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Exploitation and Growth

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I develop a model of exploitation—coercive wealth transfer—and growth based on social importance. Exploitation reduces growth since the return to capital falls with exploitation costs. Initial relative wealth across groups—the measure of social importance—determines which group is the exploiter and how costly exploitation will be. The exploiter selects an exploitation path that maintains its dominant position and rarely maximizes current transfers. Productive minorities and fast-growing groups are most prone to exploitation. International sanctions, if strong, end exploitation; otherwise they increase exploitation and reduce growth. Segregation and apartheid are broadly consistent with the theory.

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JEL classification: D23, D63, O41

1. Introduction

Exploitation is the systematic imposition of economic, political, and social restrictions on one group by another within the same nation. Although the precise form and intensity of these restrictions have varied widely over history and region, the phenomenon is very common. From South Africa and the American South, to Northern Ireland and the Indian caste system, exploitation has flourished in a variety of settings. There is a large literature on conflict, both in economics and political science, but little of this has been applied specifically to exploitation or to growth.[1] As a significant example of an economic system with incomplete property rights, exploitation is worth our attention. I take as axiomatic that the underlying purpose of exploitation is the transfer of wealth and proceed to address two main questions: what gives rise to exploitation, and what are its consequences for growth and income distribution?

In seeking an answer to the first question, one is naturally drawn to think about a group's *importance* in society. Both very important and totally insignificant groups are often left alone—in the sense of not facing the state machinery of exploitation—but those that have achieved an intermediate place are vulnerable. The Chinese minority in Malaysia, while small in numbers, has acquired considerable wealth and is subject to special laws that curtail accumulation (Jomo, 1996). Blacks in South Africa were not wealthy individually, but their numbers were large, and they, too, were subject to special restrictions. From these observations, a reasonable measure of social importance is a group's *total* wealth relative to that of other groups. The link to exploitation is provided by assuming that the more important a group the more *costly* it is to maintain the exploitive machinery.

Understanding growth in societies that experience exploitation requires us to think about the dynamic problem faced by the ruler of the exploiter group. The intensity of exploitation will directly influence the return to capital and affect the paths of absolute and relative wealth. The first path translates into the economy's measured growth rate; the second determines the groups' social importance and the prospects for the ruler's continued exploitation. Rational exploiters are concerned, foremost, with maintaining their position, and tailor the intensity of exploitation to keep the other group vulnerable and profitable: not too large and not too small. In the dynamic equilibrium, the economy's aggregate growth rate is beneath that of a nonexploitive economy, and generally falls through time. The level effect is directly attributable to the fall in the return to capital stemming from the costs of maintaining state exploitation.

This work is complementary to several strands in the recent growth literature. There is, first, a literature on social conflict (Tornell and Velasco, 1992; Benhabib and Rustichini, 1996; Bénabou, 1996) in which any of several groups can seize capital resources from a common stock. The solutions to these models involve choosing a Markovian or trigger strategy, and the equilibrium is often not unique. Growth is lower than the first-best solution because agents overconsume resources that could be invested. Not to do so is irrational when agents are convinced that others will. In contrast, here capital evolves separately by group, and the difficulty of seizing resources is endogenous and dependent on the importance of the exploited group.

A second relevant thread in the literature concerns income inequality, fiscal policy, and growth. The basic idea, due mainly to Perotti (1993), Alesina and Rodrik (1994), and Persson and Tabellini (1994), may be stated as follows. Taxes reduce the rate of growth by decreasing the net return to capital or stifling investment in human capital. Further, because of the median voter principle, the more unequal is income, the larger is the tax rate that emerges from the political system. It then follows that an unequal distribution of society's resources generates slower growth from higher taxes. This hypothesis has been heavily scrutinized empirically, and while the connection between low growth and inequality is robust to many specifications, it is harder to find a link through the fiscal system or an inverse relationship between growth and redistribution.[2] The model here is similar to much of this literature since I operationalize exploitation as a tax on wealth. It differs, however, in that income distribution is not exogenous as it is in most of this work (Perotti, 1993, is an exception) and because the tax is levied by one group on another in a nondemocratic way.

Predation is another form of coercive wealth transfer. In Grossman and Kim (1995, 1996a) there are two groups, one of which seizes the production of ("preys on") the other. The important insight of their work is that growth slows because the predator uses up valuable resources to plunder, while the prey expends scarce wealth investing in defensive fortifications. The exploitive process of this article differs in two principal ways. First, the rate of destructiveness (or cost) here is endogenous and depends on the importance of the exploited group. As a result, the identity of the exploiter group—and indeed whether exploitation occurs at all—is determined endogenously. Second, in Grossman and Kim the predator is in a somewhat inferior position to the prey (like barbarians before Rome) in that they take as given the defender's fortifications and do not take into account how their predatory activity will affect the prey's future deterrence. Here, in contrast, the exploiter does account for the future behavior of the exploited and most specifically how exploitation changes accumulation and influences the key measure of importance.

