



**CEP Discussion Paper No 1259**

**February 2014**

**The Political Economy of Inclusive Rural Growth**

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## **Abstract**

Abstract Commentators on the 'East Asian Miracle' of inclusive growth have often pointed toward shared rural growth policies. But why were these policies not chosen elsewhere? This paper models voters who invest in either subsistence or a complex technology in which public goods complement private capital. Investment and technology choices vary with wealth and the level of public goods enforced by political lobbies. Outcomes depend on the strength of the incipient middle class who bolster political incentives through contributions. Economies with a stronger middle class due to lower inequality or lower risk may thereby sustain higher productivity through public good provision.

Key words: Poverty traps, political economy, inequality, lobby formation  
JEL: O1, D2, H4, Q1

This paper was produced as part of the Centre's Globalisation Programme. The Centre for Economic Performance is financed by the Economic and Social Research Council.

## **Acknowledgements**

We thank Yasushi Asako, Teodora Borota, Swati Dhingra, Shuhei Kitamura, Yu-Hsiang Lei, Shen Qu and seminar participants at the JICA-SOAS Workshop on Institutional Foundation of Inclusive Development in Africa, SITE Institutional Challenges in Emerging Economies, GPEN-CGR, Namur, Chulalongkorn and UC-Davis.

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Published by  
Centre for Economic Performance  
London School of Economics and Political Science  
Houghton Street  
London WC2A 2AE

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# 1 Introduction

Twenty years ago scholars and practitioners of economic development paused to consider the meaning of the ‘East Asian Miracle’ of rapid *and* inclusive economic growth. Standing in particularly sharp contrast to the miracle of East Asia was Latin America, described by some as mired in a vicious circle of modest and exclusionary growth. While much was learned about the shared growth policies that helped create inclusive development in East Asia, there was also a revisionist reminder that policymaking is not cookery, and that recipes that worked in one locale will not be replicated elsewhere by a set of disinterested chefs. In other words, the revisionist question was not what was done differently in East Asia, but why did East Asian political actors choose differently than those in Latin America.

This revisionist perspective retains its salience as we pause again, this time to consider the implications of the East Asian experience for inclusive economic development in Africa. It remains important to know the recipes for the policies that work, but it is also important to consider the political economy behind the choices made. Political choices reflect existing vested interests formed by past allocations and commitments of resources. ‘What’s past is prologue’: the distribution of resources and how resources are committed matter for policy outcomes. As such commitments are made in expectation of political outcomes, it follows that inequality and the structure of economic activity are dynamically intertwined with politics.

The political economy model that lies at the heart of our analysis is based on the idea that public goods complement the productivity of private investment, especially for small and marginal commercial producers. Government provision of these public goods not only increases growth (by crowding-in private investment), it reduces inequality by creating broadly based or inclusive growth, especially as it facilitates the transition of low wealth individuals from subsistence to more remunerative commercial production. However, because the benefit of public goods varies by asset level, so does the willingness to support public good provision through taxation. By modeling endogenous production strategies around which political lobbies form, we show that the emergent equilibrium policy is sensitive to the initial distribution of wealth.<sup>1</sup> Wealth conditions not only the set of voters in favor of public goods, but the strength of their preferences through campaign contributions. For both these reasons, shared or inclusive growth policies are more likely under lower inequality scenarios. In this setting, political equilibria which fail to provide any public goods coincide with societies that fail to maintain a middle class. Conversely, societies with a stronger incipient middle class capable of transitioning to commercial production will provide more public goods. From this perspective, the extensive land reforms carried out in Japan, Korea and Taiwan designed to create a prosperous class of commercially oriented farmers may have laid

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<sup>1</sup>This can lead to multiple equilibria consisting of both low and high levels of public good provision. See Conny Olovsson and Jesper Roine (2008) for a literature overview and an example in the case of public education.

the foundation for future successes.<sup>2</sup>

While most academic discussion has long since moved away from understanding the East Asian miracle and the foundations for inclusive growth, the remainder of this paper is dedicated to taking seriously the suggestion that shared and inclusive growth requires that lower wealth agents be of interest to both economic and political entrepreneurs. Thus, this paper models political economy in the spirit of work such as Roemer (1982), Eswaran and Kotwal (1986) and Carter and Zimmerman (2000) and thereby provides a complementary mechanism in ‘stagnation to growth’ stories of development.<sup>3</sup> Previous work has noted the crucial role of nonconvexities in accumulation and the importance of different production modes (e.g. Galor and Zeira (1993), Galor et al. (2009)). Distinct from previous work where inequality is mediated through labor or credit markets (see the review of Matsuyama (2011)), here we focus on the mediating role of class based politics wherein lobbies rather than individuals attempt to circumvent market imperfections.

While this inequality-centric model captures much of the earlier debate about Latin America versus East Asia, agricultural risk—of the sort observed in large parts of Africa—operates much like inequality. Risk and isolation can trap large numbers of households at low levels of income, making them of little interest to both economic and political entrepreneurs. In this circumstance, the latter have little to gain from offering policies designed to appeal to the trapped population. Therefore even economies with relatively modest levels of asset inequality may operate like high inequality Latin American economies, with politicians eschewing investment in shared growth-promoting public goods in favor of other pathways to political power. This suggests an emphasis on economic policies that break or relax the poverty trap logic, thereby changing the political calculus in ways that would make inclusive growth policies more likely and self-sustaining.

The remainder of this paper is organized as follows. Section 2 revisits the earlier East Asian miracle debate. Section 3 lays out an economy in which voters endogenously adopt technology, which determines their material interests in shared growth. Section 4 formalizes a political economy model that codifies insights that emerged from the debate about the impact of initial asset inequality on endogenous policy choices. Section 5 considers the impact of isolation and risk on policy choices and the potential for positive political externalities.

## 2 Vicious and Virtuous Circles of Economic Growth

The observation that East Asian economies simultaneously experienced rapid growth with low and diminishing inequality provoked a rethinking of the linkages between growth and inequality. The World Bank’s *The East Asian Miracle* (Page, 1994), as well as debates (Rodrik, 1994; Wade,

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<sup>2</sup>For a detailed econometric analysis of the political consequences of land reform in Japan, see Kitamura (2013).

<sup>3</sup>Existing theories depict the role of technology, financial development, accumulation, institutional development and evolving social preferences (Doepke and Zilibotti, 2005), and export led growth (Anders Akerman et al., 2013).

2004), and follow-up work reported in Aoki et al. (1998), played important roles in sparking this rethinking. The aptly named book, *Beyond Tradeoffs: Market Reform and Equitable Growth in Latin America*, (Birdsall et al., 1998) emerged from this discussion and was intended to be a policy primer to enable Latin American governments to emulate the inclusive growth patterns observed in East Asia. This section first briefly reviews some of the macro-econometric evidence about these linkages. We then turn to consider the microfoundations for such linkages, using them as a springboard to launch a deeper exploration of the political economy of inclusive growth policies.

## 2.1 Macro Evidence of the Impact of Initial Inequality on Inclusive growth

In a provocative paper, Birdsall et al. (1995) employed cross-country data and showed that controlling for the level of per-capita GDP, aggregate human capital accumulation is enhanced by greater income equality and its implied higher absolute incomes for the least well off members of a society. In their interpretation, the rapid, inequality-reducing growth characteristic of the East Asian experience was the product of a process in which low initial levels of inequality:

1. Enhance aggregate accumulation;
2. Increase the rate of economic growth; and,
3. Boost capital accumulation in lower wealth households, further decreasing inequality.

In other words, low initial inequality creates a virtuous circle of inclusive growth (Alesina and Rodrik, 1994). Conversely, high inequality might create a vicious circle of exclusionary growth.

The suggestion that inequality conditions the distributional consequences of economic growth received further support from studies of agricultural growth. A time series study by de Janvry and Sadoulet (2000) finds that agrarian growth in Latin America is associated with sharply increasing rural inequality. While we know of no similar study of East Asia, Ravallion and Datt (1995) find that in India it is agrarian growth that is most strongly associated with reduced poverty and inequality. However, they also find that growth in Bihar—the Indian state with sharp, near Latin American levels of land inequality—appears to contradict this general pattern. Perhaps the most troubling aspect of the de Janvry and Sadoulet result is that they find that the association between agrarian growth and increasing rural inequality has been even stronger in recent, post-liberalization growth spells.<sup>4</sup> Subsequent studies have found that rural exposure to liberalization may slow poverty reduction and consumption growth (Topalova, 2010).

Finally, Carter (2004) employs mixed effects econometric methods to explore directly whether initial land ownership inequality shifts the relationship between aggregate economic growth and

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<sup>4</sup>While the estimated increase in inequality is not so sharp as to increase rural poverty in the wake of agrarian growth, it has clearly blunted the potentially positive impact of growth on rural poverty, as they analyze in some detail.

income distribution. Drawing on a standard decomposition of the Gini index, he shows that the impact of agrarian inequality should dissipate over time (as the agricultural economy shrinks in size) unless inequality has deeper structural effects on the income distribution consequences of growth. The econometric results show that indeed agrarian inequality has a surprising legacy effect that persists over time even as economies industrialize.

## 2.2 Microfoundations of Inclusive Growth

While this econometric evidence is telling, it does not identify the mechanisms linking initial economic equality and inclusive growth. There is in fact no shortage of theoretical papers that establish foundations for that linkage. To pick one example that speaks directly to the Birdsall et al. (1995) results, Ljungqvist (1993) explores how the absence of capital and insurance markets leads poor people to under invest in human capital. Holding per-capita income constant, an increase in inequality will push more people below the income threshold where human capital underinvestment begins. Krebs (2003) further shows that these effects are large, to the extent that government sponsored insurance is likely welfare improving, even if financed in a second-best fashion.

Similarly, there is a large literature that shows that imperfect rural financial markets can create an economic dynamic that squeezes out low wealth producers.<sup>5</sup> Similar to Lunqvist's analysis, increases in asset inequality that push more individuals beyond the reach of financial markets implies a deepening pattern of exclusion.<sup>6</sup> From these theoretical perspectives, the sensitivity of the income distribution consequences of growth to initial inequality rests squarely on financial market failures. The theories of credit rationing<sup>7</sup> that explain these sorts of wealth biased financial market failures are essentially saying that low wealth agents are of no interest to the economic entrepreneurs on the supply side of financial markets. While this argument seems correct when examined from the perspective of the high inequality economies of Latin America, it overlooks the fact that in East Asia, governments undertook measures that bolstered the competitiveness of small farm sector. A quick review shows that agricultural policy in Japan, Taiwan and Korea shows a common emphasis on small farm credit, extension and price stabilization.<sup>8</sup> These shared growth policies reshaped markets in ways that enabled the small farm sector to flourish and underwrote an inclusive growth strategy.<sup>9</sup>

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<sup>5</sup>The dynamic stochastic programming analysis of Zimmerman and Carter (2003) shows how these missing markets can create exclusionary patterns in which initial asset inequality deepens over time. Work on agricultural growth booms in Latin America, summarized by Carter and Barham (1996), finds empirical evidence of many of these same patterns.

<sup>6</sup>The logic here is quite similar to more recent work on asset-based theories of poverty traps—see, for example, Carter and Barrett (2006).

<sup>7</sup>See for example Stiglitz and Weiss (1981) for a general treatment of credit rationing, and Carter (1988) and Boucher et al. (2007) for extensions and applications to rural financial markets.

<sup>8</sup>For a brief overview of rural and agricultural policy concerns and objectives, see Wye Group (2011).

