



University of Essex

Department of Economics

Discussion Paper Series

No. 764 April 2015

The Political Economy of Inclusive Rural Growth

Michael Carter and John Morrow

Note : The Discussion Papers in this series are prepared by members of the Department of Economics, University of Essex, for private circulation to interested readers. They often represent preliminary reports on work in progress and should therefore be neither quoted nor referred to in published work without the written consent of the author.

The Political Economy of Inclusive Rural Growth

Michael R. Carter

University of California, Davis

John Morrow[†]

University of Essex and CEP, LSE

14 April 2015

Abstract

Commentators on the ‘East Asian Miracle’ of inclusive rural growth have often pointed toward shared growth policies. But why were these policies not chosen elsewhere? This paper shows that economies with a stronger middle class may sustain higher productivity through public good provision. We model voters who invest in either subsistence or technologies in which public goods complement private capital. Investment and technology choices vary with wealth and the level of public goods enforced by political lobbies. We show that increased productive possibilities, such as those of an emerging middle class, can further power reforms when money matters in politics.

JEL Codes: O1, D2, H4, Q1.

Keywords: Poverty traps, political increasing returns, inequality, lobby formation.

Acknowledgments. We thank Yasushi Asako, Teodora Borota, Swati Dhingra, Shuhei Kitamura, Yu-Hsiang Lei, Fidel Perez, Shen Qu, Liam Wren-Lewis, anonymous referees 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, University of California-Davis, University College Dublin, European Public Choice Society, Royal Economic Society, 5th GREThA Conference on Economic Development, 2nd InsTED Workshop, University of Essex, Econometric Society and University of Alicante. [†]Corresponding Author: Centre for Economic Performance, London School of Economics, Houghton Street, London WC2A 2AE. Email: j.morrow1@lse.ac.uk

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 sharp contrast to the miracle of East Asia were Latin America and Africa, 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 political actors choose differently elsewhere in the global South.

This paper models the political economy behind the choices made promoting inclusive growth. Since political choices often reflect vested interests formed by past allocations and commitments, we study the interaction of exogenous wealth inequality and individual production choices to influence politicians’ delivery of inclusive growth. At the heart of our analysis is a political economy model wherein public goods complement the productivity of private investment, especially for small commercial producers. Government provision of these public goods not only increases growth (by crowding-in private investment), it reduces inequality by creating *inclusive growth*, 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 pay for them through taxes. 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.¹ Wealth conditions not only the set of voters in favor of public goods, but the strength of their preferences through campaign contributions. This sets in motion increasing political returns: public good commitments open up new productive possibilities to voters, who can use their newfound income to lobby and politically enforce these commitments. Accordingly, the model can exhibit multiple equilibria. Credible promises of large leaps (perhaps by committed governments or charismatic leaders) may be necessary to move from low to high growth outcomes.²

For these reasons, inclusive growth policies, i.e. policies that increase public goods to rationalize widespread commercial participation, are more likely under lower inequality scenarios. 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. Notably, the class division of soci-

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

²This formalizes insights by Pierson (2000) regarding the consequences of increasing returns in politics.

ety varies by the implicit strength of classes under the same productive possibilities, as opposed to being technologically determined (e.g. Matsuyama, 2006). 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 the foundation for future successes.^{3,4}

The remainder of this paper is dedicated to taking seriously the suggestion that 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) and Eswaran and Kotwal (1986) and thereby provides a complementary mechanism in ‘stagnation to growth’ stories of development.⁵ Previous work has noted the crucial role of non-convexities in accumulation and the importance of different production modes (e.g. Galor et al. (2009)). Distinct from previous work where inequality is mediated through labor or credit markets, here we focus on the role of class-based politics wherein groups rather than individuals attempt to circumvent market imperfections.⁶ The unique insight of our special interest politics approach is that increased productive possibilities, such as those of an emerging middle class, can further power reforms when money matters in politics.

Finally, as pointed out by Acemoglu and Robinson (2013), the analysis of economic policy needs to include the consequences for political outcomes, as otherwise ‘good economic policy can make bad politics’. We have discussed why reductions in inequality may have political knock-on effects through political increasing returns. However, this is not the only (or most pragmatic) policy space in which we might expect to see political shifts flowing from economic policy (Dixit, 1997). 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.⁷ 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 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

³For a detailed analysis of the political consequences of land reform in Japan, see Kitamura (2013).

⁴It is additionally possible that low inequality prefigured inclusive institutions which interacted with export led growth to encourage successful institutions akin to (Acemoglu et al., 2005).

⁵Existing theories depict the role of technology, financial development, accumulation, institutional development and evolving social preferences (Doepke and Zilibotti, 2005), and export led growth (Akerman et al., 2013). However, the role of democracy in jointly directing the public and private sector is often neglected (Sen et al., 1990).

⁶See, for instance, the review of Matsuyama (2011).

⁷Such households are likely those that would additionally face expropriation risk in the absence of broadly accessible property rights as emphasized by other authors, see Chapter 13 of Ferguson (2013).

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 and risk on endogenous policy choices. Section 5 considers the impact of isolation and risk on policy choices and the potential for positive political externalities. Section 6 concludes.

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.⁸ This section first briefly reviews some of the macro-econometric evidence about these linkages. We then turn to consider the micro-foundations for such linkages, using them as a springboard to launch a deeper exploration of the political economy of inclusive growth.

2.1 Initial Inequality and Inclusive Growth: Econometric Evidence

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 low wealth households, further decreasing inequality. In other words, low initial inequality creates a virtuous circle of inclusive growth (Alesina and Rodrik, 1994).

This thesis has 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-

⁸The World Bank's *The East Asian Miracle* (Page, 1994), as well as debates (Rodrik, 1994; Wade, 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.

liberalization growth spells.⁹ Subsequent studies have found that rural exposure to liberalization may slow poverty reduction and consumption growth (Topalova, 2010).

Finally, Carter (2004) shows that the impact of agrarian inequality on aggregate economic growth should dissipate over time (as the agricultural economy shrinks) unless inequality has deeper structural effects on the income distribution consequences of growth. The econometric results confirm agrarian inequality has a surprising legacy effect even as economies industrialize.

2.2 Theoretical Foundations 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.¹⁰

Similarly, there is a large literature that shows that imperfect rural financial markets can create an economic dynamic that squeezes out low wealth producers.¹¹ Similar to Ljungqvist's analysis, increases in asset inequality that push more individuals beyond the reach of financial markets implies a deepening pattern of exclusion. 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 rationing¹² 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. Facing these issues, East Asian governments undertook measures that bolstered the competitiveness of small farm sector.¹³ These shared growth policies reshaped markets in ways that enabled the small farm sector to flourish and underwrote an inclusive growth strategy.¹⁴

⁹While 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.

¹⁰Krebs (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.

¹¹The 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.

¹²See 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.

¹³A quick review shows that agricultural policy in Japan, Taiwan and Korea shows a common emphasis on small farm credit, extension and price stabilization. For a brief overview of rural and agricultural policy concerns and objectives, see Wye Group (2011).

¹⁴Indeed, 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). 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.¹⁵

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),¹⁶ that involve large fixed costs (dams, R&D),¹⁷ or face coordination problems (irrigation and sanitation systems)¹⁸. 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.

