectively, where the latter is the marginal product term in equation (8).

As governance improves (μ rises), the wedge between enclosed and common wages shrinks. Evidence from Peru (Field 2007) and West Africa (Goldstein and Udry 2008) confirms this mechanism: stronger local land governance institutions reduce the need for labor to defend claims.

Put another way, as μ rises, the possession requirement is reduced, and at $\mu = 1$ it vanishes allowing marginal products to equalize across sectors ($MP_L^e = MP_L^c$), and labor is efficiently allocated. Note however, that strong governance is not equivalent to formal enclosure. While perfect governance eliminates static misallocation, it does not deliver the technological transformation ($\theta > 1$) often associated with private consolidation. This formulation implicitly endorses the premise that customary regimes cannot achieve all productivity gains available under private ownership, an assumption that Allen (1992) and others have challenged empirically. We adopt this setup for tractability, but note that the parameter θ already accommodates variation in how much further technological transformation enclosure can deliver. When θ is close to unity, as Allen argues was the case in parts of the English South Midlands, enclosure is primarily redistributive; when θ is large, productivity gains dominate. The framework's core logic regarding when private enclosure decisions diverge from the social optimum applies in either case, as we analyze in Section 6.2.

5.2 Power and Compensation

The second simplifying assumption of the benchmark model is that enclosure occurs without having to overcome resistance from, or offer compensation to, displaced users. While this might describe extreme cases of state-backed dispossession, it excludes many important scenarios: enclosers who are existing customary users seeking to formalize control, outsiders required by state policy to compensate locals, or landlords converting customary tenancies to commercial leases. To capture this sort of institutional diversity, we introduce a parameter $\tau \in [0, 1]$. Whether τ reflects formal compensation rules, informal bargaining power, or the costs of overcoming resistance, higher values reduce the private returns to enclosure and thus the incentive to enclose.

The level of τ reflects the power of customary users to assert their claims or demand compensation, or what Brenner (1976) termed the "balance of class forces." Following the analysis of property rights on the American frontier by Anderson and McChesney (1994) and Umbeck (1981), we recognize that τ may not merely be the consequence of a legal rule but can reflect the relative capacity to exert credible threats of resistance or political pressure. This framing connects to their distinction between "raid" and "trade" as modes of property transfer: when $\tau \to 0$, enclosure resembles a coercive raid in which existing users are displaced without compensation; when $\tau \to 1$, it resembles a negotiated trade in which enclosers fully compensate existing users. The interaction between τ and the governance parameter μ proves central to the analysis. We explore this connection further in Section 6.2.

5.3 The Extended Wedge: A Unified Framework

With compensation requirements, the private encloser's decision rule changes. For each enclosed unit of land, enclosers must now pay $\tau \cdot r_c$ to existing users, where $r_c = F_T^c A\bar{f}$ represents the land rent these users captured through possession. Enclosure is privately profitable when:

$$\theta F_T^e A\bar{f} - \tau \cdot F_T^c A\bar{f} - c \geq 0 \tag{23}$$

When $\tau > 0$, enclosers internalize fraction τ of the displaced rents identified in equation (21). When $\tau = 1$, enclosers fully compensate displaced users and private incentives align with social costs on this margin.

Recall from equation (21) that the social return to enclosure equals the gross private return ($\theta F_T^e A\bar{f}$) minus the land rents lost by displaced customary users ($F_T^c A\bar{f}$), plus the labor reallocation gain. The private encloser, by contrast, compares only the gross return minus compensation to the cost of enclosure, ignoring the labor reallocation gain. The parameters τ and μ close these wedges. With compensation requirements ($\tau > 0$), enclosers internalize a portion of the displaced rents. With regulated access ($\mu > 0$), less labor is misallocated in the first place, reducing the reallocation gain that private enclosers fail to capture. The social return to enclosure becomes:

$$\underbrace{\theta F_T^e A\bar{f}}_{\text{private return}} - \underbrace{(1-\tau)F_T^c A\bar{f}}_{\text{displaced rents}} + \underbrace{(1-\mu)F_T^c A\bar{f}\frac{T_c}{L_c}\cdot\bar{l}\cdot\frac{dl_e^0}{dt_e}}_{\text{labor reallocation gain}} - c \geq 0 \tag{24}$$

The first term is the private return to enclosure. The second term represents the uninternalized social cost of displacement, as analyzed in Section 4.2. Comparing equations (23) and (24) clarifies how τ closes this wedge: the encloser pays compensation $\tau F_T^c A\bar{f}$, leaving only the portion $(1-\tau)F_T^c A\bar{f}$ uninternalized. When $\tau = 1$, the wedge vanishes. This term also vanishes when existing customary users enclose their own plots, since they already capture these rents; such insider enclosure corresponds to $\tau = 1$ regardless of the legal environment.