<sup>9</sup>Indeed, even within highly advanced economies, the exclusion of farmers from agricultural support programs can

These observations are consistent with those of Aoki et al. (1998) who took part in a broader review of the East Asian miracle of inclusive growth. Like others writing in this area, these authors note that East Asian governments engaged in a wide range of policies, which they describe as “market enhancing,” meaning that the state carefully intervened in those realms where markets work least well (e.g., providing capital and insurance), and by so doing enabled markets to then effectively coordinate fundamental decisions of resource allocation and investment.

While others have noted this disciplined intervention of East Asian states, Aoki et al. (1998) suggest a material explanation for this state behavior. Low levels of initial inequality (and a weak elite) in East Asia implied that the only viable constituency for a government seeking political support was a broadly-based one built around shared growth policies. Agricultural policy provides one of the clearest examples of the endogeneity of a broadly-based or shared growth strategy to low levels of initial inequality. Land reform in much of East Asia not only deeply redistributed land ownership rights, but also imposed land ownership ceilings of only a few hectares. Aoki et al. suggest that the absence of a strong rural elite deprived East Asian governments of a politically influential target group for the sorts of divisible and privately appropriable goods which governments so often provision to develop the rural sector.<sup>10</sup> Instead, policy focused on discovering and providing the key indivisible, quasi-public goods that markets were ill-conditioned to offer: goods which are difficult to exclude (roads),<sup>11</sup> that involve large fixed costs (dams, R&D),<sup>12</sup> or face coordination problems (irrigation and sanitation systems)<sup>13</sup>. In addition, governments targeted institutional innovations to open credit and insurance options. What other observers of East Asian agricultural policy have attributed to an exogenous objective of shared growth (Tomich et al., 1995) is, in the argument of Aoki et al., a product of low initial inequality operating through a political economy circuit. The next section will model this political economy of shared growth policies, contrasting between low and high inequality economies that has typified the discussion of East Asia versus Latin America and rural Africa.

### 3 Asset Inequality and the Political Economy of Shared Growth

This section offers our core economic model designed to shed light on the economic and political forces that determine whether governments choose to provide tax-financed public goods that complement private investment, or whether they choose a low tax rate regime which allows indi-

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cause rapid and drastic exit from commercial production (Tadlock Cowan and Jody Feder, 2012).

<sup>10</sup>E.g. subsidized credit, machinery subsidies, investment credits, etc.

<sup>11</sup>When geographically separate ethnic concentrations make roads *functionally* excludable, public investment is likely misallocated as Burgess et al. (2013) find.

<sup>12</sup>Dams also present coordination issues due to the redistributive pattern of downstream winners and local losers (Duflo and Pande, 2007).

<sup>13</sup>The extent of such coordination problems may be exacerbated by agroecological conditions (Wade, 1988).

viduals to enjoy more private goods. The implicit underlying role of public good provision can be thought of as a second-best policy which encourages high productivity activities when incomplete financial markets otherwise constrain agents, thus generating inclusive growth.<sup>14</sup> Under our model, the complementary value of public goods depends on an individual's wealth, which implies heterogeneous preferences for the level of public good expenditure. In particular, public goods are especially valuable for those enabled to transition from subsistence to commercial production.<sup>15</sup> Because the economic valuation of public goods varies across voters, politics will matter for the choice of policy in potentially interesting ways.

After laying out the setting, this section establishes endogenous class formation in response to economic incentives and public good provision, and then considers voters' political preferences.

### 3.1 Investment, Production and Consumption

We consider a society comprised of a unit mass of voters who live two periods. Politically, each individual is endowed with one vote. Economically, each individual  $i$  enjoys an initial wealth endowment,  $A_i$ , where  $\mathbb{A}(i)$  denotes the distribution of wealth in period 0. Before considering how the overall society operates, and how its operation is influenced by inequality, we need to first characterize economic behavior and political preferences along the wealth continuum.

To generate income, each individual has access to two capital dependent technologies: a subsistence technology, and a higher yielding commercial technology that depends on both public and private capital. Wealth  $B_i$  invested in the subsistence technology generates returns at a constant rate  $r$ , generating an income flow of  $rB_i$ .

Wealth not allocated to the subsistence technology can be allocated to the commercial technology  $F$  which generates an income stream given by:

$$F(K_i, \kappa_i) = \theta (K_i^\alpha / 2 + \kappa_i^\alpha / 2)^{1/\alpha} \quad \text{with } \alpha, \theta \in (0, 1),$$

where  $K_i$  is private capital, while  $\kappa_i$  is a quasi-public capital good that is complementary to private capital in production. Use of the commercial technology requires payment of a fixed, start-up cost of  $c_F$ . We additionally assume  $\theta > 2^{1/\alpha}r$ , so that once  $c_F$  is paid, investments  $K_i$  always dominate the subsistence technology.<sup>16</sup> As a quasi-public good,  $\kappa_i$  can be provided both publicly ( $P$ ) and

<sup>14</sup>Note that the core model here is a two-period poverty trap model. Subsistence Producers are trapped at a low level of well-being by the combination of their own initial asset level and their inability to borrow from others.

<sup>15</sup>In this sense, we provide a microeconomic foundation for the G and K phases of rapid economic development as laid out by Chapter 1 of Aoki et al. (2012).

<sup>16</sup>To see this, note that the marginal investment product of  $F$  is  $(\theta/2)K_i^{\alpha-1}(K_i^\alpha/2 + \kappa_i^\alpha/2)^{1/\alpha-1} \geq \theta 2^{-1/\alpha} > r$ .



privately ( $P_i$ ) so that individual  $i$  has access to:

$$\kappa_i = P + P_i.$$

However, private provision of the quasi-public good incurs an additional fixed cost,  $c_P$ , reflecting the difficulty of private actors to both construct and ‘fence in’ these quasi-public goods.<sup>17</sup> The relationship of these production strategies to fixed costs are depicted in Figure 1.

Figure 1: Fixed Costs and Production Strategies

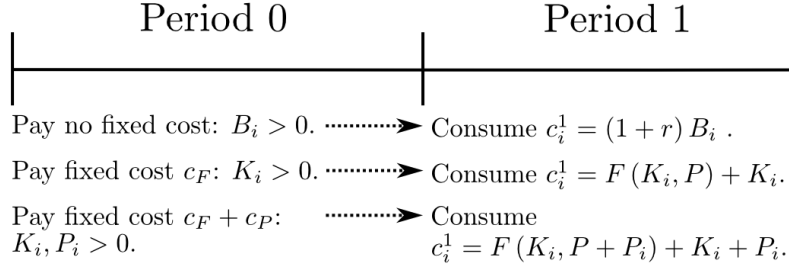
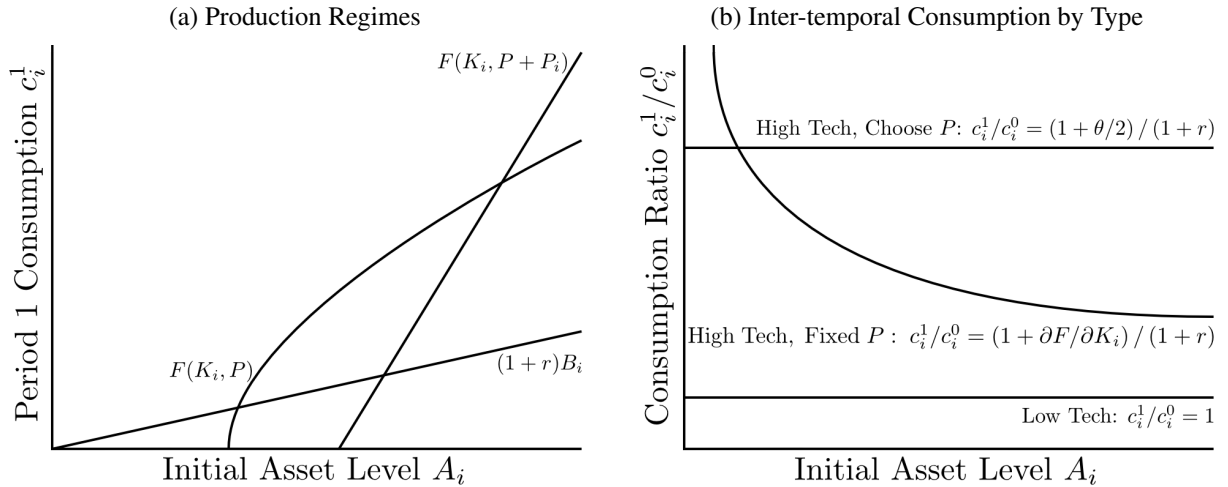


Figure 2: Production Technologies and Inter-temporal Trade-Offs



The solid lines in Figure 2a illustrate these two different production technologies. The  $F(K_i, P)$  curve is drawn for a given level of the public good  $P$ , assuming no private provisioning of this good ( $P_i = 0$ ). Increases in  $P$  and the level of the public good will complement and increase the productivity of private capital. Thus, the public provision of  $P$  is a shared or inclusive growth policy as investments in  $P$  not only boost the productivity of all individuals who employ the commercial

<sup>17</sup>We interpret public provision of the quasi-public good  $P$  as non-rivalrous, but private enhancements  $P_i$  as potentially rivalrous, thus incurring costs to ensure private access.

technology, but also opens a door of upward mobility for some individuals who would otherwise find themselves using only the subsistence technology.

Given these production possibilities, agents make their production choices in order to maximize their two period utility, discounted at rate  $\beta = (1 + r)^{-1}$ :

$$[\log(c_i^0) + \beta \log(c_i^1)] / (1 + \beta). \quad (1)$$

The budget constraints faced by each voter across periods are given by

$$\begin{aligned} c_i^0 &\leq A_i - K_i - B_i - P_i - c_F \cdot \mathbf{1}_{K_i > 0} - c_P \cdot \mathbf{1}_{P_i > 0}, \\ c_i^1 &\leq F(K_i, \kappa_i) + K_i + P_i + (1 + r) B_i, \end{aligned} \quad (2)$$

where  $\mathbf{1}_{K_i > 0}$  and  $\mathbf{1}_{P_i > 0}$  are the binary indicator variables that take the value of one when the agent respectively invests in  $K_i$  and  $P_i$  and must pay the fixed costs  $c_F$  and  $c_P$ . Note that an individual's initial wealth endowment needs to fund both period 0 consumption and capital allocated to produce income for period 1. Period 1 consumption is then the income flows generated plus assets retained. Finally, agents cannot borrow, and hence the additional constraints that:

$$B_i, K_i, P_i \geq 0. \quad (3)$$

Letting  $\tilde{c}_i^0$  and  $\tilde{c}_i^1$  denote the values of consumption that maximize (1) subject to (2)-(3), we denote an agent's welfare after making investment and consumption decisions as

$$U(A_i, P) \equiv \max_{c_i^0, c_i^1} [\log(c_i^0) + \beta \log(c_i^1)] / (1 + \beta) = \log \tilde{c}_i^0 (\tilde{c}_i^1 / \tilde{c}_i^0)^{1/(2+r)}.$$

### 3.2 Economic Classes as Endowment-necessitated Behavior

The model outlined in the prior section leads to three possible livelihood strategies or potential economic classes defined by the inequality constraints in (3):<sup>18</sup>

1. **Subsistence Producers** ( $B_i > 0, K_i = 0, P_i = 0$ ). These individuals, whom we would expect to be at the bottom of the asset distribution, will not pay  $c_F$  nor  $c_P$  and optimally choose  $B_i = A_i / (2 + r)$  and  $\tilde{c}_i^0 = \tilde{c}_i^1 = (1 + r) A_i / (2 + r)$ . The first order condition for  $B_i$  implies  $c_i^1 = c_i^0$ , so each voter's inter-temporal allocation of assets must satisfy  $B_i = A_i / (2 + r)$ . Consequently, the welfare of a Subsistence Producer, denoted  $U_S(A_i, P)$ , is given by

$$U_S(A_i, P) = \log((1 + r) A_i / (2 + r)).$$

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<sup>18</sup>Note that certain possible classes, e.g.  $B_i, K_i > 0$ , are ruled out by technology assumptions.