3 Asset Inequality and the Politics 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 individuals to enjoy more private goods. The implicit underlying role of public good provision can

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

¹⁵E.g. subsidized credit, machinery subsidies, investment credits, etc.

¹⁶When geographically separate ethnic concentrations make roads *functionally* excludable, public investment is likely misallocated as Burgess et al. (2013) find.

¹⁷Dams also present coordination issues due to the redistributive pattern of downstream winners and local losers (Duflo and Pande, 2007).

¹⁸The extent of such coordination problems may be exacerbated by agro-ecological conditions Wade (1988).

be thought of as a second-best policy which encourages high productivity activities when incomplete financial markets otherwise constrain agents, thus generating inclusive growth.¹⁹ 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.²⁰ Because the economic valuation of public goods varies across voters, politics will matter for the choice of policy in potentially interesting ways.

As a preview, the timing of a political-economic cycle is:

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, the winner's platform is implemented, and *voters* produce.

Since the model can be solved by backward induction, this section takes the level of public good provision as exogenous to focus on production by voters. We then examine endogenous class formation in response to economic incentives and public good provision, and then consider voters' political preferences. The following section then details the behavior of lobbies and parties to arrive at political-economic equilibria.

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 .

¹⁹Note 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.

²⁰In 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).

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

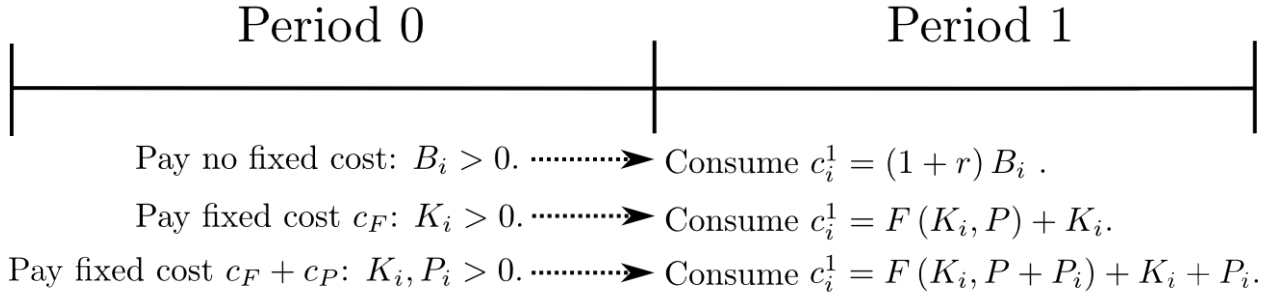
$$F(K_i, \kappa_i) = \theta (K_i^\alpha/2 + \kappa_i^\alpha/2)^{1/\alpha} \quad \text{with } \alpha, \theta \in (0, 1),$$

where K_i is private capital, while κ_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.²¹ As a quasi-public good, κ_i can be provided both publicly (P) and 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.²² The relationship of these production strategies to fixed costs is depicted in Figure 1.

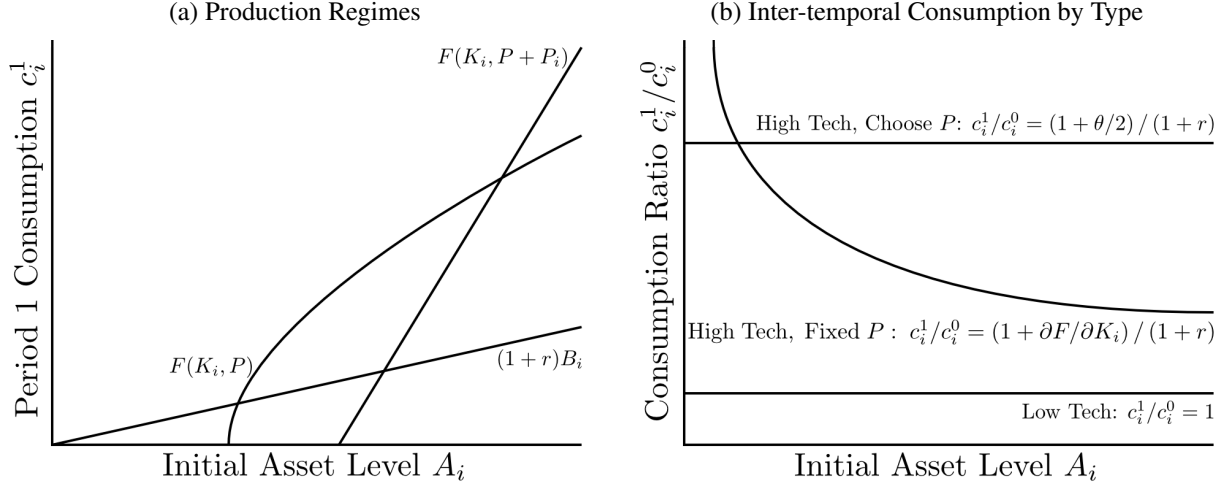
Figure 1: Fixed Costs and Production Strategies



²¹Note that the marginal investment product of F is $(\theta/2)K_i^{\alpha-1}(K_i^\alpha/2 + \kappa_i^\alpha/2)^{1/\alpha-1} \geq \theta 2^{-1/\alpha} > r$.

²²We 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.

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 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

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

where $\mathbf{1}_{K_i > 0}$ and $\mathbf{1}_{P_i > 0}$ are the binary indicator variables that take the value of one when when the agent respectively invests in K_i and P_i and must pay the fixed costs c_F and c_P .²³ Note that an individual's initial wealth endowment needs to fund both period 0 consumption and capital

²³This setting corresponds to the definition of 'natural' inequality deriving from differences in economically valuable assets across voters as opposed to inequality rooted in politically captured rents (Cogneau, 2012). Alternatively, the ability to access commercial technologies or privately invest in P_i could be modeled as being allocated by existing institutions which would distinguish the role of wealth and political resources in voters' economic interests.

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):²⁴

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 , is given by

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

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 , 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

²⁴Note that certain possible classes, e.g. $B_i, K_i > 0$, are ruled out by technology assumptions.

$P_i = K_i - P$. 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 , 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 $E_i [(\tilde{c}_i^1 - \tilde{c}_i^0) / \tilde{c}_i^0]$. 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 growth rates for 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 $\partial F / \partial P$.