The third term is the labor reallocation gain, now scaled by $(1-\mu)$. From the equilibrium condition (22), the marginal product gap $\theta F_L^e - F_L^c$ scales directly with $(1-\mu)$. When $\mu = 0$, full misallocation persists and the reallocation gain is maximized. When $\mu = 1$, labor is efficiently allocated across sectors and this term vanishes.

When both $\mu = 1$ and $\tau = 1$, only the private return remains. Private enclosure is then profitable if and only if $\theta F_T^e A\bar{f} \geq c$, which is precisely the condition for socially efficient enclosure.

This framework clarifies the power foundations of institutional change. Following Brenner (1976), a transition to private property need not be driven by an increase in the relative productivity of enclosed land (higher θ). A shift in the political landscape that reduces the compensation requirement (τ), or a successful effort by the community to regulate access and create rents (increasing r_c via higher μ), can both increase the private pressure for enclosure. We develop these connections to historical and contemporary settings in Section 6.

5.4 Power, policy, and the second-best

For labor allocation with regulated access ($\mu \in [0,1]$), the labor reaction function (10) generalizes to:

$$l_e^{\mu}(t_e) = \frac{\Lambda_\mu t_e}{(1 + (\Lambda_\mu - 1)t_e)} \quad \text{where} \quad \Lambda_\mu = \left(\frac{\alpha\theta}{1 - \mu \cdot (1-\alpha)}\right)^{\frac{1}{1-\alpha}} \tag{25}$$

As μ increases from 0 to 1, Λ_μ moves from $(\alpha\theta)^{\frac{1}{1-\alpha}}$ to $\theta^{\frac{1}{1-\alpha}}$, reflecting reduced labor misallocation. The high-TFP threshold from Definition 1 is correspondingly modified:

$$\theta_H^{\mu} = \frac{1}{\alpha} - \mu \cdot \frac{1-\alpha}{\alpha} \tag{26}$$

As commons regulation improves, this threshold falls toward 1. When $\mu = 1$, labor is efficiently allocated within the customary sector regardless of the enclosure rate, and $\theta_H^{\mu=1} = 1$. At this point, the second-best planner's problem from Section 4.1 coincides with the first-best: the decision thresholds derived in Section 3.2 apply exactly. This same threshold governs distributional consequences: as shown in Section 6.1, labor income rises with enclosure when $\theta > \theta_H^{\mu}$ and falls when $\theta < \theta_H^{\mu}$.

Incorporating both parameters, the private enclosure decision becomes:[12]

$$r_\mu^e(t_e) - \tau \cdot r_\mu^c(t_e) - c \geq 0 \tag{27}$$

where $r_\mu^e(t_e)$ is the rental rate on enclosed land and $r_\mu^c(t_e)$ is the rental rate in the customary sector. The encloser compares the return to enclosed land against the compensation owed to displaced users plus enclosure costs. With these modifications, we can adjust Propositions 2 and 3 with appropriately modified boundary loci.

The four panels of Figure 6 illustrate how these modifications affect equilibrium outcomes. The red-shaded regions show decentralized enclosure decisions under different combinations of μ and τ, while blue-shaded regions represent socially optimal decisions. In the left-hand panels of the figure, constrained-optimal decisions are characterized by the blue dashed lines, which may be relevant in this parameter range. Panel (a) shows our benchmark case: unregulated commons ($\mu = 0$) with no compensation ($\tau = 0$).

Panel (b) shows the case of a well-regulated commons ($\mu = 1$) without compensation ($\tau = 0$). Better governance reduces labor misallocation and entry into the customary areas, increasing labor supply to the enclosed sector. This lowers wages and raises enclosure returns since operators no longer need to pay high premiums to draw labor