2. **Petty Commercial Producers** ( $B_i = 0, K_i > 0, P_i = 0$ ) rely on existing public goods. These agents pay  $c_F$  to produce, using investments  $K_i$  in the high productivity technology  $F$ . The first order condition for  $K_i$  implies each voter's inter-temporal allocation of assets satisfies

$$\tilde{c}_i^0 = A_i - K_i - c_F, \quad \tilde{c}_i^1 = F(K_i, P) + K_i, \quad \tilde{c}_i^1 / (1 + \partial F / \partial K_i) = \tilde{c}_i^0 / (1 + r). \quad (4)$$

Consequently,  $K_i$  is fixed by (4) and the welfare of a Petty Producer,  $U_P(A_i, P)$ , is

$$U_P(A_i, P) = \log(A_i - K_i - c_F) [(1 + \partial F / \partial K_i) / (1 + r)]^{1/(2+r)}.$$

3. **Large Commercial Producers** ( $B_i = 0, K_i > 0, P_i > 0$ ) who self-provide complementary production goods  $P_i$  for their private use by paying  $c_F$  and  $c_P$ . These individuals supplement existing public goods until the returns from investments and public goods are equated at  $P_i = K_i - P$ . The first order conditions for  $K_i$  and  $P_i$  imply each individual's inter-temporal allocation of assets must satisfy

$$\tilde{c}_i^0 = A_i - 2K_i + P - c_F - c_P, \quad \tilde{c}_i^1 = (\theta + 2)K_i - P, \quad \tilde{c}_i^1 / (1 + \theta/2) = \tilde{c}_i^0 / (1 + r).$$

This implies investments are fixed by

$$K_i = [(A_i - c_F - c_P)(1 + \theta/2) + (2 + r + \theta/2)P] / (2 + r)(2 + \theta).$$

Under this allocation, returns to additional assets become linear as shown in Figure 3a. The welfare of a Large Commercial Producer,  $U_L(A_i, P)$ , is

$$U_L(A_i, P) = \log \left( \frac{(1 + r)(1 + \theta/2)(A_i - c_F - c_P) + r(\theta/2)P}{(2 + r)(1 + \theta/2)} \right) \left( \frac{1 + \theta/2}{1 + r} \right)^{-(1+r)/(2+r)}.$$

Looking across these three potential economic classes, we see that returns to wealth invested in production increase as we move from the Subsistence to the Petty Commercial to the Large Commercial strategies. The marginal returns provided by productive investments are summarized by the rate at which voters are willing to trade off present for future consumption. Comparing the three regimes, we see that inter-temporal consumption patterns satisfy the following:

$$\text{Subsistence : } \frac{\tilde{c}_i^1}{\tilde{c}_i^0} = 1, \quad \text{Petty : } \frac{\tilde{c}_i^1}{\tilde{c}_i^0} = \frac{1 + \partial F / \partial K_i}{1 + r}, \quad \text{Large : } \frac{\tilde{c}_i^1}{\tilde{c}_i^0} = \frac{1 + \theta/2}{1 + r}. \quad (5)$$

Figure 2b graphs these marginal returns to investment for each class.

These inter-temporal trade-offs determine the marginal welfare of assets and public goods. To see this, consider the welfare transformation  $\exp(U(A_i, P))$  and note that for any economic class,

$$\partial \exp(U(A_i, P)) / \partial A_i = (1 + r) / (2 + r) \cdot (\tilde{c}_i^1 / \tilde{c}_i^0)^{1/(2+r)}. \quad (6)$$

Combining Equations (5) and (6) shows that the graphs of  $\exp(U(A_i, P))$  would appear much as in Figure 2a. As assets increase, producers initially receive low returns from subsistence, achieve accelerated gains as Petty producers, and at the highest asset levels receive the greatest returns.

For any fixed set of Subsistence, Petty and Large producers, increases in public goods increase the average growth rate  $E[(\tilde{c}_i^1 - \tilde{c}_i^0) / \tilde{c}_i^0]$ . This occurs through an intensive margin, by which producers further delay consumption, and can be understood through the intertemporal consumption ratios of Equation (5). There it is clear that changes in public goods do not affect Subsistence or Large producers. Simultaneously, increases in public goods decrease investments  $K_i$  for Petty producers while augmenting the productivity of investments, and both factors increase the marginal product of capital and thus  $\tilde{c}_i^1 / \tilde{c}_i^0$ . This implication is summarized as Proposition 1.

**Proposition 1.** *For any fixed set of Subsistence, Petty and Large producers, increases in public goods increase the growth rate.*

However, changes in public good provision also induce producers to adopt different production strategies, which we now examine.

### 3.3 Public Goods and the Creation of a Middle Class

While all agents would in principle prefer the higher returns and welfare associated with the higher strategy classes, two forces block them. First, fixed costs prevent lower wealth individuals from self-financing the higher return technologies. Second, borrowing constraints prevent those same low wealth individuals from using other's wealth to reach the larger scales required to reap the higher returns. Thus, an individual's position in the endowment continuum conditions his or her constrained optimal choice of production strategy. However, the provision of public goods improves productive possibilities and thus alters optimal strategies. More formally, the welfare impact of public good provision is stark across classes since

$$\partial \exp(U(A_i, P)) / \partial P = (\partial F / \partial P) / (2 + r) \cdot (\tilde{c}_i^1 / \tilde{c}_i^0)^{-(1+r)/(2+r)}.$$

Thus, Subsistence producers who do not use the production technology  $F$  have  $d \exp(U_S) / dP = 0$ , while the welfare of Commercial producers increases. This implies that when public goods increase, the set of Commercial producers expands at the expense of Subsistence producers. Equation (7) computes the value of public goods across Commercial producers. Large producers can

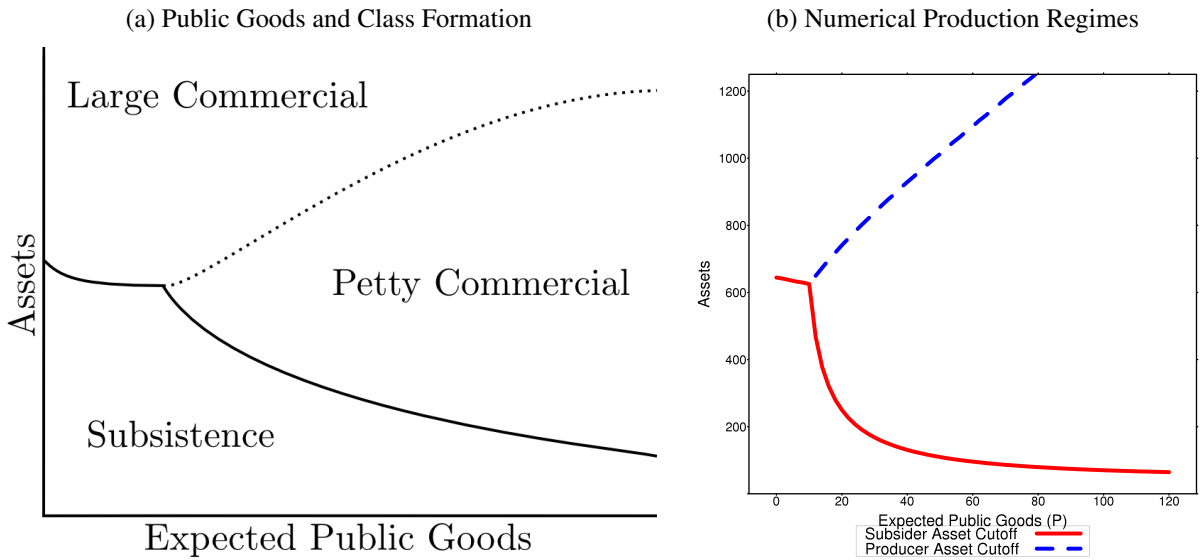
fluidly move investments across periods, so absorb public goods as to achieve a return of  $\theta/2$  in period 1, while Petty producers are constrained and achieve a return of  $\partial F/\partial P$ .

$$\frac{\partial \exp U_L}{\partial P} = \frac{\theta/2}{2+r} \left( \frac{1+r}{1+\theta/2} \right)^{(1+r)/(2+r)}, \quad \frac{\partial \exp U_P}{\partial P} = \frac{\partial F/\partial P}{2+r} \left( \frac{1+r}{1+\partial F/\partial K_i} \right)^{(1+r)/(2+r)}. \quad (7)$$

For a producer indifferent between Petty and Large production, Petty production implies saving on fixed costs  $c_P$  to ‘over invest’ until  $K_i > P$ . With (7), this shows  $\partial \exp(U_P)/\partial P > \partial \exp(U_L)/\partial P$ .<sup>19</sup> Therefore increases in public goods will enlarge the Petty commercial class at the expense of the Large Commercial class, as depicted in Figure 3a.<sup>20</sup> In summary, we have:

**Proposition 2.** *Costless increases in public goods enlarge the Petty Commercial class relative to Subsistence and Large Commercial classes.*

Figure 3: Public Goods and Class



We also claim that, absent any restrictions on the range of initial assets, the economy will exhibit all three classes when sufficient public goods are provided. First, subsistence is always chosen by those with insufficient assets to join the Commercial classes. Second, as  $P$  grows large, any producer with the assets  $c_F$  to join the Commercial classes would be rewarded with high consumption in period 1, justifying any amount of low consumption in period 0. Third, producers with assets in  $[c_F, c_P)$  can afford to become Petty but cannot afford to become Large. Finally, for

<sup>19</sup>Formally, because this implies that  $\partial F/\partial P > \theta/2 > \partial F/\partial K_i$  for this indifferent producer.

<sup>20</sup>The dashed line of the Figure represents the assets of a producer indifferent between Petty and Large classes.

any fixed level of public goods, the higher asset returns of the Large commercial class are always rational provided sufficiently high initial assets.<sup>21</sup> Proposition 3 summarizes this argument.

**Proposition 3.** *Provided initial assets range from zero to infinity, economies with sufficiently high levels of public goods will exhibit all three classes. A sufficient level of public goods is*

$$1 + \frac{c_F}{P} \leq \frac{(1+r)(1+\theta)}{1+\theta/2} \left[ \frac{2+r}{1+r} \left[ \frac{1+\theta/2}{1+r} \right]^{1/(2+r)} - 1 \right]. \quad (8)$$

*Proof.* See Appendix. □

Finally, the adoption of technology as assets range from zero to infinity can be seen by combining Propositions 2 and 3. At high levels of public goods, there are three endogenously determined groups of Subsistence, Petty Commodity and Large-scale producers as in Figure 3a. At low asset levels ( $A_i \leq \underline{A}_P$ ), producers choose Subsistence, while for high asset levels ( $\underline{A}_L \leq A_i$ ), producers join the Large commercial class. Intermediate asset levels ( $\underline{A}_P \leq A_i \leq \underline{A}_L$ ) correspond to Petty commercial production. These three endogenously determined groups of Subsistence, Petty Commodity and Large-scale producers have respective population shares

$$\sigma_S \equiv \mathbb{A}(\underline{A}_P), \quad \sigma_P \equiv \mathbb{A}(\underline{A}_L) - \mathbb{A}(\underline{A}_P), \quad \sigma_L \equiv 1 - \mathbb{A}(\underline{A}_L). \quad (9)$$

It is of course possible that there may be no members of any particular class, as would happen, for example, if no agent enjoys wealth in excess of  $\underline{A}_L$ . Using the numerical assumptions detailed in the appendix, Figure 3b illustrates class boundaries for different levels of public goods. Individuals whose initial wealth places them to the southwest of the solid line will optimally choose to employ the subsistence technology. Those to the northwest of the dashed line will optimally invest in privately provisioned public goods and join the Large Commercial class. Finally, those between the solid and dashed lines will be in Petty Commercial Producer class. As can be seen, as the level of public goods increases, the initial wealth level needed to exit Subsistence and join the Petty Commercial class drops off quickly.