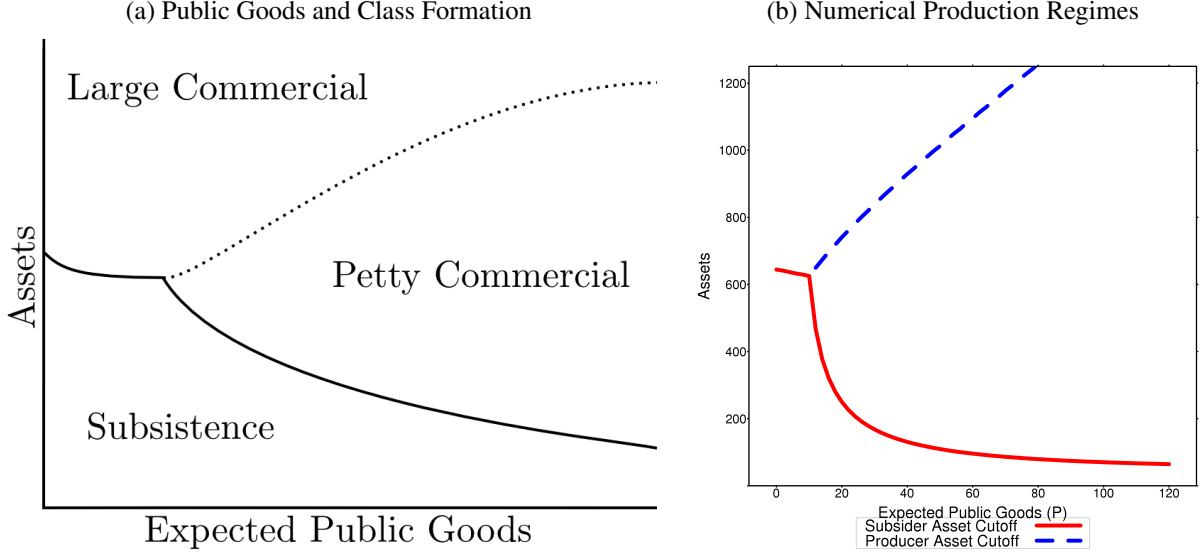
$$\frac{\partial \exp U_L}{\partial P} = \frac{\theta/2}{2+r} \left(\frac{1+r}{1+\theta/2} \right)^{1+r/2+r}, \quad \frac{\partial \exp U_P}{\partial P} = \frac{\partial F / \partial P}{2+r} \left(\frac{1+r}{1+\partial F / \partial K_i} \right)^{1+r/2+r}. \quad (7)$$

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 $\partial \exp(U_P) / \partial P > \partial \exp(U_L) / \partial P$.²⁵ Therefore increases in public goods will enlarge the Petty commercial class at the expense of the Large Commercial class, as depicted in Figure 3a. Here the solid line represents the assets of a producer indifferent between Petty and Subsistence classes, while the dashed line represents the assets of a producer indifferent between Petty and Large classes. In summary, we have:

²⁵Formally, because this implies that $\partial F / \partial P > \theta/2 > \partial F / \partial K_i$ for this indifferent producer.

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 any fixed level of public goods, the higher asset returns of the Large commercial class are always rational provided sufficiently high initial assets.²⁶ 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 classes.*

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

²⁶Formally, $\lim_{A_i \rightarrow \infty} d[\exp U_L - \exp U_S] / dA_i \geq \left[(1 + \theta/2)^{1/(2+r)} - (1 + \theta 2^{-1/\alpha})^{1/(2+r)} \right] / (2+r) > 0$.

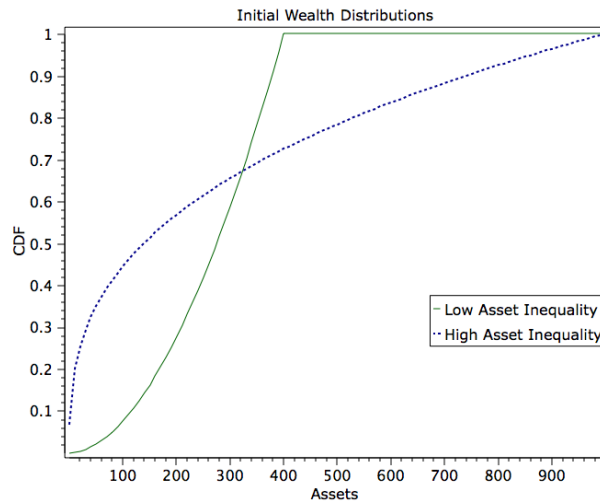
join the Large commercial class. Intermediate asset levels ($\underline{A}_P \leq A_i \leq \underline{A}_L$) correspond to Petty commercial production. These three endogenously determined groups of Subsistence, Petty Commodity and Large-scale producers have respective population shares

$$\sigma_S \equiv \mathbb{A}(\underline{A}_P), \quad \sigma_P \equiv \mathbb{A}(\underline{A}_L) - \mathbb{A}(\underline{A}_P), \quad \sigma_L \equiv 1 - \mathbb{A}(\underline{A}_L). \quad (8)$$

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 represent particular societies in Figure 4. The horizontal axis represents the wealth continuum and 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 with the same mean level of wealth. Figure 4 shows that in the absence of public goods, 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 class. In contrast, in the low inequality economy, the absence of public goods would imply all individuals and 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 τ , or does not tax, thereby directly increasing individuals' private assets.²⁷ 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. The rationale for modeling public good provision as a one period 'rental' is that it maintains symmetric treatment of capital goods (which are consumed in period 1) and public goods, which are consumed by Large Commercial producers through capital markets.²⁸

We assume that everyone in society receives an equal per-capita share of the total public goods provided, which is therefore equal to P . To cover the interest on this debt, the government raises taxes $\tau\mu$ in period 0 and saves them for a total return of $(1 + \theta/2)\tau\mu$ in period 1 to service the debt.²⁹ This implies the level of public good provision must satisfy the inter-temporal budget constraint

$$\text{Government Budget Constraint : } (1 + \theta/2)\tau\mu = (1 + \theta/2)P - P, \quad (9)$$

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.

We now consider the competing effects of taxation and public good provision on well-being

²⁷More 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.

²⁸This is easily formalized by putting explicit government bonds in the model, whose return is fixed by opportunity cost of investment for Large Commercial producers, $1 + \theta/2$.

²⁹While state capacities to literally implement this type of tax may be lacking, many government policies form implicit taxes which are enacted in practice such as tariffs, royalties collected from natural resources or existing monopolies, choices made in state owned sectors, etc.

across economic classes. The total effects of government policy for any Commercial class are³⁰

$$dU/d\tau = (1 + \theta/2) \mu / (\theta/2) \cdot \partial U / \partial P - A_i \cdot dU/dA_i. \quad (10)$$

Equation (10) 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 τ so long as the tax paid, τA_i is less than the discounted value of public goods provided in period 1, so Equation (10) becomes³¹

$$dU_L/d\tau = (\mu - A_i) \cdot dU_L/dA_i. \quad (11)$$

Equation (11) 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 (10) 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 concerns 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.³² 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.³³

³⁰An increase in taxes τ 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 τ provides public goods to all voters at rate $P/\tau = (1 + \theta/2) \mu / \theta/2$, which implies $\partial U / \partial \tau|_{(1-\tau)A_i \text{ fixed}} = (1 + \theta/2) \mu / (\theta/2) \cdot dU/dP$.

³¹Formally, the envelope theorem shows that $\partial U / \partial P = ((\partial F / \partial P) / (2 + r)) \cdot (\tilde{c}_i^0 / \tilde{c}_i^1) \cdot dU/dA_i$.

³²The condition of Proposition 3 guarantees this Petty producer exists.

³³While the costless provision of public goods enlarges the Petty Commercial class, the taxation required for these

Informed by this analysis, we restrict τ 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 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:

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.

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 .

4 Political Parties and Electoral Competition

In this section, we lay out a model of electoral competition in which the economic strength of classes manifests through lobbying.³⁴ We then establish the behavior of political parties and analyze the resulting political-economic equilibrium. All voters have random political preferences that make them more likely to vote for one of the two political parties. Voters involved in the commercial economy are informed and tend to vote and lobby for their economic interest.³⁵ Uninformed voters are 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.