12. See the online appendix for derivations.

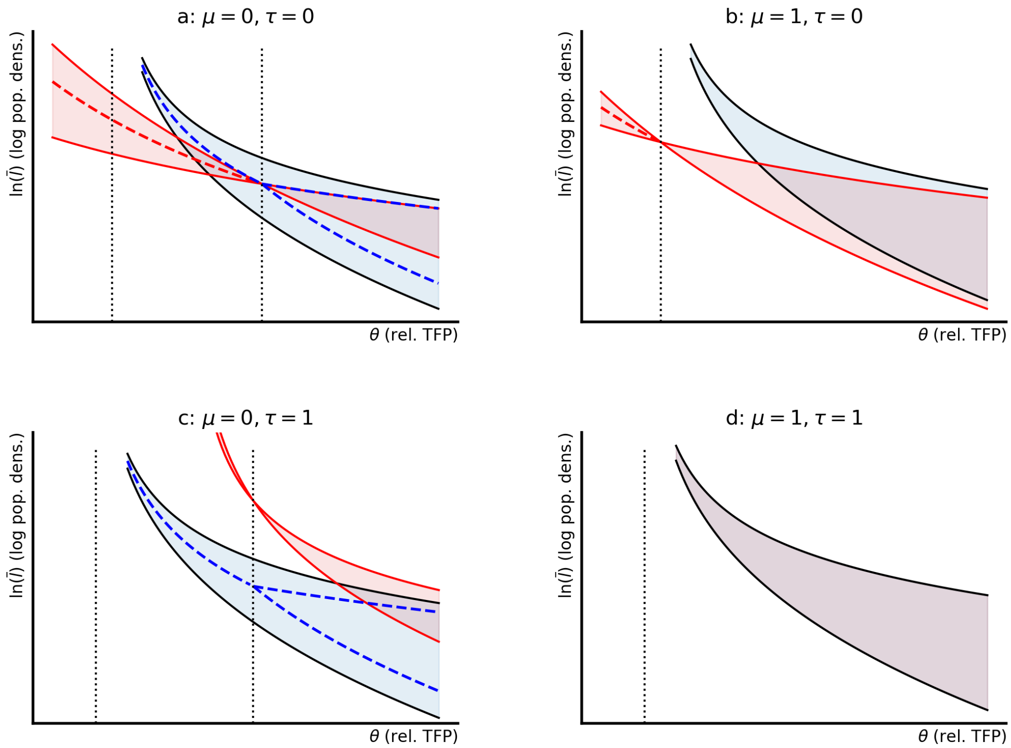

Figure 6: Decentralized and socially optimal enclosure. (a) Benchmark: unregulated commons, no compensation. (b) Regulated commons ($\mu = 1$), no compensation: under-enclosure eliminated but over-enclosure expanded. (c) Unregulated commons, full compensation ($\tau = 1$): over-enclosure eliminated but under-enclosure expanded. (d) Both $\mu = 1$ and $\tau = 1$: private decisions align with social optimum.

away from possession activities. The range of inefficient under-enclosure disappears as enclosure becomes more profitable across a wider range of parameters. However, the range of over-enclosure expands, as enclosers still capture displaced rents without compensation. Higher μ lowers the threshold θ_H^{μ} below which enclosure decisions exhibit strategic complementarity, making sudden property races less likely; when $\mu = 1$, $\theta_H^{\mu=1} = 1$, cascades arise only when enclosure offers no productivity gain.

Panel (c) shows the opposite case: open-access ($\mu = 0$) but full compensation ($\tau = 1$). The compensation requirement forces enclosers to internalize the cost of displaced activities, eliminating the rent-seeking motive that drove excessive enclosure. However, the range of inefficient under-enclosure expands. This creates an important tension: weaker compensation requirements ($\tau < 1$, as in panel a) may facilitate higher output in some regions via increased enclosure with technological transformation, albeit at the cost of greater inequality and displacement.

Finally, panel (d) shows the case where both regulation and compensation are complete ($\mu = \tau = 1$). Here, both wedges identified in equation (21) close: enclosers fully compensate displaced users, and labor is efficiently allocated within the customary sector. Decentralized decisions align perfectly with social optimality—the first-best outcome from Section 3.2.

The contrast between panels (b) and (c) versus panel (d) illustrates the theory of the second-best. Each parameter addresses one source of inefficiency, but addressing only one while neglecting the other can worsen outcomes. Improving governance of the commons without compensation requirements (panel b) expands over-enclosure; requiring compensation without improving governance (panel c) expands under-enclosure. Only when both institutional failures are addressed do private incentives align with social welfare.

6 Applications and Extensions

We now apply the framework to historical and contemporary cases. Our benchmark model, with an unregulated commons ($\mu = 0$), no compensation ($\tau = 0$), no technological transformation ($\theta = 1$), and costless enclosure ($c = 0$), yields the results of Weitzman (1974); adding $c > 0$ and endogenous enclosure decisions yields de Meza and Gould (1992). Varying these parameters alongside population density $\bar{l}$ allows us to explore the Boserupian association between scarcity and privatization documented across settings (e.g., Hayami and Ruttan 1985; Ensminger 1996; Holden, Otsuka, Place, et al. 2010), while also identifying when transitions prove inefficient, whether through dissipative property races (Umbeck 1981; Alston, Harris, and Mueller 2012) or coordination failures that block beneficial change (Libecap 1989; Chen, Restuccia, and Santaeulàlia-Llopis 2023). Varying the power parameter τ connects to debates over whether enclosure transitions occur through "trade" or "raid" (Anderson and McChesney 1994) and shapes the distributional consequences for labor and existing customary users. The model does not resolve these debates empirically but clarifies the conditions under which competing predictions hold.