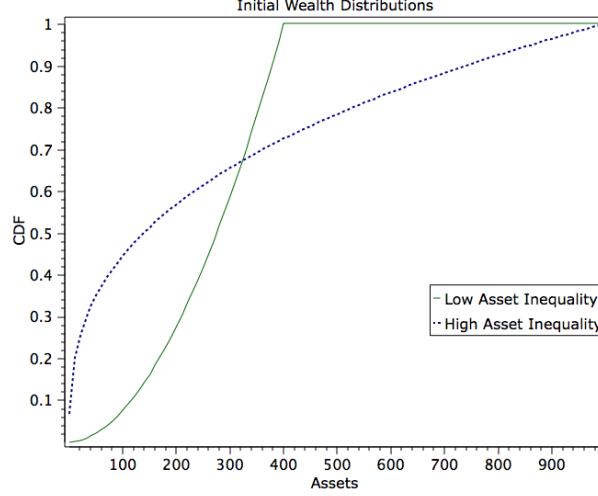
We can represent a particular society as in Figure 4. The horizontal axis represents the wealth continuum along which individuals are distributed. The vertical axis represents the cumulative distribution of individuals. The solid line represents a society with a more egalitarian initial wealth distribution, while the dashed curve represents a less egalitarian society, but with the same mean level of wealth. In Figure 4, we can see that in the absence of public goods, approximately 80% of the high inequality population will be in the Subsistence class, with the remainder in the Large producer class. However, more than 80% of all wealth will be controlled by the large producer

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<sup>21</sup>Formally,  $\lim_{A_i \rightarrow \infty} d[\exp(U_L) - \exp(U_S)]/dA_i \geq \left[ (1+\theta/2)^{1/(2+r)} - (1+\theta 2^{-1/\alpha})^{1/(2+r)} \right] / (2+r) > 0$ .

class. In contrast, in the low inequality economy, the absence of public goods would imply all individuals and all wealth will be in the Subsistence class.

Figure 4: High and Low Inequality Asset Distributions



### 3.4 Public Policy and Political Interests

We now consider individuals' preferences for government action. While government provision of public goods provides a benefit to all (incipient) commercial producers, a key political question is for whom this benefit is worth the cost. To explore this question, we need to first specify a model of public finance that defines the government's budget constraint. We restrict our attention to the simple case in which the government taxes assets at a flat rate  $\tau$ , or does not tax, thereby directly increasing individuals' private assets.<sup>22</sup> Average wealth in the economy is  $\mu \equiv \int A_i d\mathbb{A}(i)$  so that the total tax raised to provide public goods is  $\tau\mu$ . As mentioned above, the provision of public goods is a shared growth policy in the sense that it provides a benefit to all commercial producers. It is also an inclusive growth policy as it reduces the critical initial wealth threshold,  $\underline{A}_P$ , allowing more individuals to graduate from subsistence to petty commercial production.

To simplify the analysis, we assume that Large Commercial producers are the sole participants in domestic financial markets. The resulting equilibrium interest rate of  $\theta/2$  reflects that for these individuals, both investments and public goods yield a one period total return of  $1 + \theta/2$ . Thus, the government may borrow at interest rate  $\theta/2$  to purchase  $P$  units of the public good. We assume that everyone in society receives an equal per-capita share of the total public goods provided.<sup>23</sup> To cover the interest on this debt, the government raises taxes  $\tau\mu$  in period 0 and saves them for a

<sup>22</sup>More complex tax regimes would certainly influence political outcomes. Following the analysis below, progressive schemes would further antagonize Large producer support for public goods, while driving up the benefit of public goods to Petty producers thus increasing their support for public goods.

<sup>23</sup>This is  $P$  as society is comprised of a unit mass of individuals.

total return of  $(1 + \theta/2) \tau \mu$  in period 1 to service the debt. This implies the level of public good provision must satisfy the inter-temporal budget constraint

$$\text{Government Budget Constraint : } (1 + \theta/2) \tau \mu = (1 + \theta/2) P - P, \quad (10)$$

This budget constraint reflects the fact that the government can save collected taxes  $\tau \mu$  for one period and use its total budget to pay the debt service.<sup>24</sup>

We now consider the competing effects of taxation and public good provision on well-being across economic classes. The total effects of government policy for any Commercial class are<sup>25</sup>

$$dU/d\tau = (1 + \theta/2) \mu / (\theta/2) \cdot \partial U / \partial P - A_i \cdot dU/dA_i. \quad (11)$$

Equation (11) sets the beneficial effect of public good provision against the detrimental costs of taxation, and characterizes the policy regime that each individual would support politically.

For Subsistence Producers, the lack of access to the production technology  $F$  implies  $\partial U / \partial P = 0$ , so they pay taxes with no hope of compensation and would prefer that no taxes are levied. At the other extreme, members of the Large Commercial class are free to reduce  $P_i$  to offset increases in  $P$ , so they are immune to ‘forced purchase’ of public goods. Therefore a Large Commercial Producer’s welfare increases in  $\tau$  so long as the tax paid,  $\tau A_i$  is less than the discounted value of public goods provided in period 1, so Equation (11) becomes<sup>26</sup>

$$dU_L/d\tau = (\mu - A_i) \cdot dU_L/dA_i. \quad (12)$$

Equation (12) shows members of the Large Commercial class prefer higher taxes only when their assets are below average, so for this class, taxes are purely redistributive. Clearly then, the wealthiest members of the society will oppose the taxation needed for a shared growth policy.

Finally, for Petty Commercial Producers, Equation (11) can be written

$$dU_P/d\tau = \left( \underbrace{\mu - A_i}_{\text{Redistributive}} + \underbrace{\left[ \frac{1 + \theta/2}{\theta/2} \frac{\partial F / \partial P}{1 + \partial F / \partial K_i} - 1 \right] \mu}_{\text{Benefit of Public Goods}} \right) \cdot dU_P/dA_i.$$

Decomposing this equation shows that Petty producers are motivated by both redistributive con-

<sup>24</sup>The rationale for modeling public good provision at a one period ‘rental’ is in keeping with longer horizon models in which a government would own public goods but amortize their cost over several periods.

<sup>25</sup>An increase in taxes  $\tau$  decreases available assets at rate  $A_i$ , as  $\partial U / \partial \tau|_{P \text{ fixed}} = -A_i \cdot dU/dA_i$ , so the impact of taxation is known from (6) above. Conversely, an increase in  $\tau$  provides public goods to all voters at rate  $P/\tau = (1 + \theta/2) \mu / \theta/2$ , which implies  $\partial U / \partial \tau|_{(1-\tau)A_i \text{ fixed}} = (1 + \theta/2) \mu / (\theta/2) \cdot dU/dP$ .

<sup>26</sup>Formally, the envelope theorem shows that  $\partial U / \partial P = ((\partial F / \partial P) / (2 + r)) \cdot (\tilde{c}_i^0 / \tilde{c}_i^1) \cdot dU/dA_i$ .



cerns and the productive benefits of public goods. For a Petty producer who happens to equate the marginal product of private and public investments ( $K_i = P$ ), the benefit term above vanishes as for Large producers.<sup>27</sup> Petty producers with more assets increase private investment, making the benefit term positive, since the potential return of public goods to such producers is higher than the opportunity cost of providing public goods,  $\theta/2$ . Similarly, Petty producers with fewer assets achieve returns on public goods below  $\theta/2$ , yielding a negative benefit term. Ultimately, the combined effects are positive so long as taxes aren't prohibitively high.<sup>28</sup>

Informed by this analysis, we restrict  $\tau$  to moderate levels in order to analyze economies where public goods have some positive benefit for Petty producers, i.e. that taxes have not immiserated producers into highly unproductive behaviors, as laid in Assumption 1. Conditions 1 and 2 of this assumption means that the class boundaries above do not violate producers ability to pay for their preferred class plus a small margin, and in order to be violated, taxes have to approach  $1/(2+r)$ , i.e. almost 50% at standard discount rates. For condition 3 to be violated at tax rates below 50% would require extremely high marginal returns to public goods of over 200%.

**Assumption 1.** *Moderate taxation.*

1.  $(1 - \tau)\underline{A}_P - c_F > (1 + r)\tau\underline{A}_P$ .
2.  $(1 - \tau)\underline{A}_L - c_P > 0$ .
3.  $1 - \partial F / \partial P|_{A_i = \underline{A}_L} / 4 \geq \tau$ .

Under moderate taxation, all Petty producers receive positive marginal benefits from increased taxation. We summarize these political interests as

**Proposition 4.** *The political interests of Large producers are purely redistributive, while Petty producers care also about the productive benefits of public goods. Under moderate taxation:*

1.  $dU_L/d\tau \geq 0$  if and only if  $\mu \geq A_i$ .
2.  $dU_P/d\tau \geq 0$  for all  $A_i \geq \underline{A}_P$ .

*Proof.* See Appendix. □

While we have seen that costless increases in public goods enlarge the Petty Commercial class, the introduction of taxes to pay for public goods introduces income effects which might also shrink this class. However, at moderate tax rates, the productive benefits of publicly augmenting private investments dominate income effects, as summarized in Proposition 5:

<sup>27</sup>The condition of Proposition 3 guarantees this Petty producer exists.

<sup>28</sup>While the costless provision of public goods enlarges the Petty Commercial class, the taxation required for these goods drains producers of wealth, potentially disincentivizing high return production. The most obvious way this might occur is under prohibitively high taxes which preclude producers from paying the fixed costs of adoption. For example, at a 100% taxation rate, all producers are immiserated to subsistence by the lack of assets to pay  $c_F$ .

**Proposition 5.** *Under moderate taxation, increases in public goods enlarge the Petty Commercial class relative to Subsistence and Large Commercial classes.*

*Proof.* See Appendix. □

Until now, we have exogenously modeled public good provision. We now model public goods as the outcome of a political contest between parties who are lobbied along class lines.

## 4 Political Parties and Electoral Competition

To explore the politics of policy choice, we assume a two-party political system. Voters involved in the commercial economy are informed and tend to vote and lobby for their economic interest. Non-commercial subsistence producers are uninformed as public goods are meaningless to them.<sup>29</sup> All voters have random political preferences that make them more likely to vote for one of the two political parties. Uninformed voters are further swayed by political expenditures made by the parties. In our modeling, we pay particular attention to each agent's constrained willingness to pay for a particular policy. We then explore the suggestion that the extent of initial asset inequality and risk will fundamentally shape whether the political-economic processes will result in the choice of shared growth policies.

In this section, we lay out the elements for a model of electoral competition. We then establish the behavior of political parties and analyze the resulting political-economic equilibrium.

### 4.1 Parties, Lobbies and Elections

We assume there are two political parties, Reds ( $R$ ) and Greens ( $G$ ). Parties are office motivated and offer platforms  $(\tau_R, P_R)$  and  $(\tau_G, P_G)$  composed of a flat income tax  $\tau$  used to finance public goods  $P$  through (10).<sup>30</sup> Voters have idiosyncratic preferences  $\delta_i$  in favor of party  $R$ , distributed uniformly over  $[-1/2\psi, 1/2\psi]$ . Petty and Large Commercial producers are informed voters who vote on the basis of economic policy. The welfare of an informed voter  $i$  under a platform  $(\tau, P)$  is

$$U((1 - \tau)A_i, P) + \delta_i \cdot \mathbf{1}_{R \text{ elected}}.$$

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<sup>29</sup>Similar to Bardhan and Mookherjee (2000), this implies that the share of informed voters increases with wealth. Our more stark assumption that the poorest voters are completely uninformed is to allow for the added complexity of endogenous interest group formation.