In the next two sections, I treat exploitation statically and propose a theory to explain how relative total wealth, the measure of social importance, determines (1) whether or not exploitation occurs, (2) if so, which group emerges as the exploiter, and (3) the magnitude of its gain. Peaceful coexistence is likely to occur when both groups are similar in social importance or if there are several groups. I conclude by showing that either minorities or majorities are capable of becoming exploiters.

The second half of the article extends the model to growth. Here it is shown that steady-state growth inevitably falls because of the costs of maintaining the exploitive position, although the exploiter group becomes increasingly wealthy compared to the exploited. Various comparative dynamic exercises are performed in these sections, and I am able to provide an explanation for the fact that very productive minorities, and fast-growing groups, are often the victims of long-term exploitation. An important result is that *weak* international sanctions make exploitation worse and growth lower but that *strong* ones raise the growth rate by bringing an end to exploitation.

2. A Static Model of Exploitation

A necessary condition for the existence of exploitation is the ability to distinguish between groups, whether by ethnicity, religion, tribe, political affiliation, culture, or other characteristics. If exploitation is profitable, *any* distinguishing feature can provide the basis for exploitation. Peoples that are very similar ethnically, such as the Irish or the inhabitants of the former Yugoslavia, are as likely as others to experience exploitive conflict if they differ along some other dimension, like religion. Interestingly, simple profitability is consistent with the rich variety of reasons offered to explain exploitation in history. All that is necessary is an identifying feature.

My focus is on the growth path of a country that contains two groups, A and B, whose members can be identified without cost because of a natural distinguishing feature. While allowing for some degree of endogenous coalition formation would be interesting—especially in light of the fact that at times identifiability is imposed or enhanced artificially—the case of nature-defined groups is an important one. To take two examples, South Africa and the American South were cases in which members of the exploited group simply could not change affiliation. In other cases, like India and Northern Ireland in recent centuries, it may have been possible to switch caste or religion but not without significant costs (relocation costs, for example). In many situations of continuing exploitation that we observe, switching costs appear to be high enough that group numbers are essentially unaffected by changing affiliation.[3]

In the absence of exploitation, and ignoring growth, the income and consumption of individual j in group i is given by

$$y_j^i = c_j^i = Pk_j^i \qquad (i = A, B), \tag{1}$$

where y is output, c is consumption, k is a composite capital good, all expressed in per capita terms, and P is the productivity of the capital good, which is the same across groups.[4]

Exploitation has taken many forms throughout history. The group that suffers exploitation will not, for example, be allowed to own certain kinds of property or assets, to vote, to hold certain jobs, or to live in certain areas. One way to model exploitation is to let Group A levy a tax at rate τ on the capital wealth of each member of Group B. This reduces the income of each member j of B to $y_j^B = (P - \tau)k_j^B$ and results in total collections of

$$T = \sum_{j=1}^{N^B} \tau k_j^B = \tau k^B N^B, \tag{2}$$

where N^i is the population of group i. The second equality is true under the simplifying assumption that all members possess the same amount of capital. Although the identification of a wealth tax with exploitation is too simple to account fully for this complex phenomenon, I believe that it captures an essential element of many exploitive situations: the greater one's wealth, the more one loses, in absolute terms, from exploitation. This is true when, for example, taxes are levied on certain occupations that are traditionally identified with specific groups. Also, when human capital constitutes a large part of wealth, exploitive restriction on job holding limit the efficient use of that capital and reduce wages in proportion to wealth. Restrictions on financial capital work the same way: often groups are forbidden from investing capital in certain types of business, or in certain locations. Income is reduced in proportion to the amount of capital so constrained.[5]

Tax collections, however, are costly. I assume three things about these costs. First, there are *increasing marginal costs* of collection, in the sense that the increase in net collections received by the exploiter falls as the tax rate rises. Second, it is more costly to exploit a group, the more *important* it is as measured by its share of the economy's total wealth. Third, costs rise with the economy's *scale*.

These ideas are formalized as follows and discussed below. Total payments to the members of A are equal to tax collections T net of costs, C. Call these transfers V:

$$V = T - C = T - [F(\tau)T + G(Z, a)k^A N^A], \tag{3}$$

where

$$Z \equiv \frac{k^B N^B}{k^A N^A} \tag{4}$$

is *relative wealth of the exploited group* and is defined to be the ratio of B's *total wealth* to that of A. Costs are divided into two components, those that depend on the tax rate and total tax revenue collected—$F(\tau)T$—and those that depend on relative and absolute wealth—$G(Z, a)k^A N^A$ (the variable a is a shift parameter).

There are many reasons why collection costs rise with the degree of exploitation, so that $F'(\tau) > 0$. As exploitation becomes more intense, there is a need for extra policing and surveillance and for greater operation of the judicial and penal systems. Moreover, we expect the efficiency losses due to the restrictions placed on trades and job holding to rise as the distortions from τ rise. For simplicity I assume that these effects are proportional to total collections, T.[6]

The key influence of social importance shows up in the second cost term. The intuition for $G_Z > 0$ is that as exploited groups become more important in society, whether in sheer numbers *or* individual wealth, the more difficult and costly it is to continue their exploitation.[7] Three general reasons may be advanced for linking cost to importance. First, surveillance, monitoring, and enforcement of regulations become more difficult the greater the number in the exploited group relative to those who exploit. Second, the wealthier and more numerous is the exploited group, the more difficult it becomes to stop them from hiding assets, transferring them abroad, or bribing corrupt officials.[8] Third, both wealth and numbers increase the ability of exploited groups to attract international attention. To the extent that this heightened awareness results in increased penalties, the costs of exploitation rise with the exploited group's relative wealth.