4.1 Voters, Parties and Lobbies

To explore the politics of policy choice, we assume a two-party political system consisting of Red (R) and Green (G) parties. Parties are office motivated and offer platforms (τ_R, P_R) and (τ_G, P_G) composed of a flat income tax τ used to finance public goods P through the government budget constraint (9).³⁶ Voters have idiosyncratic preferences δ_i in favor of party R , distributed uniformly over $[-1/2\psi, 1/2\psi]$, where ψ determines the range and density of political preferences. 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 (τ, P) is

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

Therefore commercial voters prefer a Red platform over a Green platform whenever

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

³⁴Of course, this presumes a democratic political regime (at at least a regime in which elections are de jure determined by votes but de facto in part determined by bribing or deluding voters. This likely better reflects the latter stages of East Asian success as democracy was consolidated. Similar results that realistically reflect the more autocratic regimes in place at the beginning of the East Asian 'miracle' would likely follow based on the same production technologies here but under the implicit threat of insurgency, e.g. (Acemoglu and Robinson, 2006).

³⁵A lobby might also be interpreted as a broad based interest group represent common economic interests. More directly, instead of modeling lobbies, one could presume that parties directly pursue welfare maximization for their constituency, which would reparamaterize the model but look very much the same in terms of policy equilibria.

³⁶We 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).

Subsistence producers are uninformed as public goods do not directly impact them.³⁷ Instead, they are swayed 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 contributions, the probability that the Red party is elected (ρ) is:

$$\rho = 1/2 + \psi \int_{A_P}^{\infty} [U((1 - \tau_R)A_i, P_R) - U((1 - \tau_G)A_i, P_G)] d\mathbb{A}(i) + \psi \int_0^{A_P} [C_R - C_G] d\mathbb{A}(i).$$

Once parties have chosen platforms to maximize their election chances, commercial lobbies make campaign contributions.

A Large Commercial lobby and a Petty Commercial lobby provide contributions towards parties which maximize the aggregate welfare of their constituencies. We assume per capita contributions incur a quadratic welfare cost, so that for a given platform (τ, P) , the aggregate welfare for Large producers (\bar{U}_L) and Petty producers (\bar{U}_P) is

$$\begin{aligned} \bar{U}_L(\tau, P) &= \int_{A_L}^{\infty} \left[U((1 - \tau)A_i, P) - ((C_R + C_G) / \sigma_L)^2 / 2 \right] d\mathbb{A}(i), \\ \bar{U}_P(\tau, P) &= \int_{A_P}^{A_L} \left[U((1 - \tau)A_i, P) - ((C_R + C_G) / \sigma_P)^2 / 2 \right] d\mathbb{A}(i). \end{aligned}$$

As elections are probabilistic, the Large Commercial lobby makes contributions to solve

$$\max_{C_R, C_G} \rho(C_R, C_G) \bar{U}_L(\tau_R, P_R, C_R, C_G) + [1 - \rho(C_R, C_G)] \bar{U}_L(\tau_G, P_G, C_R, C_G).$$

Similarly, the Petty Commercial lobby contributes according to

$$\max_{C_R, C_G} \rho \bar{U}_P(\tau_R, P_R) + [1 - \rho] \bar{U}_P(\tau_G, P_G).$$

Once contributions are allocated, voters elect parties, the winner's platform is implemented, and voters produce. Note that all of these stages are contingent on the fixed costs paid by voters which determine their class, which in turn depend on a rational expectation of the political outcome. We now turn to examine when such expectations are in fact equilibrium outcomes.

³⁷Similar to Bardhan and Mookherjee (2000), this implies that the share of informed voters increases with wealth. Our assumption that the poorest voters are uninformed permits the added complexity of endogenous group formation.

4.2 Equilibrium

With these building blocks, we take a standard approach and model the behavior of class-based lobbies. 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:³⁸

$$\max_{(\tau, P)} (1 + \psi\sigma_L)\bar{U}_L(\tau, P) + (1 + \psi\sigma_P)\bar{U}_P(\tau, P) \quad \text{subject to} \quad (9). \quad (12)$$

Of the range of possible equilibrium tax rates between zero and one, extremely high tax rates (e.g. $\tau = 1$) will not be offered by parties. This is for the simple reason that the high levels of public goods thereby provided are of low value to voters with few assets left after taxes. Conversely, low expectations of public good provision could lead to an anemic Petty class ($\bar{U}_P = 0$), allowing for a corner solution to Equation (12) of no public goods ($\tau = 0$). However, in the presence of a middle class ($\bar{U}_P > 0$), Petty producers enforce public good provision politically. To see this, examine the first order condition for Equation (12) to hold at an interior equilibrium:

$$0 = \underbrace{(1 + \psi\sigma_L)(d\bar{U}_L(\tau, P)/d\tau)}_{\text{Marginal Cost of } \tau \text{ to Large Producers}} + \underbrace{(1 + \psi\sigma_P)(d\bar{U}_P(\tau, P)/d\tau)}_{\text{Marginal Benefit of } \tau \text{ to Petty Producers}}. \quad (13)$$

As the marginal benefit of public goods to Petty producers is arbitrarily high at low tax rates in Equation (13), the existence of a middle class guarantees at least some positive level of public goods. 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.

4.3 Inequality, Risk and Public Good Provision

The initial distribution of assets impacts public good provision through Equation (13). To see this, note that in light of Proposition 4, voters with assets greater than $\max\{\underline{A}_L, \mu\}$ prefer lower taxes and voters with fewer assets down to \underline{A}_P prefer higher taxes. Now consider two economies with

³⁸Note that this political-economic outcome does not strictly reflect output or welfare maximization, as we might expect for theoretical and empirical reasons. See Cheibub and Przeworski (1997).

identical technologies, but one with asset distribution \mathbb{A} and another with asset distribution \mathbb{B} that exhibits a stronger (incipient) Petty class. Formally, suppose \mathbb{B} results from \mathbb{A} by redistributing from rich voters with $A_i > \max\{\underline{A}_L^1, \mu\}$ to poorer voters so that there are more voters at every asset level below $\max\{\underline{A}_L^1, \mu\}$. In this second \mathbb{B} economy, Equation (13) must be positive at the equilibrium tax rate of \mathbb{A} . As (13) decreases in τ for any fixed set of producers under moderate taxation (see Appendix), it follows that a \mathbb{B} distribution economy has a higher equilibrium tax rate. This result, linking the relative strength of Petty producers more equal economies to increased public goods is Proposition 7.

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

Risk also prevents 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.

In order to model high yielding technologies which may entail risk, further suppose that commercial production yields variable total returns of $c_i^1 = [F(K_i, \kappa_i) + K_i + P_i] \cdot \omega_i$ where ω_i is randomly distributed with $E[\omega_i] = 1$ and support on $[\theta 2^{-1/\alpha} - r, \infty)$. This implies commercial production always yields higher returns than subsistence, but risk as measured by $\Omega \equiv |E[\ln \omega_i]|$ makes Commercial production less rewarding. Increases in risk Ω 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. Thus, risk increases \underline{A}_P and shrinks the Petty class. Following the logic above through Equation (13), decreases in risk thereby crowds in political capital in support of public goods, summarized as Proposition 8.