<sup>30</sup>We abstract from factors that might influence the application of taxes towards public good provision, such as government leakages or the capacity of politicians to effectively provide public goods once funds are allocated. The role of these factors when local politics are distinct or fractionalized is an area for further work (Gehlbach, 2006).

Therefore informed voters prefer a Red party platform in preference to a Green platform whenever

$$U((1 - \tau_R)A_i, P_R) + \delta_i \geq U((1 - \tau_G)A_i, P_G).$$

Subsistence producers are uninformed voters who are influenced by campaign contributions  $C_R$  and  $C_G$ , and vote for the Red party whenever

$$C_R + \delta_i \geq C_G.$$

Given party platforms and campaign contributions, the probability that Red party is elected ( $\rho$ ) is:

$$\rho = 1/2 + \psi \int_{A_i \geq \underline{A}_P} [U((1 - \tau_R)A_i, P_R) - U((1 - \tau_G)A_i, P_G)] d\mathbb{A}(i) + \psi \int_{A_i < \underline{A}_P} [C_R - C_G] d\mathbb{A}(i).$$

Once parties have chosen platforms to maximize their election chances, lobbies representing each group of commercial producers make campaign contributions to support their preferred party.

With these building blocks, we take a standard approach and model the behavior of class-based lobbies, where each lobby maximizes the welfare of its constituency less a quadratic loss function associated with the per capita costs of raising political contributions from its members.<sup>31</sup> As is well known in this setting, (Persson and Tabellini, 2000; Gehlbach, 2013), in equilibrium each party selects the same platform and no contributions are made. Equilibrium platforms coincide with the solution to a weighted sum of Petty and Large Commercial Producer welfare:

$$\max_{(\tau, P)} (\sigma_L + \psi \sigma_L^2) E_{\mathbb{A}} [U_L | A_i > \underline{A}_L] + (\sigma_P + \psi \sigma_P^2) E_{\mathbb{A}} [U_P | \underline{A}_L > A_i > \underline{A}_P] \text{ subject to (10).} \quad (13)$$

In summary, the timing of a political-economic cycle is as follows:

1. *Voters* choose their class, contingent on a rational expectation of political outcomes.
2. *Parties* propose platforms, maximizing their probability of being elected.
3. Commercial *lobbies* contribute to campaigns to maximize constituent welfare.
4. *Voters* elect parties and the winner's platform is implemented.
5. *Voters* choose their flexible investments and produce.

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<sup>31</sup>For example, the lobby for the Large Commercial class would pick a contribution level to maximize

$$\int_{\underline{A}_L}^{\infty} \left[ \rho U((1 - \tau_R)A_i, P_R) + (1 - \rho) U((1 - \tau_G)A_i, P_G) - ((C_R + C_G)/\sigma_L)^2 / 2 \right] d\mathbb{A}(i).$$

Expectations of low public good provision lead to an anemic Petty class, while high expectations crowd in Petty producers who enforce high public good levels politically. These possibilities are better understood by examining the necessary conditions for political equilibria of Equation (14):

$$\underbrace{-(1 + \psi\sigma_L) \int_{\underline{A}_L}^{\infty} (dU_L/d\tau) d\mathbb{A}(i)}_{\text{Marginal Cost of } \tau \text{ to Large Commercial Producers}} \geq \underbrace{(1 + \psi\sigma_P) \int_{\underline{A}_P}^{\underline{A}_L} (dU_P/d\tau) d\mathbb{A}(i)}_{\text{Marginal Benefit of } \tau \text{ to Petty Commercial Producers}}. \quad (14)$$

When the marginal cost to Large producers is strictly larger than the marginal benefit to Petty producers, the Petty class does not exist. This is because strict inequality in Equation (14) can only occur at the ‘corner equilibrium’ of no public good provision, in which case the marginal benefit of public goods to Petty producers is infinite. This yields Proposition 6.

**Proposition 6.** *The only class structure compatible with no public good provision is an economy composed solely of Subsistence and Large Commercial Producers.*

These results show that the strength of a class to pursue its interests in the political arena depend on the fixed investments voters make. Since investments in turn depend on the expected level of public goods provided by politicians, good and bad expectations can lead to inclusive or exclusive policies. We now address these outcomes by investigating voter interests as class strength changes.

## 4.2 Inequality and Public Good Provision

In light of Propositions 4 and 6, at any interior equilibrium, Equation (14) can be written as

$$\begin{aligned} 0 = & \underbrace{(1 + \psi\sigma_L) \int_{\max\{\underline{A}_L, \mu\}}^{\infty} (dU_L/d\tau) d\mathbb{A}(i)}_{(-)} \\ & + \underbrace{(1 + \psi\sigma_L) \int_{\underline{A}_L}^{\max\{\underline{A}_L, \mu\}} (dU_L/d\tau) d\mathbb{A}(i)}_{(+)} + \underbrace{(1 + \psi\sigma_P) \int_{\underline{A}_P}^{\underline{A}_L} (dU_P/d\tau) d\mathbb{A}(i)}_{(+)}. \end{aligned} \quad (15)$$

The initial distribution of assets impacts public good provision through Equation (15). In particular, consider an economy with asset distribution  $\mathbb{A}$  and equilibrium tax rate  $\tau^1$ . Now consider a second economy with identical productive features, but an asset distribution  $\mathbb{B}$  which results from redistributing from rich to poor voters that increases the size of the (incipient) Petty class.<sup>32</sup> In this second economy, Equation (15) must be positive at tax rate  $\tau^1$ . As (15) decreases in  $\tau$  for any fixed set of producers under moderate taxation (see Appendix), it follows that a  $\mathbb{B}$  distribution economy

<sup>32</sup>Formally,  $\mathbb{B}$  has fewer voters at every level of assets above  $\max\{\underline{A}_L^1, \mu\}$  and more voters at every level of assets in  $(\underline{A}_P^1, \max\{\underline{A}_L^1, \mu\})$ .

has a higher equilibrium tax rate. This result, linking the relative strength of Petty producers more equal economies to increased public goods is summarized as Proposition 7.

**Proposition 7.** *Under moderate taxation, economies with a stronger incipient Petty class have higher levels of public goods.*

Risk may also prevent voters from adopting higher productivity technologies and thereby reduces the size of the incipient Petty class. Thus, reducing risk may in fact crowd in public goods, which we now explain.

### 4.3 Risk and Public Good Provision

In order to model high yielding technologies which may entail risk, suppose that commercial production yields variable total returns of  $[F(K_i, \kappa_i) + K_i + P_i] \cdot \varepsilon_i$  where  $\varepsilon_i$  is randomly distributed with  $E[\varepsilon_i] = 1$  and support on  $[\theta 2^{-1/\alpha} - r, \infty)$ . This implies commercial production always yields higher returns than subsistence, but risk as measured by  $\rho \equiv |E[\ln \varepsilon_i]|$  makes Commercial production less rewarding. Increases in risk  $\rho$  do not change the relative attractiveness of Petty versus Large Commercial production across asset levels, but risk does make Subsistence more appealing than Commercial production, increasing  $\underline{A}_P$  and shrinking the Petty class. Following the logic above through Equation (15), decreases in risk thereby again crowds in political capital in support of public goods, summarized as Proposition 8.

**Proposition 8.** *Under moderate taxation, economies with less risk have higher levels of public goods.*

We next illustrate the mechanisms of the formal results with a numerical example to fix ideas.

### 4.4 Endogenous Class and Willingness to Pay for Public Policy

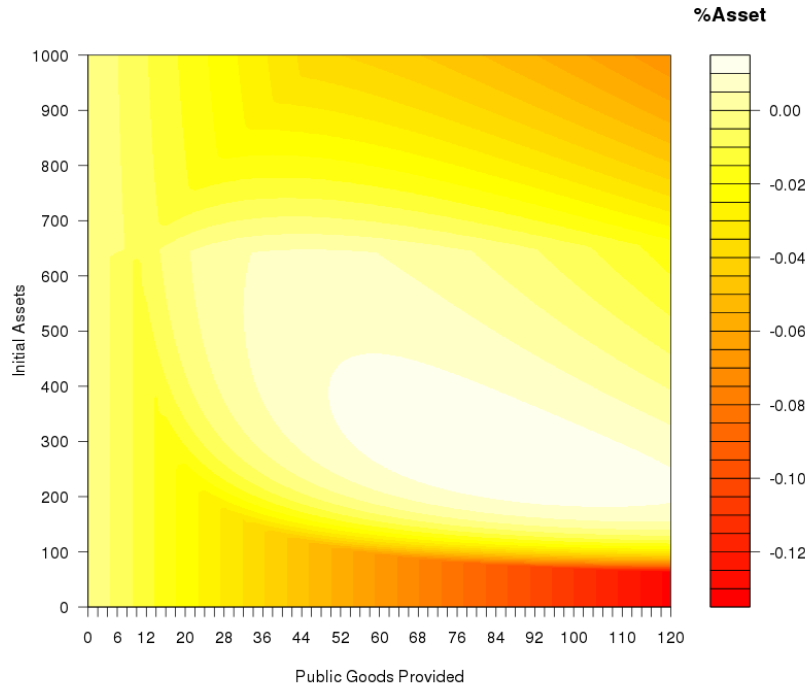
In an effort to understand agent's potential budget-constrained willingness to make political contributions, we perform the following thought experiment:

- The Red party offers a status quo of  $P_R = 0$ , while the Green party offers a reform of  $P_G > 0$ .
- The Green party accountants calculate how much initial wealth each voter would be willing to give up in order to obtain (or avoid) the reform policy with probability one.

These amounts calculated can be considered as upper bound estimates of the amount of political contributions the reformist Green party could collect. While individuals would likely contribute less than this upper-bound estimate (given electoral uncertainty, among other things), these estimates do provide a window into the interaction between politics and economics.

Figure 5 displays the percentage of initial wealth that an individual could pay to their preferred political party without making themselves worse off compared to the policy of their non-preferred party. For example, at  $P = 50$  on the horizontal axis, a voter willing to contribute 5% of their wealth would be indifferent between (i) a 5% contribution plus implementation of  $P = 50$  and (ii) the status quo ( $P = 0$ ). Asset positions that show negative amounts means that the individual could contribute that amount to secure a status quo, Red Party win.

Figure 5: Upper Bound Estimates of Political Willingness to Pay



As can be appreciated in Figure 5, the strongest potential support for reform policies emerge from what might be termed the incipient petty commercial class. Note that at low levels of public good provision, voters with wealth levels of between 200 and 600 optimally pursue the subsistence strategy. At those modest wealth levels, it never makes economic sense for them to pursue commercial production. However, if the government delivers roughly 20 units of public good or more, then individuals at this wealth level optimally transition to the petty commercial class. These incipient Petty producers would become informed and be able to contribute positive, but modest amounts of their wealth to insure the election of a reform policy. The willingness to pay of this group increases up until public good levels of at least 70 units.

Notably, such endogenous support for public goods ‘led by the middle class’ means that the distribution and provision of public goods are not independent. For example, for a fixed government budget the distribution of public goods might fail anti-poverty objectives (as in Bardhan and

Mookherjee, 2006), but the *size* of the budget may be in proportion to the political strength of Petty producers. When the economic environment is constrained by such political realities, the policies which maximally reduce poverty may be those which form common cause with other groups, as this ‘imprecise targeting’ is precisely what garners political capital.