The following subsections illustrate this organizing capacity. Section 6.1 addresses the distributional consequences of enclosure, engaging Weitzman's claim that labor always benefits from open access and the Marxian literature on primitive accumulation. Section 6.2 examines how shifts in political power, what Brenner (1976) termed the "balance of class forces," interact with pre-existing institutional quality to determine efficiency outcomes, drawing on Anderson and McChesney (1994)'s distinction between "raid" and "trade." Section 6.3 analyzes encompassing interests in frontier settings, connecting to Domar's trilemma and Wakefield's theory of systematic colonization. Section 6.4 sketches implications for structural transformation and the macro-misallocation literature.

6.1 Labor release and wages

A central controversy concerns the impact of enclosure on labor. Weitzman (1974) argued that labor "will always be better off with (inefficient) free access rights than under (efficient) private ownership," echoed as well by Samuelson (1974) who answered the question "Is the rent-collector worthy of his full hire" in the negative. Marxian interpretations also stress expropriation and labor displacement (Tawney 1912; Humphries 1990), whereas "Tory" accounts argue enclosure increased labor demand through more intensive farming (Chambers 1953). Our framework shows that these views represent different parametric regions of the same model.

The Weitzman-Samuelson result assumes enclosure offers no productivity improvement ($\theta = 1$) and that the commons is unregulated ($\mu = 0$), so labor captures the entire output through possession and any enclosure necessarily harms workers. Our framework relaxes both restrictions, allowing for productivity gains ($\theta > 1$) and regulated commons ($\mu > 0$), which generate conditions under which labor could gain from enclosure even without direct compensation.

To trace the distributional effects, we examine uncompensated displacement ($\tau = 0$) and study how total labor income Y_L varies with the enclosure rate t_e. As explained in Section 5.1, when $\mu > 0$, the access-fee payments equal to $\mu \cdot MP_T^c \cdot T_c$ are collected to regulate the commons. We consider two possible ways this income is distributed: access fees may be redistributed to labor, or they may be captured by third parties such as chiefs or customary landlords.

Suppose first that access fees are redistributed to member households. Then labor effectively earns the full average product on common land, and total labor income is:

$$Y_L = AF(\bar{T}, \bar{L}) \cdot \frac{1 + (\alpha\theta\Lambda_\mu^\alpha - 1)t_e}{(1 + (\Lambda_\mu - 1)t_e)^\alpha} \tag{28}$$

where Λ_μ is defined in equation (25). When $t_e = 0$, labor receives the entire output $AF(\bar{T}, \bar{L})$. When $t_e = 1$, labor earns only the neoclassical share $\alpha\theta \cdot AF(\bar{T}, \bar{L})$. Labor gains from uncompensated enclosure if and only if $\alpha\theta > 1$, or equivalently $\theta > \theta_H = 1/\alpha$. The threshold for labor to benefit coincides with the threshold separating strategic substitutes from strategic complements (Proposition 1).

Alternatively, access fees accrue to village chiefs, landlords, or other non-labor claimants. In this case, labor in the enclosed sector earns w_e, while labor on common land earns the wage plus a fraction $(1-\mu)$ of possession rents, as in equation (22). Total labor income is then:

$$Y_L = (1-\mu(1-\alpha))AF(\bar{T},\bar{L})(1+(\Lambda_\mu-1)t_e)^{1-\alpha} \tag{29}$$

Under full enclosure ($t_e = 1$) labor again earns $\alpha\theta AF(\bar{T},\bar{L})$, but now, when $t_e = 0$, labor earns only a share $(1-\mu(1-\alpha))AF(\bar{T},\bar{L})$, with the residual accruing to local authorities as a governance interest. Labor income therefore increases with enclosure if and only if $\alpha\theta > (1-\mu(1-\alpha))$, or equivalently $\theta > \theta_H^\mu$ as defined in equation (26).

This threshold depends on customary governance. When governance is weak (low μ), the threshold θ_H^μ is high. Labor crowds into the commons to capture possession rents, and although this dissipates rents inefficiently, it also withdraws labor from the enclosed sector and raises the wage w_e. This rent-seeking acts as an artificial support for labor earnings. Enclosure removes this support: labor is pushed back into the formal market, wages fall, and workers are immiserated unless productivity gains are large ($\theta > \theta_H^\mu$). When governance is effective (high μ), the commons has already regulated entry and released inefficient labor. The threshold θ_H^μ falls toward unity, so even modest productivity gains ($\theta > 1$) allow workers to share in the benefits of enclosure.