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

Propositions 7 and 8 thus show that while both inequality and risk decrease public good provision, there is a trade off between the two under which governments will provide the same level of public goods. We next illustrate the mechanisms of the model with an example to fix ideas.

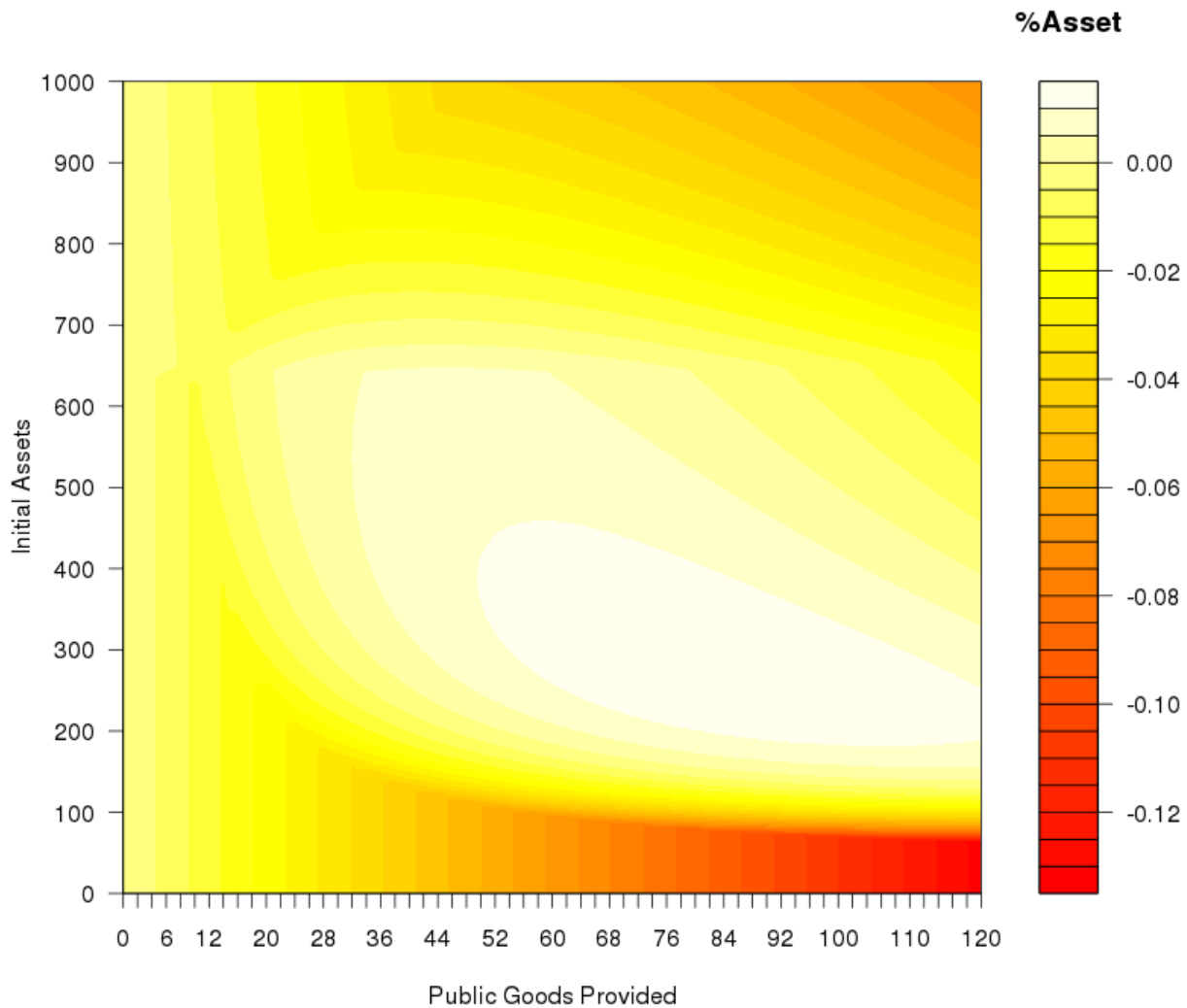
4.4 Endogenous Class and Willingness to Pay for Public Policy

In an effort to understand each agent's potential budget-constrained willingness to make political contributions off the equilibrium path (where contributions are zero), we perform a thought experiment wherein a Reform party tactically promises public good provision in the face of a Status Quo party that offers none. This illustrates the impetus behind political contributions that shapes equilibrium outcomes, by calculating 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 political contributions the Reform 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 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 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 a numerical example of 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.

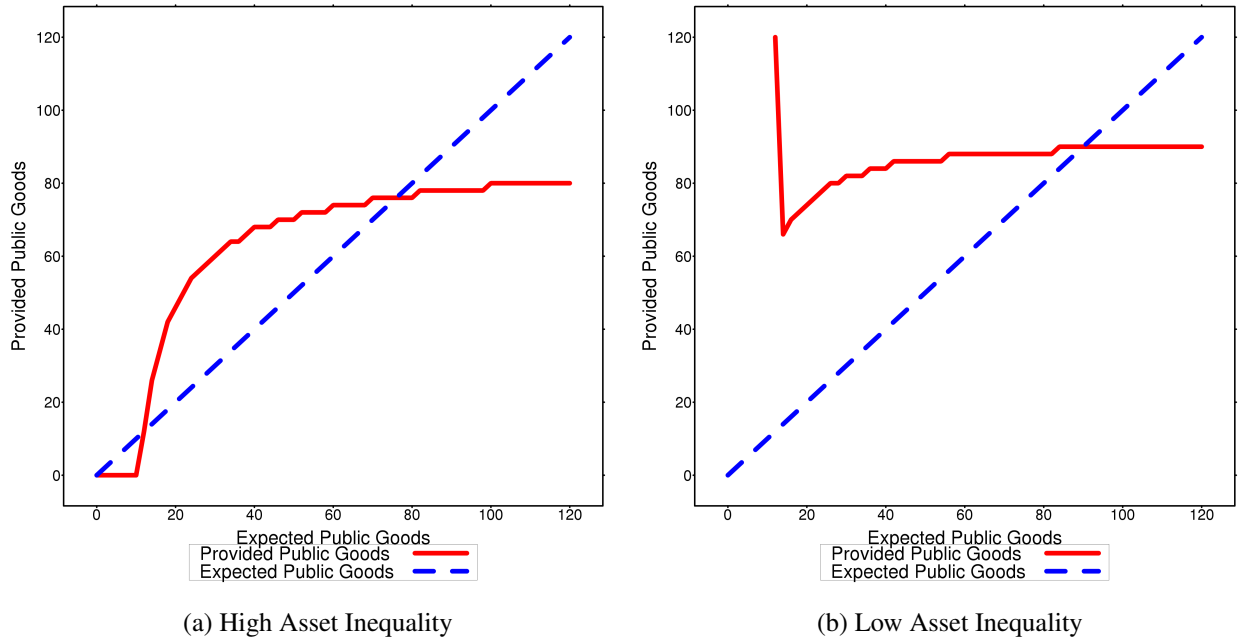


Figure 6: Political-Economic Equilibria

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.³⁹

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 (13) to zero, achieving a high level of public good provision in equilibrium.