From an informed voter perspective, with  $P = 0$ , individuals with wealth in excess of about 600 units would provide their own public goods ( $P_i > 0$ ), pursuing the large scale commercial strategy. However, because these individuals are all above the mean wealth level in the economy ( $\mu = 260$  in the numerical example), they strictly lose from the implementation of a reform policy. While a further exposition of the contest between parties is laid out in Appendix C, we now turn to equilibrium outcomes.

#### 4.5 Political Poverty Traps and Endogenous Class Formation

Finally, combining these different class interests across promised public good levels yields Figures 6a and 6b. The horizontal axis of these Figures contains the expected level of public goods voters credibly might expect, while the vertical axis plots the level of public goods that are the political outcome when voters invest based on expectations.

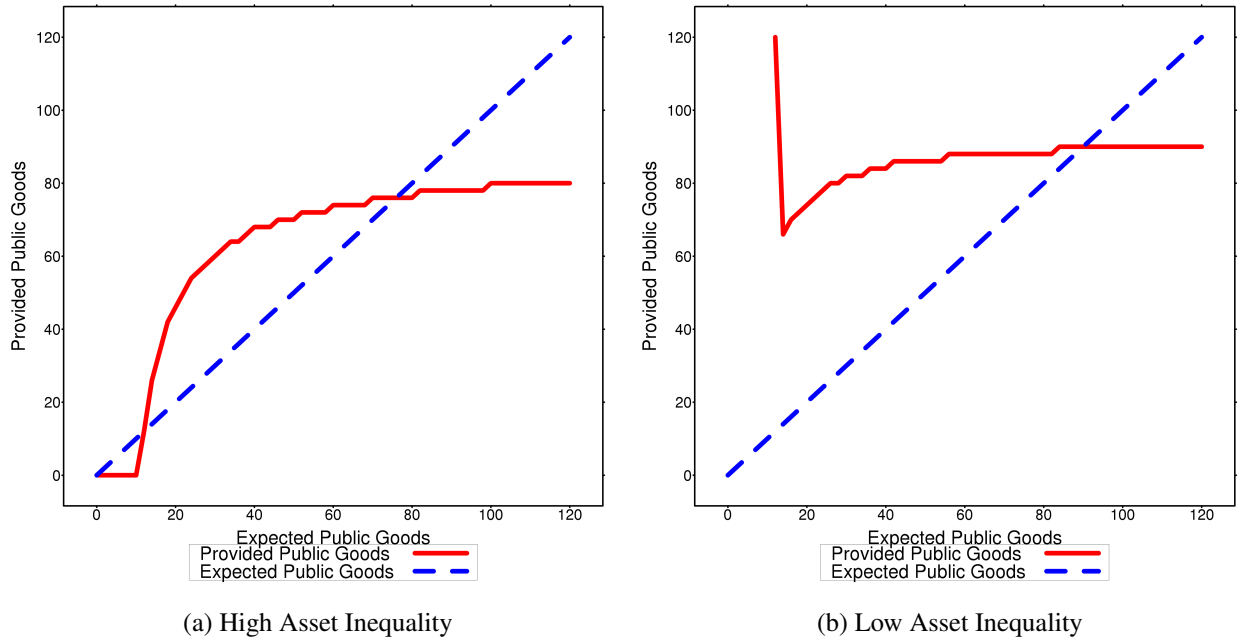


Figure 6: Political-Economic Equilibria

Figure 6a depicts a low public good equilibrium at  $P = 0$  wherein a weak Petty Commercial Class (see Figure 3b) cannot obtain any positive level of public goods from the government. The

same Figure also depicts a high public good equilibrium at  $P \approx 75$  where an incipient middle class, formed by expectations of high public good provision can ensure this level of public goods politically. Here the political poverty trap is evident: sustaining a low to moderate level of public goods can make Petty producers of sufficient interest to political entrepreneurs to pursue a high level of public goods in equilibrium. In contrast, the low asset inequality economy of Figure 6b has a unique equilibrium of high public good provision as the high asset interest groups which act against the taxation that public goods entail are considerably weaker.<sup>33</sup>

The potential for no public good provision (a la Proposition 6) can be clearly seen in the high inequality economy of Figure 6a. In contrast, the economy of Figure 6b consists solely of Subsistence and Petty producers. These dominant Petty producers maximize their average class welfare by setting the RHS of Equation (14) to zero, achieving a high level of public good provision in equilibrium.

More broadly, this political poverty trap can be broken when political parties can credibly promise to deliver public goods, which brings voters into the Petty commercial class and crowds in both physical and political capital to support inclusive growth. This relationship is depicted in both Figure 6a and Figure 6b, which show that the level of public goods provided by political contests increase as voters come to expect them. This occurs when there are sufficient Petty producers (measured by  $\sigma_P$ ) who receive high benefits of taxation (measured by  $dU_P/d\tau|_{A_i=A_L}$ ) relative to Large producers. Formally,

$$\sigma_P \cdot dU_P/d\tau|_{A_i=A_L} > \sigma_L \cdot dU_L/d\tau|_{A_i=A_L} . \quad (16)$$

Equation (16) means that when considering the benefits of taxation to a voter indifferent between Petty and Large production, the benefit to Petty production weighted by the mass of Petty producers is larger than the corresponding quantity for Large production. In summary, we have

**Proposition 9.** *Under moderate taxation and (16), increases in expected public goods crowd in delivered public goods.*

*Proof.* See Appendix. □

We now briefly discuss the role of risk which is endemic to small entrepreneurs in developing countries and crucially shapes their economic lives. In this framework, risk alters production strategies which in turn informs the political interests of producers. Thus, risk has spillover effects on the national development strategy akin to the role of initial inequality.

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<sup>33</sup>As is common in models of political public good provision, the conditions which pin down the number and particular properties of equilibria are highly endogenous, e.g. Benabou (2000).



## 5 Viable Producers as the Foundation for Inclusive Growth

While highly stylized, our political economy model implies that in the presence of high levels of risk, the kinds of shared growth policies that underwrote the rural foundations of the East Asian miracle are not politically viable, even in economies with modest levels of asset inequality. Before turning to consider what might be done to rectify that situation, it is important to recall that the model itself rests on an assumption of financial market failure. Formally, it is the inability of low wealth agents to borrow large amounts of resources that keep them from leapfrogging from the subsistence to the petty commercial class and higher rates of returns to the assets that they own.<sup>34</sup> While this assumption seems reasonable, it is essentially a statement that low wealth agents are of no more interest to economic entrepreneurs than they are to political entrepreneurs. As exhibited in the last section, risk plays a key role in this exclusionary process, and reductions in risk may have political knock on effects. We now speculate on the policy implications of our political economy framework for the likelihood that polities might support and sustain inclusive growth policies, taking Africa as an example.

### 5.1 The Political Ramifications of Risk in Africa

Risk plays an important part in explaining rural financial market failures. Only a tiny fraction of agricultural land in sub-Saharan Africa is irrigated, in sharp contrast to other world regions.<sup>35</sup> While the absence of irrigation reduces productivity, it also has a large impact on the risk to which farmers are exposed. In an analysis of West Africa, Carter (1997) documents the magnitude of this risk, showing not only that is larger than other world regions, but also that if left unmanaged exposes households to huge consumption risk. Households of course do manage that risk, but often by avoiding higher yielding, but risky and more expensive technologies.

Should the higher yielding technology exhibit risk in the model above, investment incentives to abandon subsistence would be reduced as agents would be tempted to consume more in the initial period rather than risking resources in investment projects which perhaps do not pay off. As shown in Figure (3ab), it is this class that sacrifices the most to invest by having already precariously low period 0 consumption. In addition, as already demonstrated in dynamic poverty trap models, an increase in risk pushes out the initial asset level at which individuals will attempt the transition from a low-level equilibrium strategy to a higher level equilibrium strategy.<sup>36</sup>

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<sup>34</sup>Our model shares this characteristic with the general category of multiple equilibrium poverty trap models analyzed by Barrett and Carter (2013).

<sup>35</sup>The 2008 World Development Report indicates that less than 5% of land is irrigated in Africa, compared to 39% in South Asia and 29% in East Asia.

<sup>36</sup>E.g. in the frame work of Carter and Ikegami (2009), this impact appears as a shift out in what they call the Micawber Frontier. In our model, it will appear as rightward shift in  $\underline{A}_p$ , the asset level at which individuals endogenously move from the subsistence class to the petty commodity class.

These two fundamental changes brought by risk have important implications for political economy. For a given initial asset distribution, the rightward shift in  $\underline{A}_P$  thins the ranks of those who support Government investment in public goods. In addition, for those who remain Petty Commodity Producers, it reduces their material gain from policies that promote public goods. Together, these two forces imply that a broader class of wealth distributions will not be able to endogenously sustain inclusive growth policies. Put differently, office-seeking political entrepreneurs have little to gain from offering public goods to a population that will remain trapped at relatively low levels of economic well-being even after public goods are provided. Risk, especially at the levels observed across wide parts of rural Africa, not only discourages investment, but also fundamentally breaks the political-economic logic that could create and sustain inclusive growth policies.

## 5.2 Policy Interventions Through the Lens of Political Economy

Models, such as the one developed in this paper that indicates that initial conditions matter, are problematic in terms of their policy implications. The Peruvian economist, Adolfo Figueroa, once commented that Latin America needed a “refoundational shock” to reduce asset inequality so that it could start over with different initial conditions. While the desirability and certainly political feasibility of a refoundational shock are questionable, is it any more reasonable to think about changing the foundational agroecological conditions across parts of Africa that trap individuals in situations in which they are of little interest to both economic and political entrepreneurs?

Somewhat surprisingly, the answer to this question may be yes. Fueled in part by technological innovation in the area of remote sensing, recent years have seen an outpouring of efforts to index insurance contracts that transfer the correlated component of risk out of African agricultural systems. While these efforts are still largely in the proof-of-concept stage, several of them reveal the potential power of the idea. In the remote pastoral regions of Northern Kenya, a satellite-based livestock mortality insurance contract successfully delivered payouts quickly, when and where warranted. Initial research reported in Janzen and Carter (2013) shows that the insurance payments have indeed served to guard family consumption standards and to protect families from further asset loss and decapitalization.

As described by McIntosh et al. (2013), another such effort designed a weather index insurance contract targeted at low productivity Ethiopian grain farmers. Under cover of this contract, a large private bank agreed to open a loan portfolio for these farmers to provide the liquidity needed to adopt improved seeds and fertilizers. The hope is that this new source of liquidity, combined with the risk reduction of the insurance contract would crowd-in technology uptake and, in the language of the model here, create a transition from a subsistence to a petty commercial class.<sup>37</sup> Research

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<sup>37</sup>Insurance is costly, and the key to this and other projects is the effort to interlink insurance with credit resources needed to simultaneously increase expected income. Michael Carter et al. (2011) analyze this interlinkage in detail.

is still underway to determine if in fact this risk transfer contract has these desired effects. But note that if it does, this intervention will have created a viable commercial farming class in an area heretofore characterized by technological stagnation and low income levels.

While it is premature to declare that these efforts have succeeded in fundamentally altering the political economic landscape in Kenya and Ethiopia, the approach taken in these and related projects is, if nothing else, novel. With modest public investment, these projects have tried to change the landscape for economic entrepreneurs, converting low wealth households into a bankable investment project. If these efforts can indeed succeed and sustain themselves, then the political economic calculus of the sort examined here may turn in change, creating a novel variant of the virtuous circle that underlay the East Asian Miracle a generation ago.