Evidence from Mexico's 1990s ejido reforms illustrates the mechanics of the low-μ case. When households received ownership certificates, severing the link between land use and land rights, significant labor release followed. de Janvry et al. (2015) find that certified households were 28 percent more likely to have a migrant member, with larger effects where initial property rights were weaker. This is consistent with labor displacement when $\theta < \theta_H^\mu$.

6.2 Power shifts and contested claims

In many historical and contemporary settings, landlords, tenants, and other stakeholders contest the terms of rents, eviction protections, and customary rights (Binswanger, Deininger, and Feder 1995; Byres 1996). As serfdom declined in England after the 14th century, peasants acquired valuable customary protections that landlords sought to erode, making outcomes dependent on both local political conditions and broader demographic forces (Hatcher and Bailey 2001; Allen 1992). Anderson and McChesney (1994) usefully distinguish between "trade," where enclosers compensate existing users, and "raid," where enclosure is imposed with limited or no compensation. Our parameter τ captures this spectrum, while μ captures the pre-existing quality of commons governance. As we now show, the efficiency consequences of a shift in political power depend on the interaction between these two institutional dimensions.

Consider a shift in political power that favors landlords, perhaps through the capture of state institutions (Marx [1867] 1992; Brenner 1976; Wood 2002). Suppose tenants initially pay only a fraction μ of customary land's marginal return ($F_T^c A\bar{f}$) to the landlord as rent. Through enclosure, landlords might be able to evict tenants and charge the full market rent ($\theta F_T^c A\bar{f}$), but they must weigh these gains against enclosure costs (c), forgone customary rents ($\mu F_T^c A\bar{f}$), and compensation owed to displaced tenants ($\tau F_T^c A\bar{f}$). A landlord already receiving a fraction μ internalizes these rents as a foregone flow upon enclosure. Combined with any compensation τ owed to tenants, the landlord's decision follows the generic enclosure rule (equation 23) with an effective internalization rate of $\mu + \tau$.

Strong tenant protections imply a high τ. Figure 6 shows that the effects of lowering τ depend critically on the quality of commons governance. When commons governance is weak ($\mu = 0$), the effect of reducing τ is ambiguous. Moving from panel (c) to panel (a), some economies that previously suffered from inefficiently blocked enclosure will now adopt productivity-enhancing technologies. However, other economies, particularly those with low potential productivity gains ($\theta < \theta_H$), become vulnerable to dissipative enclosure races. The power shift thus cuts both ways: it can unlock beneficial transitions in high-θ settings while triggering destructive cascades in low-θ settings.

When commons governance is strong ($\mu = 1$), the effect of reducing τ is also inefficient, though the mechanism differs. With $\mu = 1$, labor is efficiently allocated across sectors regardless of the enclosure rate, and $\theta_H^\mu = 1$. Households can earn customary rents as secure, property-like returns rather than through possession effort. In panel (d), with both good governance and strong customary protections, enclosure becomes a pure technology adoption decision: enclose if and only if the productivity gain from the new technology it makes possible exceeds enforcement costs. Moving to panel (b), enclosers can now appropriate these quasi-property rights without compensation. However, some of these enclosures are socially wasteful: they proceed because enclosers capture uncompensated rents, even when the net productivity improvement falls short of enforcement costs c.

This distinction helps reconcile the competing interpretations of English enclosures discussed in Section 2. Allen (1982, p. 937) emphasizes landlords' expectations of higher rents, while Clark (1998, p. 77) argues that commons persisted because they were "not very inefficient." Both views are consistent with a high-μ environment where enclosure was primarily redistributive. Yet Heldring, Robinson, and Vollmer (2024) find Parliamentary enclosure unleashed positive causal effects on productivity and structural change in other regions. Our framework suggests these findings need not conflict: efficiency and distributional outcomes depend on whether particular localities were in high-θ or low-θ regions of the parameter space, and on pre-existing governance (μ) and compensation requirements (τ).

The U.S. frontier presents two entangled property transitions with sharply differing compensation regimes. First, as Anderson and McChesney (1994) argue, Indian-white relations were governed by the relative capacity for violence. Where tribes could credibly threaten resistance (high τ), the government tended to negotiate treaties ("trade"). Conversely, further West and after the civil war, as the U.S. cavalry reduced tribal military power (lowering τ), the dynamic shifted toward coercive displacement ("raid").