³⁹As 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).

4.6 Breaking the Political Poverty Trap

More broadly, this political poverty trap can be broken when political parties can credibly promise to deliver a minimal threshold of 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 increases as voters come to expect them. This is analytically formalized as Proposition 9.

Proposition 9. *Assume moderate taxation and that there are sufficient Petty producers (σ_P) who receive high benefits of taxation ($dU_P/d\tau|_{A_i=A_L}$) relative to Large producers and the benefits they receive:*

$$\sigma_P \cdot dU_P/d\tau|_{A_i=A_L} > \sigma_L \cdot dU_L/d\tau|_{A_i=A_L}. \quad (14)$$

Then increases in expected public goods crowd in delivered public goods.

Proof. Equation (14) 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. This will hold whenever the value of public goods are high or when the Large Commercial class is relatively small. For the formal proof, see Appendix. \square

Note that parallel to asset based poverty traps, here non-convexities in *production* manifest as non-convexities in *politics*. As exhibited in Figure 6a, a discrete jump in promised public goods is required to garner any possibility of politically enforced public goods.

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.

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.⁴⁰ 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.⁴¹ 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 it 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.⁴²

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

⁴⁰Our model shares this characteristic with the general category of multiple equilibrium poverty trap models analyzed by Barrett and Carter (2013).

⁴¹The 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.

⁴²E.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.

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. Recent years have seen an outpouring of efforts to index insurance contracts that transfer the correlated component of risk out of African agricultural systems. Janzen and Carter (2013) show that insurance payments to herders in remote pastoral regions of Northern Kenya 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), weather index insurance contract targeted at low productivity Ethiopian grain farmers provided 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. 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.

6 Conclusion

This paper models endogenous class formation wherein agents’ productive choices, votes and interests depend on their assets and emergent political equilibrium. Increases in public goods are inclusive, enlarging a Petty Commercial class and increasing growth rates by rationalizing investment in more productive technologies. This ‘crowded in’ Petty Commercial class has increased votes and income which politically reinforces public good provision, leading to increasing returns

in politics. As with other increasing returns models, this may result in multiple equilibria with low or high levels of public goods, and we show when increases in expected public good provision (perhaps backed by new movements, ideologies, leaders or geopolitical conditions) increase the equilibrium public goods provided by politicians. Conversely, societies with low expectations of public good provision face an economically and politically anemic Petty Commercial class. We have also shown that low inequality and risk strengthen the incipient middle class and increase the responsiveness of government policy to their interests.

Within the context of a wider argument that economic interventions have political dimensions that need consideration when crafting policy, the model illustrates underlying interconnections between the economic and political realms. Specifically considering the selection of inclusive growth policies in development and the role of risk, we have discussed the potential for recent interventions to expand the Petty Commercial class, which could have political knock-on effects. Future work might test or craft interventions (and subsequent monitoring) with these considerations in mind. This could help policymakers more deeply understand and shape the political forces set in motion by economic policy.

This paper has focused on conflicting political interests played out in a democratic setting, albeit one in which wealth may heavily influence policy outcomes. How these conflicts play out under alternative political institutions such as autocracies (e.g. De Luca et al., 2013), which thereafter transition to democracies, could yield a more complete narrative exploring the influence of inequality on inclusive growth.⁴³ The existence of multiple equilibria as exhibited here might also motivate a more stylized setting wherein voter-producers face a distribution over political outcomes which impacts class formation and therefore political interests. A political landscape inhabited by widely divergent, but electable parties (or the potential for coups) might inhibit the formation of a Petty Commercial class and therefore sabotage stable political-economic public support for widespread commercial engagement. This might speak to the mixed relationship between democracy and growth (see the review of Przeworski and Limongi, 1993) as only consolidated democracies which have escaped low level equilibria might have growth advantages over autocracies.

Finally, one interpretation of our results is that a more equitable distribution of wealth may trigger virtuous growth cycles. However, distinct from mechanisms in other research, here we emphasize the role of an incipient middle class to be of interest to political entrepreneurs through special interest politics. It is the size of this class that politically ensures public good provision, and thus decreases in inequality are meaningful only insofar as they strengthen this group relative

⁴³Indeed, there is evidence that the accumulation of human capital generates later improvement in political institutions (Glaeser et al., 2004). If human capital is complementary to commercial production as modelled here, then human capital accumulation would later improve institutions and growth simultaneously.

to the wealthy: in our setting, only such ‘targetted’ policies or events change the political calculus, in line with evidence as provided by Acemoglu et al. (2005). This suggests that the empirical tests of the relationship between inequality and growth might be confounded by the fact that it is not overall inequality, but rather the balance of economic strength between actors above a certain asset threshold that matters for inclusive growth.

References

- ACEMOGLU, D., S. JOHNSON, AND J. ROBINSON (2005): “The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth,” *American Economic Review*, 546–579.
- ACEMOGLU, D. AND J. A. ROBINSON (2006): *Economic Origins of Dictatorship and Democracy*, Cambridge University Press.
- (2013): “Economics versus Politics: Pitfalls of Policy Advice,” *Journal of Economic Perspectives*, 27, 173–192.
- AKERMAN, A., A. L. SEIM, AND A. NAGHAVI (2013): “Autocracies and Development in a Global Economy: A Tale of Two Elites,” *Working Paper*.
- ALESINA, A. AND D. RODRIK (1994): “Distributive Politics and Economic Growth,” *The Quarterly Journal of Economics*, 109, 465–490.
- AOKI, M., T. KURAN, AND G. ROLAND (2012): *Institutions and Comparative Economic Development*, vol. 150, Palgrave Macmillan.
- AOKI, M., M. OKUNO-FUJIWARA, AND H.-K. KIM, eds. (1998): *The Role of Government in East Asian Economic Development: Comparative Institutional Analysis*, Oxford University Press, USA.
- BARDHAN, P. AND D. MOOKHERJEE (2000): “Capture and Governance at Local and National Levels,” *The American Economic Review*, 90, 135–139.
- (2006): “Pro-poor Targeting and Accountability of Local Governments in West Bengal,” *Journal of Development Economics*, 79, 303–327.
- BARRETT, C. B. AND M. R. CARTER (2013): “The Economics of Poverty Traps and Persistent Poverty: Policy and Empirical Implications,” *Journal of Development Studies*.
- BENABOU, R. (2000): “Unequal Societies: Income Distribution and the Social Contract,” *American Economic Review*, 96–129.
- BIRDSALL, N., C. GRAHAM, AND R. H. SABOT (1998): *Beyond Tradeoffs: Market Reforms and Equitable Growth in Latin America*, Brookings Institution Press.
- BIRDSALL, N., D. ROSS, AND R. SABOT (1995): “Inequality and Growth Reconsidered: Lessons from East Asia,” *The World Bank Economic Review*, 9, 477–508.