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## A Proofs

**Proposition.** *Provided initial assets range from zero to infinity, economies with sufficiently high levels of public goods will exhibit all three classes. A sufficient level of public goods is*

$$1 + \frac{c_F}{P} \leq \frac{(1+r)(1+\theta)}{1+\theta/2} \left[ \frac{2+r}{1+r} \left[ \frac{1+\theta/2}{1+r} \right]^{1/(2+r)} - 1 \right].$$

*Proof.* For a Petty producer with assets such that  $K_i = P$ , say  $\tilde{A}_P$ , the producer’s intertemporal decision implies

$$(1-\tau)\tilde{A}_P = \left[ 1 + \frac{(1+r)(1+\theta)}{1+\theta/2} \right] P + c_F. \quad (17)$$

Since a Large producer with assets  $\tilde{A}_P$  would also choose  $K_i = P$ , clearly  $U_P > U_L$  since  $c_P > 0$ . Using the expressions above, Petty production dominates subsistence at  $\tilde{A}_P$  exactly when

$$\left( (1-\tau)\tilde{A}_P - P - c_F \right) [(1+\theta/2)/(1+r)]^{1/(2+r)} \geq (1+r)(1-\tau)\tilde{A}_P/(2+r).$$

With equation (17), this is equivalent to

$$\left[ 1 + \frac{(1+r)(1+\theta)}{1+\theta/2} \right] P + c_F \geq \frac{P + c_F}{1 - (1+r)/(2+r) \cdot [(1+r)/(1+\theta/2)]^{1/(2+r)}},$$

which implies both (8) and that  $(1-\tau)\tilde{A}_P > c_F$  so that Petty production is accessible.  $\square$

**Proposition.** *The political interests of Large producers are purely redistributive, while Petty producers care also about the productive benefits of public goods. Under moderate taxation:*

1.  $dU_L/d\tau \gtrless 0$  if and only if  $\mu \gtrless A_i$ .

2.  $dU_P/d\tau \geq 0$  for all  $A_i \geq \underline{A}_P$ .

*Proof.* Consider that at  $A_i = \underline{A}_P$ , substitution shows

$$\left. \frac{dU_P}{d\tau} \right|_{A_i=\underline{A}_P} = \frac{1+\theta/2}{\theta/2} \frac{\partial F/\partial P}{1+\partial F/\partial K_i} \mu - \underline{A}_P = \frac{1+\theta/2}{\theta/2} \frac{(\theta/2) P^{\alpha-1} (K_i^\alpha/2 + P^\alpha/2)^{(1-\alpha)/\alpha} \tilde{c}_i^0}{(1+r) \tilde{c}_i^1} \mu - \underline{A}_P.$$

Clearly  $\tilde{c}_i^0/\tilde{c}_i^1 = ((1-\tau)\underline{A}_P - K_i - c_F)/(F + K_i)$  decreases in  $K_i$ , so evaluating at  $K_i = 0$  shows

$$\begin{aligned} \frac{1+\theta/2}{\theta/2} \frac{\partial F/\partial P}{1+\partial F/\partial K_i} \mu - \underline{A}_P &\geq \frac{1+\theta/2}{\theta/2} \frac{(\theta/2) P^{\alpha-1} (P^\alpha/2)^{(1-\alpha)/\alpha} ((1-\tau)\underline{A}_P - c_F)}{(1+r) \theta P^{2-1/\alpha}} \mu - \underline{A}_P \\ &= [(1 - (2+r)\tau)\underline{A}_P - c_F]/(1+r)\tau, \end{aligned}$$

which is positive so long as investible period 0 assets,  $(1-\tau)\underline{A}_P - c_F$  are greater than  $(1+r)\tau\underline{A}_P$  as assumed. Also note that  $(1-\tau)\underline{A}_P - c_F > (1+r)\tau\underline{A}_P$  with  $c_F \geq 0$  implies  $\tau \leq 1/(2+r)$ , so  $(1-\tau)A_i - c_F > (1+r)\tau A_i$  for all  $A_i \geq \underline{A}_P$ . Replacing  $\underline{A}_P$  with  $A_i \geq \underline{A}_P$  in the argument above then gives the result.  $\square$

**Proposition.** *Under moderate taxation, increases in public goods enlarge the Petty Commercial class relative to Subsistence and Large Commercial classes.*

*Proof.* What is needed is to show that as  $\tau$  increases,  $\underline{A}_L$  increases and  $\underline{A}_P$  decreases. First consider that for producers indifferent between Petty and Large production at asset level  $\underline{A}_L$ , Equations (11) and (6) imply the benefits of Petty production dominate as taxes increase ( $dU_P/d\tau \geq dU_L/d\tau$ ) iff

$$(\mu - \underline{A}_L) \left( \frac{1+\theta/2}{1+r} \right)^{1/(2+r)} \leq \left( \frac{1+\theta/2}{\theta/2} \frac{\partial F/\partial P}{1+\partial F/\partial K_i} \mu - \underline{A}_L \right) \left( \frac{1+\partial F/\partial K_i}{1+r} \right)^{1/(2+r)}. \quad (18)$$

Further reduction shows Equation (18) holds exactly when

$$\left( \frac{1+\theta/2}{1+\partial F/\partial K_i} \right)^{1/2+r} \left[ 1 - \left( \frac{1+\theta/2}{1+\partial F/\partial K_i} \right)^{1+r/2+r} \frac{\partial F/\partial P}{\theta/2} \right] \leq \left[ \left( \frac{1+\theta/2}{1+\partial F/\partial K_i} \right)^{1/2+r} - 1 \right] \frac{\underline{A}_L}{\mu}. \quad (19)$$

At  $\underline{A}_L$ , a Petty producer would necessarily use the saved fixed costs  $c_P$  from not becoming a Large producer to invest in assets  $K_i > P$ , it follows that  $\partial F/\partial K_i < \theta/2 < \partial F/\partial P$ , so the RHS of Equation (19) is positive, while the LHS is negative. Therefore  $dU_P/d\tau \geq dU_L/d\tau$  at  $\underline{A}_L$ , so the Petty class expands at the expense of the Large class. Similarly, for producers indifferent between

Petty and Subsistence production at asset level  $\underline{A}_P$ , Equations (11) and (6) imply that  $dU_S/d\tau \leq 0$  while  $dU_P/d\tau \geq 0$  under moderate taxation. Therefore as taxes increase, Petty producers expand at the expense of the Subsistence producers.  $\square$

**Lemma.**  $d^2U_P/d^2\tau < 0$  for all Petty producers as long as the marginal return on public goods at  $\underline{A}_L$  is less than  $4\sqrt{1-\tau}$ .

*Proof.* From the envelope theorem,  $dU_P/d\tau = \begin{bmatrix} 1/\tilde{c}_i^0 & \partial F/\partial P/\tilde{c}_i^1 \end{bmatrix} \cdot \begin{bmatrix} -A_i & P/\tau \end{bmatrix}$  and therefore

$$\frac{d^2U_P}{d^2\tau} = - \begin{bmatrix} -A_i \\ P/\tau \end{bmatrix}^T \begin{bmatrix} (d\tilde{c}_i^0/dA_i)/(\tilde{c}_i^0)^2 & (d\tilde{c}_i^0/dP)/(\tilde{c}_i^0)^2 \\ (d\tilde{c}_i^0/dP)/(\tilde{c}_i^0)^2 & d(\partial F/\partial P/\tilde{c}_i^1)/dP \end{bmatrix} \begin{bmatrix} -A_i \\ P/\tau \end{bmatrix}.$$

Further reduction shows that

$$\frac{d^2U_P}{d^2\tau} = -\frac{1}{(\tilde{c}_i^0)^2} \begin{bmatrix} -A_i \\ P/\tau \end{bmatrix}^T \begin{bmatrix} d\tilde{c}_i^0/dA_i & d\tilde{c}_i^0/dP \\ d\tilde{c}_i^0/dP & \frac{(1+r)^2}{(1+\partial F/\partial K_i)^2} [(d\tilde{c}_i^1/dP) \cdot \partial F/\partial P - \tilde{c}_i^1 \cdot \partial^2 F/\partial^2 P] \end{bmatrix} \begin{bmatrix} -A_i \\ P/\tau \end{bmatrix},$$

so that  $d^2U_P/d^2\tau < 0$  iff

$$\frac{d\tilde{c}_i^0}{dA_i} A_i^2 + \frac{(1+r)^2}{(1+\partial F/\partial K_i)^2} \left[ \frac{d\tilde{c}_i^1}{dP} \cdot \partial F/\partial P - \tilde{c}_i^1 \cdot \partial^2 F/\partial^2 P \right] \left( \frac{P}{\tau} \right)^2 > \left( \frac{d\tilde{c}_i^0}{dP} \right)^2 A_i \frac{P}{\tau}. \quad (20)$$

The LHS of Equation (20), is positive which follows from

$$\frac{d\tilde{c}_i^0}{dA_i} = (1-\tau) - \frac{dK_i}{dA_i} = (1-\tau) \frac{(1+r) - \partial^2 F/\partial^2 K_i \cdot \tilde{c}_i^0/(1+\partial F/\partial K_i)}{(2+r) - \partial^2 F/\partial^2 K_i \cdot \tilde{c}_i^0/(1+\partial F/\partial K_i)} > (1-\tau) \frac{(1+r)}{(2+r)},$$

and noting  $\partial^2 F/\partial^2 K_i, \partial^2 F/\partial^2 P < 0 < \partial^2 F/\partial P \partial K_i$ , combined with

$$\begin{aligned} \frac{d\tilde{c}_i^1}{dP} \cdot \partial F/\partial P &= \frac{\partial F/\partial P}{1+r} \left[ \partial^2 F/\partial P \partial K_i \cdot \tilde{c}_i^0 + [\partial^2 F/\partial^2 K_i - (1+\partial F/\partial K_i)] \frac{dK_i}{dP} \right] \\ &= \partial F/\partial P \left[ \frac{(1+\partial F/\partial K_i) \partial^2 F/\partial P \partial K_i \cdot \tilde{c}_i^0}{(2+r)(1+\partial F/\partial K_i) - \partial^2 F/\partial^2 K_i} + \frac{1+\partial F/\partial K_i - \partial^2 F/\partial^2 K_i}{(2+r)(1+\partial F/\partial K_i) - \partial^2 F/\partial^2 K_i} \partial F/\partial P \right] > \frac{(\partial F/\partial P)^2}{2+r}. \end{aligned}$$

Thus, for Equation (20) to hold, it is sufficient that

$$(1-\tau) \frac{(1+r)}{(2+r)} A_i^2 + \frac{(1+r)^2}{(1+\partial F/\partial K_i)^2} \frac{(\partial F/\partial P)^2}{2+r} \left( \frac{P}{\tau} \right)^2 \geq \left( \frac{d\tilde{c}_i^0}{dP} \right)^2 A_i \frac{P}{\tau}. \quad (21)$$



The RHS of Equation (21) is also bounded above by  $\left(\frac{(1+r)\partial F/\partial P}{(2+r)(1+\partial F/\partial K_i)-\partial^2 F/\partial^2 K_i}\right)^2 A_i P/\tau$  because

$$\begin{aligned}\frac{d\tilde{c}_i^0}{dP} &= \frac{(1+r)\partial F/\partial P - \partial^2 F/\partial P \partial K_i \cdot \tilde{c}_i^0}{(2+r)(1+\partial F/\partial K_i) - \partial^2 F/\partial^2 K_i} \\ &= \frac{(\theta/2)(1+r) K_i^{1-\alpha} (K_i^\alpha/2 + P^\alpha/2) + \alpha(\theta/2)(K_i^\alpha/2 + P^\alpha/2)^{1/\alpha} - (1-\alpha)(K_i/2)}{1 + \partial F/\partial K_i} \frac{K_i^{1-\alpha} P^{1-\alpha} [(2+r)(1+D_1 F) - D_{11} F] (K_i^\alpha/2 + P^\alpha/2)^{(2\alpha-1)/\alpha}}{> 0}\end{aligned}$$

and  $\partial^2 F/\partial P \partial K_i \cdot \tilde{c}_i^0 > 0$ . Therefore to show Equation (21), it is sufficient to show

$$(1-\tau)(2+r)A_i^2(1+\partial F/\partial K_i)^2/(1+r) + (2+r)(\partial F/\partial P)^2(P/\tau)^2 \geq (\partial F/\partial P)^2 A_i P/\tau.$$