Second, among white settlers, institutions evolved differently. Organized squatter pressure secured the Preemption Acts, which effectively raised their bargaining power and compensation requirements (τ) vis-à-vis speculators and the state. Since squatters were themselves the subsequent enclosers, the displaced-rents term was already internalized; the higher τ protected their claims against outsiders without distorting their own formalization incentives. Claim clubs complemented this by strengthening local governance (μ) (Murtazashvili 2013). As Carlos, Feir, and Redish (2022) note, this produced a dual regime: orderly transition for settlers (Anderson and McChesney 1994; Libecap 1993), contrasted with dissipative races to claim land from displaced Native Americans. Finally, technological shocks also played a role: the introduction of barbed wire lowered enclosure costs (c), shifting the equilibrium further toward enclosure regardless of the compensation regime (Hornbeck 2010).

6.3 Encompassing interests and frontier colonization

Enclosure processes often involved actors with more unified and encompassing interests than atomistic decision-makers. Colonial governments, companies, and other centralized authorities frequently shaped enclosure policy to advance particular objectives. In the early and mid-nineteenth century, Edward G. Wakefield's theory of "systematic colonization" framed frontier land policy in ways that influenced both British colonial practice and classical political economy.

Wakefield emphasized a core tension of land-abundant frontiers: laborers' easy access to independent holdings raised their outside option, rendering capitalist wage-labor operations unprofitable (Wakefield 1849). He proposed asserting preemptive control over "wastelands" and selling land at a "sufficient price" to artificially lower this outside option. This policy addresses the trilemma of Domar (1970), which holds that sustaining a rent-collecting landed elite amidst land abundance requires restricting either labor (slavery) or land availability (restricted access to the frontier). Marx [1867] (1992, chap. 33) sardonically cited this logic to argue that capital is a social relation predicated on the separation of direct producers from their means of subsistence. While squatter resistance often thwarted these proposals in settler colonies (e.g., the U.S., Canada, Australia), restrictive versions were imposed in parts of Sub-Saharan Africa and Latin America (Binswanger and Deininger 1993; Solberg 1969; LeGrand 1984). Faust

To formalize these ideas about encompassing interests, consider a syndicate, such as Wakefield's proposed colonization companies, that is granted exclusive rights to unenclosed land and acts as a monopolistic encloser. The syndicate maximizes land rents through enclosure and subsequent leasing or selling to competitive farmers.[13] For simplicity, we assume unenclosed areas remain under free access ($\mu = 0$) and compensation to displaced users is zero ($\tau = 0$).

The syndicate chooses an enclosure rate t_e to maximize:

$$\pi(t_e) = r(t_e) \cdot t_e - c \cdot t_e, \tag{30}$$

where $r(t_e)$ is the market rental rate from (11). In low-TFP economies, $\pi(t_e)$ is convex, generating a choice between full enclosure and no enclosure. Full enclosure is chosen when $\pi(1) > 0$, or

$$\pi(1) > 0 \quad \Leftrightarrow \quad \bar{l} \geq \left[\frac{c}{A\theta} \cdot \frac{1}{1-\alpha}\right]^{\frac{1}{\alpha}} = \bar{l}^m. \tag{31}$$

Condition (31) matches the decentralized boundary $\bar{l}_1^d$ in (14), from Proposition 3. However, unlike the atomistic case—where economies with $r(1) > c > r(0)$ exhibit multiple equilibria—the monopolist internalizes these effects and jumps directly to $t_e = 1$ in a range of environments where decentralized processes would not, even when full enclosure is socially inefficient. This corresponds closely to Wakefield's objective: restricting workers' access to free land to expand the supply of wage labor and raise land rents.

In high-TFP environments ($\theta \geq \theta_H$), the monopolist behaves differently. Enclosure

13. We abstract from potential labor monopsony effects if the encloser also becomes a major employer. See Conning and Kevane (2007) for an analysis of monopoly–monopsony interactions.