- BOUCHER, S. R., M. R. CARTER, AND C. GUIRKINGER (2007): "Risk Rationing and Wealth Effects in Credit Markets: Theory and Implications for Agricultural Development," *American Journal of Agricultural Economics*, 90, 409–423.
- BURGESS, R., R. JEDWAB, E. MIGUEL, A. MORJARIA, AND G. P. I. MIQUEL (2013): "The Value of Democracy: Evidence from Road Building in Kenya," *NBER Working Paper*.
- CARTER, M. R. (1988): "Equilibrium Credit Rationing of Small Farm Agriculture," *Journal of Development Economics*, 28, 83–103.
- (1997): "Environment, Technology, and the Social Articulation of Risk in West African Agriculture," *Economic Development and Cultural Change*, 45, 557–590.
- (2004): *Inequality, Poverty and Growth in an Era of Liberalization and Globalization*, Oxford University Press, chap. 3.
- CARTER, M. R. AND B. L. BARHAM (1996): "Level Playing Fields and Laissez Faire: Postliberal Development Strategy in Inegalitarian Agrarian Economies," *World Development*, 24, 1133–1149.
- CARTER, M. R. AND M. IKEGAMI (2009): *Poverty Dynamics: Interdisciplinary Perspectives*, Oxford University Press, chap. Looking Forward: Theory Based Measures of Chronic Poverty and Vulnerability.
- CHEIBUB, J. A. AND A. PRZEWORSKI (1997): "Government Spending and Economic Growth Under Democracy and Dictatorship," in *Understanding Democracy*, ed. by Breton, A., et al, Cambridge University Press, 107–124.
- COGNEAU, D. (2012): "The Political Dimension of Inequality During Economic Development," *Region et Developpement*, 35, 11–36.
- COWAN, T. AND J. FEDER (2012): "The Pigford Cases: USDA Settlement of Discrimination Suits by Black Farmers," *Congressional Research Service*.
- DE JANVRY, A. AND E. SADOULET (2000): "Growth, Poverty, and Inequality in Latin America: A Causal Analysis, 1970-94," *Review of Income and Wealth*, 46, 267–287.
- DE LUCA, G., A. LITINA, AND P. G. SEKERIS (2013): "Growth-friendly Dictatorships," *Journal of Comparative Economics*.
- DIXIT, A. (1997): "Economists as Advisers to Politicians and to Society," *Economics & Politics*, 9, 225–230.
- DOEPKE, M. AND F. ZILIBOTTI (2005): "Social Class and the Spirit of Capitalism," *Journal of the European Economic Association*, 3, 516–524.
- DUFLO, E. AND R. PANDE (2007): "Dams," *The Quarterly Journal of Economics*, 122, 601–646.
- ESWARAN, M. AND A. KOTWAL (1986): "Access to Capital and Agrarian Production Organization," *Economic Journal*, 96, 482–498.

- FERGUSON, W. (2013): *Collective Action and Exchange: A Game-theoretic Approach to Contemporary Political Economy*, Stanford University Press.
- GALOR, O., O. MOAV, AND D. VOLLRATH (2009): “Inequality in Landownership, the Emergence of Human-capital Promoting Institutions, and the Great Divergence,” *The Review of Economic Studies*, 76, 143–179.
- GEHLBACH, S. (2006): “Electoral Institutions and the National Provision of Local Public Goods,” *Quarterly Journal of Political Science*, 2, 5–25.
- (2013): *Formal Models of Domestic Politics*, Cambridge University Press.
- GLAESER, E. L., R. LA PORTA, F. LOPEZ-DE SILANES, AND A. SHLEIFER (2004): “Do Institutions Cause Growth?” *Journal of Economic Growth*, 9, 271–303.
- JANZEN, S. A. AND M. R. CARTER (2013): “After the Drought: The Impact of Microinsurance on Consumption Smoothing and Asset Protection,” *NBER Working Paper*.
- KITAMURA, S. (2013): “Loyalty and Treason: Theory and Evidence from Occupied Japan,” *Working Paper*.
- KREBS, T. (2003): “Human Capital Risk and Economic Growth,” *The Quarterly Journal of Economics*, 118, 709–744.
- LJUNGQVIST, L. (1993): “Economic Underdevelopment: The Case of a Missing Market for Human Capital,” *Journal of Development Economics*, 40, 219–239.
- MATSUYAMA, K. (2006): “The 2005 Lawrence R. Klein Lecture: Emergent Class Structure,” *International Economic Review*, 47, 327–360.
- (2011): “Imperfect Credit Markets, Household Wealth Distribution, and Development,” *Annual Review of Economics*, 3, 339–362.
- MCINTOSH, C., A. SARRIS, AND F. PAPADOPOULOS (2013): “Productivity, Credit, Risk, and the Demand for Weather Index Insurance in Smallholder Agriculture in Ethiopia,” *Agricultural Economics*, 44, 399–417.
- OLOVSSON, C. AND J. ROINE (2008): “On the Possibility of Political Change,” *Working Paper*.
- PAGE, J. (1994): “The East Asian Miracle: Four Lessons for Development Policy,” in *NBER Macroeconomics Annual 1994, Volume 9*, MIT Press, 219–282.
- PERSSON, T. AND G. TABELLINI (2000): *Political Economics: Explaining Economic Policy*, MIT Press.
- PIERSON, P. (2000): “Increasing Returns, Path Dependence, and the Study of Politics,” *American Political Science Review*, 251–267.
- PRZEWORSKI, A. AND F. LIMONGI (1993): “Political Regimes and Economic Growth,” *The Journal of Economic Perspectives*, 51–69.

- RAVALLION, M. AND G. DATT (1995): *Growth and Poverty in Rural India*, vol. 1405, World Bank Publications.
- RODRIK, D. (1994): “King Kong Meets Godzilla: The World Bank and the East Asian Miracle,” *Centre for Economic Policy Research*.
- ROEMER, J. E. (1982): *A General Theory of Exploitation and Class*, Cambridge, MA: Harvard University Press.
- SEN, A., N. STERN, AND J. STIGLITZ (1990): “Development Strategies: The Roles of the State and the Private Sector,” in *Proceedings of the World Bank Annual Conference on Development Economics*, 421–35.
- STIGLITZ, J. E. AND A. WEISS (1981): “Credit Rationing in Markets with Imperfect Information,” *The American Economic Review*, 71, 393–410.
- TOMICH, T. P., P. KILBY, AND B. F. JOHNSTON (1995): *Transforming Agrarian Economies: Opportunities Seized, Opportunities Missed*, Cornell University Press.
- TOPALOVA, P. (2010): “Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty from India,” *American Economic Journal: Applied Economics*, 2, 1–41.
- WADE, R. H. (1988): “The Management of Irrigation Systems: How to Evoke Trust and Avoid Prisoner’s Dilemma,” *World Development*, 16, 489–500.
- (2004): *Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization*, Princeton University Press.
- WORLD BANK (2007): *World Development Report 2008 (Overview) Agriculture for Development.*, Washington, D.C.: The World Bank.
- WYE GROUP (2011): *Statistics on Rural Development and Agricultural Household Income*, United Nations Publications.
- ZIMMERMAN, F. J. AND M. R. CARTER (2003): “Asset Smoothing, Consumption Smoothing and the Reproduction of Inequality Under Risk and Subsistence Constraints,” *Journal of Development Economics*, 71, 233–60.