This holds exactly when

$$\begin{aligned}&\left[(1+\partial F/\partial K_i) \sqrt{(1-\tau)(2+r)/(1+r)} A_i - \partial F/\partial P \cdot \sqrt{(2+r)}(P/\tau)\right]^2 \\ &\geq \left[(\partial F/\partial P)^2 - 2(\partial F/\partial P)(1+\partial F/\partial K_i)(2+r) \sqrt{(1-\tau)/(1+r)}\right] A_i (P/\tau),\end{aligned}$$

which implies the result.  $\square$

**Proposition.** *Under moderate taxation and (16), increases in expected public goods crowd in delivered public goods.*

*Proof.* Recall the first order condition for interior equilibria of Equation (14).<sup>38</sup> Holding the politically determined level of public goods (say  $P$ ) constant, now consider what happens in (14) when the level of expected public goods (say  $P^*$ ) increases. Since  $\underline{A}_L$  and  $\underline{A}_P$  are functions of expected public goods only, differentiating Equation (14) with respect to  $P^*$ , we have

$$\psi \frac{d\sigma_L}{dP^*} \int_{\underline{A}_L}^{\infty} (\mu - A_i) \frac{dU_L}{dA_i} d\mathbb{A}(i) + \psi \frac{d\sigma_P}{dP^*} \int_{\underline{A}_P}^{\underline{A}_L} \left( \frac{\partial F/\partial P}{1+\partial F/\partial K_i} \frac{1+\theta/2}{\theta/2} \mu - A_i \right) \frac{dU_P}{dA_i} d\mathbb{A}(i) \quad (22)$$

$$- (1 + \psi\sigma_L) (\mu - \underline{A}_L) \frac{dU_L}{dA_i} \Big|_{A_i=\underline{A}_L} \frac{d\underline{A}_L}{dP^*} \mathbb{A}'(A_i = \underline{A}_L) \quad (23)$$

$$+ (1 + \psi\sigma_P) \left( \frac{\partial F/\partial P}{1+\partial F/\partial K_i} \frac{1+\theta/2}{\theta/2} \mu - \underline{A}_L \right) \frac{dU_P}{dA_i} \Big|_{A_i=\underline{A}_L} \frac{d\underline{A}_L}{dP^*} \mathbb{A}'(A_i = \underline{A}_L) \quad (24)$$

$$- (1 + \psi\sigma_P) \left( \frac{\partial F/\partial P}{1+\partial F/\partial K_i} \frac{1+\theta/2}{\theta/2} \mu - \underline{A}_P \right) \frac{dU_P}{dA_i} \Big|_{A_i=\underline{A}_P} \frac{d\underline{A}_P}{dP^*} \mathbb{A}'(A_i = \underline{A}_P) \quad (25)$$

By breaking down Equations (22-25), we will show that the entire expression is positive. We first claim that (22) must be positive. This is because, under moderate taxes, the second term on the

<sup>38</sup>At the unique corner solution of  $P = 0$ , clearly no change in public good provision occurs until an interior equilibrium of  $P > 0$  binds, so public good provision weakly increases.

RHS of (14) is positive and  $d\sigma_P/dP^* > 0$ . Consequently, the first term on the LHS of (14) must be positive and  $d\sigma_L/dP^* < 0$ , so (22) is positive. Second, (25) is positive because  $d\bar{A}_P/dP^* < 0$ , clearly  $dU_P/dA_i > 0$  and under moderate taxes,  $\left(\frac{\partial F/\partial P}{1+\partial F/\partial K_i} \frac{1+\theta/2}{\theta/2} \mu - \bar{A}_P\right) > 0$ . Finally, (22-25) is then positive if (23-24) can be shown to be positive, which holds exactly when

$$(1 + \psi\sigma_P) \cdot dU_P/d\tau|_{A_i=\bar{A}_L} > (1 + \psi\sigma_L) \cdot dU_L/d\tau|_{A_i=\bar{A}_L}.$$

Since Proposition 5 has shown  $dU_P/d\tau|_{A_i=\bar{A}_L} \geq dU_L/d\tau|_{A_i=\bar{A}_L}$ , a sufficient condition for (22-25) to be positive is  $\sigma_P \cdot dU_P/d\tau|_{A_i=\bar{A}_L} > \sigma_L \cdot dU_L/d\tau|_{A_i=\bar{A}_L}$ .

Since (22-25) is positive, if (14) decreases in  $P$ , then increases in expected public goods  $P^*$  increase public goods delivered in equilibrium. This follows if  $d^2U_L/d^2\tau < 0$  and  $d^2U_P/d^2\tau < 0$ . It can be shown directly that  $d^2U_L/d^2\tau < 0$ ,<sup>39</sup> and the Lemma above shows  $d^2U_P/d^2\tau < 0$ .  $\square$

## B Numerical Details

The numerical simulations in the main text have the same preferences, production parameters and mean asset level of 260, but vary in the distribution of assets. The low inequality economy has an initial asset distribution that is inverse Pareto of  $\Pr(A \leq a) = (a/400)^{1.85}$  while the high inequality economy has an initial asset distribution satisfying  $\Pr(A \leq a) = (a/1000)^{.351}$ . The latter distribution is based on the distribution of land ownership in Nicaragua of the 1970s.

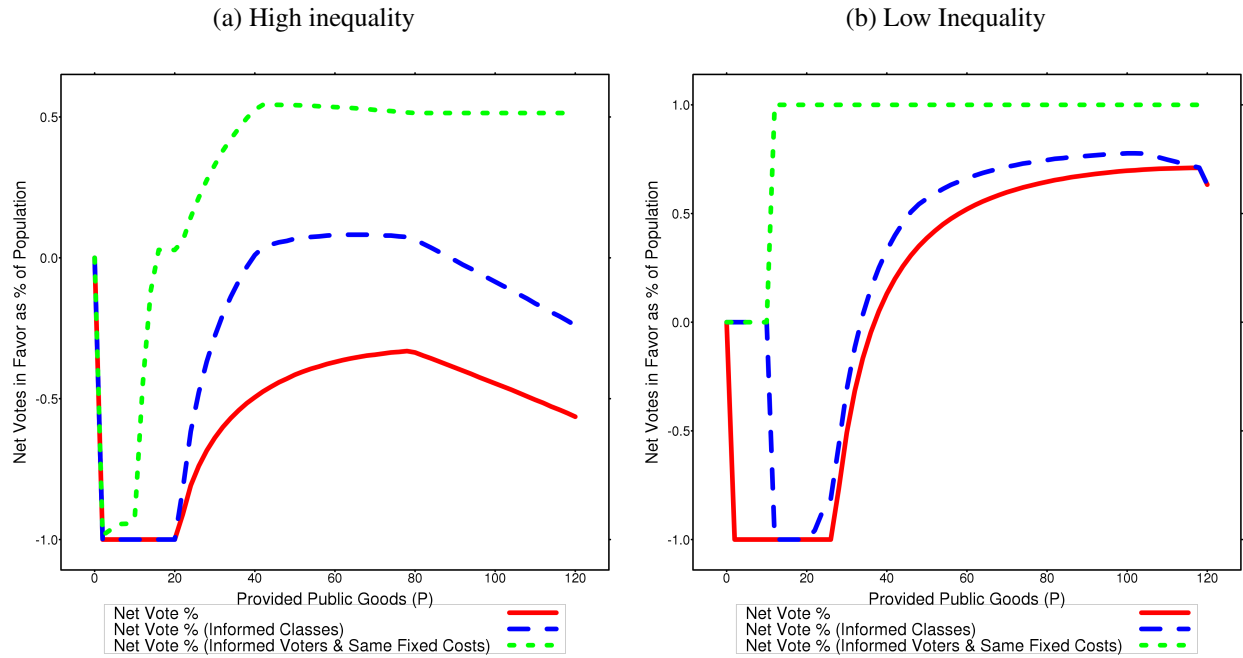
The discount rate in both economies was taken as  $1/1.1$  for an interest rate of 10%. The common production parameters are  $\alpha = 1/5$  and  $\theta = .8$  (so that the return to  $F$  in the absence of public goods is .025). The fixed costs of production are given by  $c_F = 25$  and  $c_P = 45$ . In the political simulations, the density of party preference shocks corresponds to  $\psi = 4$ .

## C Expected Electoral Outcomes and Equilibrium Policy

Given these economic fundamentals, how will electoral politics work? Figure 7 shows the likely political fate of the reformist Green party for different public good platforms (shown on the horizontal axis) in opposition to a  $P = 0$  status quo party. The solid (red) line shows expected net votes for the Green Party minus votes for the Red Party including both informed and uninformed voters, when classes are formed expecting  $P = 0$ . Similarly, the long-dashed (blue) lines shows the net voting preference of informed voters. The short-dashed line (green) graphs informed voter support when classes are formed based on expected public goods  $P > 0$  as on the horizontal axis. All net vote percentages are displayed as a fraction of the overall population of the society.

<sup>39</sup>Specifically,  $d^2U_L/d^2\tau = -[-(1+r)(1+\theta/2)A_i + r(1+\theta/2)\mu]^2 / [(1+r)(1+\theta/2)\bar{c}_i^0 + r(1+\theta/2)\tau\mu]^2$ .

Figure 7: Net Votes for Reform Party



We now consider politics and policy under the low and high inequality scenarios displayed above in Figure 4. The high inequality scenario approximates Latin American levels of agrarian inequality, with the wealthiest 20% of the population controlling 80% of the wealth. The low inequality scenario approximates an East Asian scenario in which an asset ownership ceiling has been imposed (akin to what happened in many East Asian economies during the World War II era). Under the high inequality scenario displayed in panel (a) of Figure 7, both informed and total net votes for the reform party are overwhelmingly negative, especially for small steps away from the  $P = 0$  status quo. It is of course the money the informed voters (large scale commercial producers in this case) that drive the votes of the large mass of uninformed voters. Even if the reform party radically promises a policy of relatively high taxes and public good provision, net votes still remain negative. Wealth inequality in this case continues to drive politics even though more individuals become informed and interested in supporting public good policies.

It is important stress here that politics are here being driven by the same liquidity constraints that drive production choices. Individuals must self-finance their own investment through reduced consumption. Similarly, the assumed borrowing constraint prevents voters from borrowing to finance the election of a party that would improve their economic well-being.

Panel b of Figure 7 displays expected electoral outcomes under the low initial inequality scenario. Here, a reform party promise of modest amounts of public good will meet with neither support nor opposition by any informed group. Elections should thus be a toss-up. However, a reform party promise of more significant amounts of public goods ( $P \approx 30$ ) begins to garner some

informed support. A promise of quite high levels of tax-financed public goods ( $P > 100$ ) garners the greatest amount of informed political support. While there are still taxpayers in the low inequality economy that will pay more in taxes than they receive in public goods, the returns to public goods are extraordinarily high for this class of voters as public capital augments the productivity of private capital. These groups thus find it in their interest to support reform parties and policies for relatively high public expenditure levels.

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