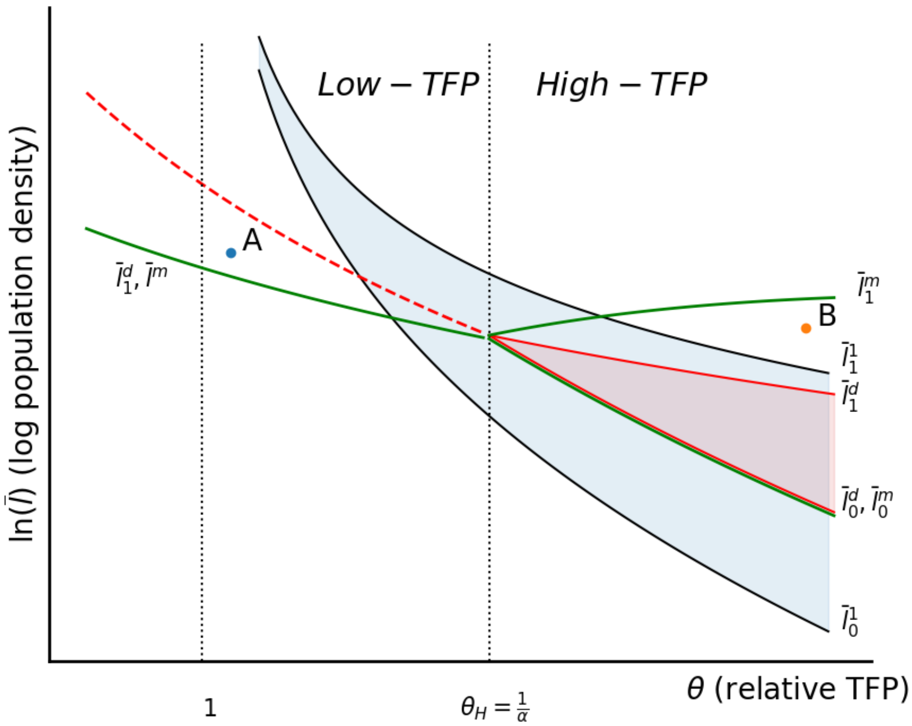

Figure 7: Monopolistic versus competitive and optimal enclosure. The monopolist encloses fully above the thick green line in low-TFP regions, but chooses partial enclosure between $\bar{l}_0^m$ and $\bar{l}_1^m$ in high-TFP regions.

begins when $\pi'(0) > 0$, where

$$\pi'(t_e) = r(t_e) + r'(t_e)t_e - c, \tag{32}$$

yielding at $t_e = 0$ the same threshold as the decentralized economy:

$$\pi'(0) \geq 0 \quad \Leftrightarrow \quad \bar{l} \geq \frac{1}{(\alpha\theta)^{\frac{1}{1-\alpha}}} \left[\frac{c}{A\theta} \cdot \frac{1}{1-\alpha} \right]^{\frac{1}{\alpha}} = \bar{l}_0^m. \tag{33}$$

But as density rises, the monopolist diverges from decentralized enclosers: it internalizes the depressing effect of higher t_e on $r(t_e)$ and thus fully encloses only when

$$\pi'(1) \geq 0 \quad \Leftrightarrow \quad \bar{l} \geq \left[\frac{\alpha}{1-\alpha} \frac{c}{\theta A} \frac{(\alpha\theta)^{\frac{1}{1-\alpha}}}{(\alpha\theta)^{\frac{1}{1-\alpha}}(1-\alpha) + \alpha} \right]^{\frac{1}{\alpha}} = \bar{l}_1^m. \tag{34}$$

As Figure 7 illustrates, the encompassing interest exploits two distinct mechanisms to suppress wages, depending on regional productivity. In low-TFP regions, it inefficiently pushes to full enclosure at points such as A, mirroring Wakefield's supply-side strategy of artificially restricting the commons to depress the outside option where decentralized economies would not yet enclose. In contrast, in high-TFP regions ($\theta \geq \theta_H$), enclosure is labor-absorbing and raises the market wage. Here the strategy flips to the demand side: the monopolist restricts enclosure, stopping at partial enclosure points such as B, to limit competition for labor and prevent rising wages from eroding land rents. The resulting outcome sustains a dual economy, with a modern enclosed sector alongside a stagnant unenclosed sector, closely paralleling the "functional dualism" described by de Janvry (1981) for parts of Mexico and Latin America, where commercial agriculture benefited from preserving a low-productivity peasant sector to ensure a steady supply of cheap labor.

6.4 Structural transformation and manufacturing

Historical interpretations of English enclosures' role in structural transformation remain contested. Allen (1992) argues that in the South Midlands, the heartland of open-field agriculture, significant productivity growth occurred under customary systems prior to Parliamentary enclosure, implying those enclosures were largely redistributive. He further contends that displaced labor swelled a rural surplus population, a pattern more reminiscent of Lewis (1954) style underemployment than creation of an industrial proletariat. Using the universe of Parliamentary enclosure acts, Heldring, Robinson, and Vollmer (2024) find positive effects on productivity and later industrial development, but also substantial increases in land inequality.

We cannot adjudicate these empirical debates, but our theoretical framework clarifies how endogenous property-regime changes interact with structural transformation and why outcomes might vary across regions. Earlier models—such as Cohen and Weitzman (1975) and Crafts and Harley (2004), and recent macro–misallocation approaches (Chen 2017; Chen, Restuccia, and Santaeulàlia-Llopis 2023; Gottlieb and Grobovšek 2019) study related mechanisms but treat institutional change as exogenous. By endogenizing property-rights transitions, we identify the conditions that trigger regime changes and the general equilibrium feedbacks that shape their timing and extent.