A Proofs

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

$$1 + \frac{c_F}{P} \leq \frac{(1+r)(1+\theta)}{1+\theta/2} \left[\frac{2+r}{1+r} \left[\frac{1+\theta/2}{1+r} \right]^{1/(2+r)} - 1 \right]. \quad (15)$$

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

$$(1 - \tau)\tilde{A}_P = \left[1 + \frac{(1+r)(1+\theta)}{1+\theta/2} \right] P + c_F. \quad (16)$$

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 (16), 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 (15) and that $(1 - \tau)\tilde{A}_P > c_F$ so that Petty production is accessible. \square

Proposition. *The political interests of Large producers are 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. Consider that at $A_i = \underline{A}_P$, substitution shows

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

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 τ 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 (10) and (6) imply the benefits of Petty production dominate as taxes increase ($dU_P/d\tau \geq dU_L/d\tau$) iff

$$(\mu - \underline{A}_L) \left(\frac{1 + \theta/2}{1 + r} \right)^{1/(2+r)} \leq \left(\frac{1 + \theta/2}{\theta/2} \frac{\partial F/\partial P}{1 + \partial F/\partial K_i} \mu - \underline{A}_L \right) \left(\frac{1 + \partial F/\partial K_i}{1 + r} \right)^{1/(2+r)}. \quad (17)$$

Further reduction shows Equation (17) holds exactly when

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

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 (18) 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 (10) 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, $dU_P/d\tau = \left[1/\tilde{c}_i^0 \quad \partial F/\partial P/\tilde{c}_i^1 \right] \cdot \left[-A_i \quad P/\tau \right]$ so

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

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

$$\frac{d\tilde{c}_i^0}{dA_i} A_i^2 + \frac{(1+r)^2}{(1+\partial F/\partial K_i)^2} \left[\frac{d\tilde{c}_i^1}{dP} \cdot \partial F/\partial P - \tilde{c}_i^1 \cdot \partial^2 F/\partial^2 P \right] \left(\frac{P}{\tau} \right)^2 > \left(\frac{d\tilde{c}_i^0}{dP} \right)^2 A_i \frac{P}{\tau}. \quad (19)$$

The LHS of Equation (19), 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

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

Thus, for Equation (19) to hold, it is sufficient that

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

The RHS of Equation (20) is 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

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

and $\partial^2 F / \partial P \partial K_i \cdot \tilde{c}_i^0 > 0$. Therefore to show Equation (20), 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. Assume moderate taxation and that there are sufficient Petty producers (σ_P) who receive high benefits of taxation ($dU_P / d\tau|_{A_i = \underline{A}_L}$) relative to Large producers and the benefits they

receive:

$$\sigma_P \cdot dU_P/d\tau|_{A_i=\underline{A}_L} > \sigma_L \cdot dU_L/d\tau|_{A_i=\underline{A}_L}. \quad (21)$$

Then increases in expected public goods crowd in delivered public goods.

Proof. Recall the first order condition for interior equilibria of Equation (13).⁴⁴ Holding the politically determined level of public goods (say P) constant, now consider what happens in (13) 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 (13) with respect to P^* , we have

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

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

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

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

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 RHS of (13) is positive and $d\sigma_P/dP^* > 0$. Consequently, the first term on the LHS of (13) must be positive and $d\sigma_L/dP^* < 0$, so (22) is positive. Second, (25) is positive because $d\underline{A}_P/dP^* < 0$, clearly $dU_P/dA_i > 0$ and under moderate taxes, $\left(\frac{\partial F/\partial P}{1 + \partial F/\partial K_i} \frac{1 + \theta/2}{\theta/2} \mu - \underline{A}_P \right) > 0$. Finally, (22-25) is then positive if (23-24) can be shown to be positive, which holds exactly when

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

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

Since (22-25) is positive, if (13) 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 $d^2U_L/d^2\tau < 0$,⁴⁵ and the Lemma above shows $d^2U_P/d^2\tau < 0$. \square

⁴⁴At 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.

⁴⁵Specifically, $d^2U_L/d^2\tau = -[-(1+r)(1+\theta/2)A_i + r(1+\theta/2)\mu]^2 / [(1+r)(1+\theta/2)c_i^0 + r(1+\theta/2)\tau\mu]^2$.

B Numerical Details

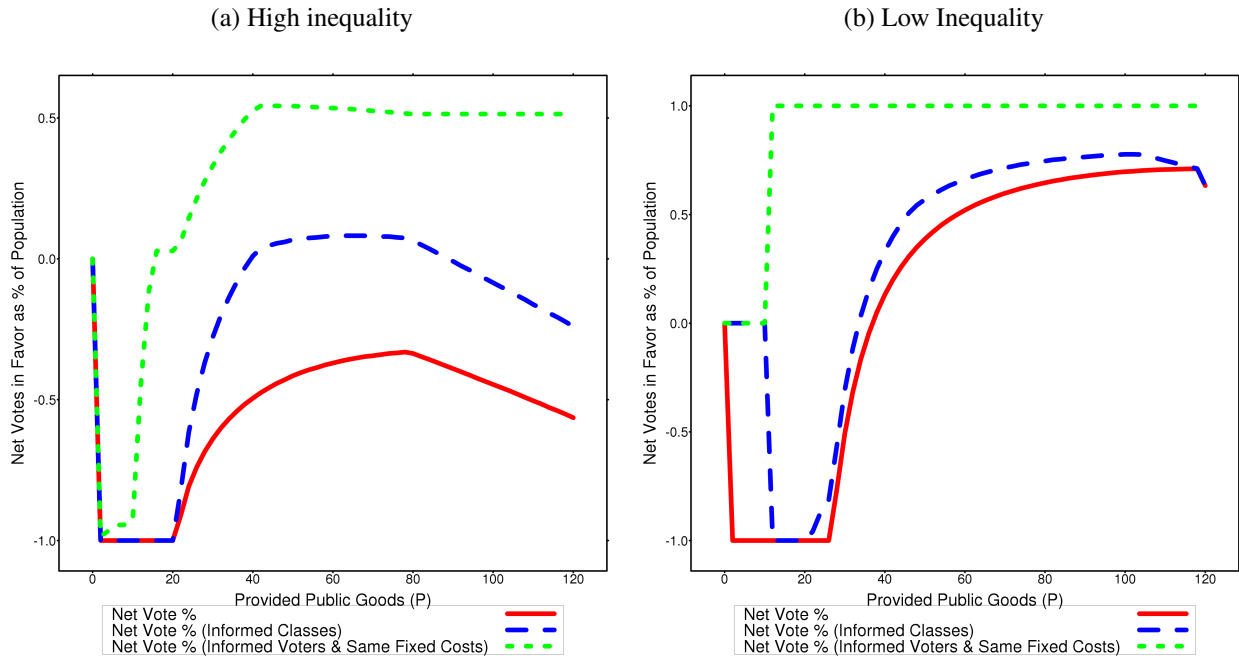
The numerical simulations in the main text have the same preferences, production parameters and mean asset level of 260, but vary in the distribution of assets. The low inequality economy has an initial asset distribution that is inverse Pareto of $\Pr(A \leq a) = (a/400)^{1.85}$ while the high inequality economy has an initial asset distribution satisfying $\Pr(A \leq a) = (a/1000)^{3.51}$. The latter distribution is based on the distribution of land ownership in Nicaragua of the 1970s.

The discount rate in both economies is $1/1.1$ 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 Reform 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 Reform party minus votes for the Status Quo 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.

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.