A full treatment of structural transformation is beyond our scope, but we can extend the model to illustrate how property regime transitions affect its dynamics. Adding a manufacturing sector that competes for labor, the labor-market balance condition becomes:

$$l_e + l_c = 1 - l_m, \tag{35}$$

where l_m is the share of total labor $\bar{L}$ employed in manufacturing.

Manufacturing uses constant-returns technology $G(K, L) = A_m K^{1-\beta} L^{\beta}$ with productivity A_m and sector-specific capital $\bar{K}$. With $L_m = l_m \bar{L}$, output is

$$G(\bar{K}, L_m) = l_m^{\beta} \cdot G(\bar{K}, \bar{L}).$$

In this small open economy, the relative price of manufactures p is determined by world markets. Labor mobility equalizes returns across the three sectors, giving manufacturing wages:

$$p \cdot MP_L^m = p \cdot \beta A_m \left(\frac{1}{l_m}\right)^{1-\beta} \bar{k}^{1-\beta},$$

while the value-average product in the customary sector is:

$$AP_L^c = A \left(\frac{1 - t_e}{(1 - l_m) - l_e}\right)^{1-\alpha} \cdot \bar{t}^{1-\alpha},$$

where $\bar{t} = \bar{T}/\bar{L}$. Labor mobility imposes:

$$w = p \cdot MP_L^m = MP_L^e = AP_L^c > MP_L^c.$$

Solving $MP_L^e = AP_L^c$ for l_e yields the modified enclosed-sector labor demand:

$$l_e^0(t_e) = \frac{(\alpha\theta)^{\frac{1}{1-\alpha}} t_e}{1 + \left((\alpha\theta)^{\frac{1}{1-\alpha}} - 1\right) t_e} \cdot (1 - l_m), \tag{36}$$

which adjusts the earlier expression (10). The private return to enclosure $r(t_e)$ in (11) and other expressions follow analogously.

Manufacturing opportunities raise labor's opportunity cost of remaining in the customary sector—a potential "pull" toward industry. There are also "push" effects: the elasticity of labor supply to manufacturing depends on agricultural parameters (A, α, θ) and on policy variables $(p, \bar{l}, c, \mu, \tau)$ that determine whether land becomes enclosed and labor released. Structural transformation may be constrained when property regimes fail to adjust or accelerated when inefficient enclosure and migration push labor into manufacturing. Depending on initial conditions, the economy may experience a smooth and efficient transformation, become stuck with excessive labor in the customary sector, or undergo premature or excessive enclosure and structural change.

7 Conclusion

Our analysis provides a unified framework for evaluating the transformation of property rights. By modeling enclosure as a decentralized aggregative game, we reconcile mechanisms emphasized in Neoclassical efficiency arguments with the distributional conflicts and power dynamics highlighted by Marxian and political economy perspectives. We identify the precise conditions under which property regimes evolve smoothly, tip into dissipative races, or or fall short of socially beneficial transformation.

Although our framework acknowledges that customary regimes can impede productivity, our results urge caution regarding the modern push for hasty formalization. Critics following Scott (1998) have long argued that top-down attempts to make property "legible" often ignore the complex accommodations that govern customary resources. This logic is reflected in the shift in national legislation described by Alden Wily (2018), which increasingly recognizes rural communities as collective owners. Moving away from past doctrines of *terra nullius*, modern approaches now prioritize the resolution of community claims and village boundaries before pursuing individualization (Takeuchi 2022; Deininger and Bank 2003). Our model validates this sequence: strengthening customary governance (increasing μ) is often a prerequisite for efficient privatization, not merely an alternative to it.

Without such protections, interventions focused solely on reducing enclosure costs (c) can push economies from stable customary arrangements into destructive enclosure races. In low-productivity or weak-governance environments, enclosure decisions become strategic complements. Here, well-intentioned policy can inadvertently trigger runs on the commons that concentrate wealth while displacing labor onto increasingly crowded margins. With strong governance and adequate protection of customary claims, private incentives to enclose align with social efficiency.

Ultimately, our analysis suggests that the "tragedy of the commons" and the "tragedy of the anti-commons" are not inevitable features of resource regimes, but endogenous outcomes of the interaction between technology and local institutions. Effective policy requires more than drawing lines on a map; it requires aligning the private returns to enclosure with its social costs, often by strengthening the very customary rights that formalization seeks to replace.

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