The social importance effect is assumed to be proportional to the wealth of the A group, $k^A N^A$, which means that total collection costs rise with the economy's scale as measured by total wealth, $W \equiv k^A N^A + k^B N^B$. This is a natural assumption to make since as the economy gets larger and more prosperous, it requires a larger and more complex bureaucracy to administer the restrictions. International sanctions also represent costs that increase with scale. If foreign countries cease to trade with a nation or to extend it credit, the absolute effect is larger the wealthier the nation affected. The effects of such penalties (of which one might include federal sanctions against southern U.S. states in the 1960s) would not change if the intensity of exploitation τ were marginally increased or reduced. The provision of "separate but equal" school facilities imposed by the U.S. Supreme Court put enormous strain on the budgets of southern states in the United States immediately prior to desegregation (Woodward, 1974). These costs were primarily determined by the scale of the southern economy, where new schools and other facilities had to be constructed.[9] I introduce A's total wealth in multiplicative fashion because it makes the analysis of growth more tractable.

The tax rate is set by A's governing authority—the "government" or "ruler"—and the proceeds are distributed proportionally to wealth among the members of Group A. This means that

$$V = \sum_{j=1}^{N^A} \nu k_j^A = \nu k^A N^A, \tag{5}$$

where ν is the *subsidy rate* for each member of A. The second equality follows if all members of A have the same capital. The assumption of proportionality in distribution may be thought less compelling than for taxation, and it is made partly for simplicity when growth is introduced below. On the other hand, it is not implausible to think that wealthy exploiters gain proportionally more than poor ones. Tax sheltering, legal or not, yields benefits in proportion to wealth. Credit subsidies reward those who secure the largest loans on below-market terms. Often, public goods are selective in their benefits: roads and other public infrastructural projects can be built to reward regional groups. Such benefits are greater the larger the amount of private capital installed.

Equating (3) and (5) and dividing both sides by $k^A N^A$ results in the following subsidy rate for each member of A:

$$\nu = \nu(\tau, Z, a) = [1 - F(\tau)]\tau Z - G(Z, a). \tag{6}$$

It is convenient to use specific forms for the F and G functions, so that I can construct numerical examples of growth paths later. I assume that the tax-rate effect is linear, $F(\tau) = \alpha\tau$, while the relative-wealth effect is given by $G(Z, a) = a + \frac{Z^{1+\gamma}}{1+\gamma}$, with $\gamma > 0$. The subsidy rate is then

$$\nu = \nu(\tau, Z, a) = (1 - \alpha\tau)\tau Z - \left[a + \frac{Z^{1+\gamma}}{1+\gamma}\right]. \tag{7}$$

The representative member of Group A treats the subsidy rate ν as given and independent of his own behavior so that income rises to $y^A = (P + \nu)k^A$. If A's government takes Z and a as given, its rational strategy is to maximize ν in (7) by selecting τ. This rule establishes the constant *myopic* tax rate:

$$\tau_M = \frac{1}{2\alpha}. \tag{8}$$

The subsidy rate, ν_M, which is determined by substituting (8) into (7), is *single-peaked* as a function of Z, as shown in Figure 1. This is a direct result of the assumption that $\gamma > 0$. The ν_M curve's vertical intercept is at $-a$ which, if not too large, makes exploitation profitable for a certain range of Z.

Casual observation suggests that where groups are low in numbers or possess little individual wealth (a small Z) institutional restrictions against them are absent. Conversely, if a group is large and wealthy (a large Z), it is also not exploited. In terms of the model, these are cases in which ν_M in Figure 1 is negative. Groups most in danger of institutional exploitation are those that have achieved an intermediate position with respect to either numbers or wealth.

Numbers alone do not determine whether or not exploitation occurs: the exploited group can be either a minority or a majority. Letting κ and n stand for, respectively, the ratios k^B/k^A and N^B/N^A—so that $Z = \kappa n$—we know that A exploits B if $n < Z_H/\kappa$, where Z_H is the upper bound of the range of A's profitable exploitation (see Figure 1). If the following is satisfied—

$$1 < n < \frac{Z_H}{\kappa} \tag{9a}$$

—then B constitutes a numerical *majority*, as was true of apartheid in South Africa (Lundahl, 1992). If, on the other hand, $n < 1$, the exploited Group B would be a *minority*, which occurred in the American South during segregation (Myrdal, 1962). It is not difficult to satisfy (9a), even if Z_H is less than one, if each member of B is considerably poorer than a member of A.

Individuals in exploited groups, however, are sometimes *richer* than those who hold political power. One example of this phenomenon is the Chinese minority in Malaysia

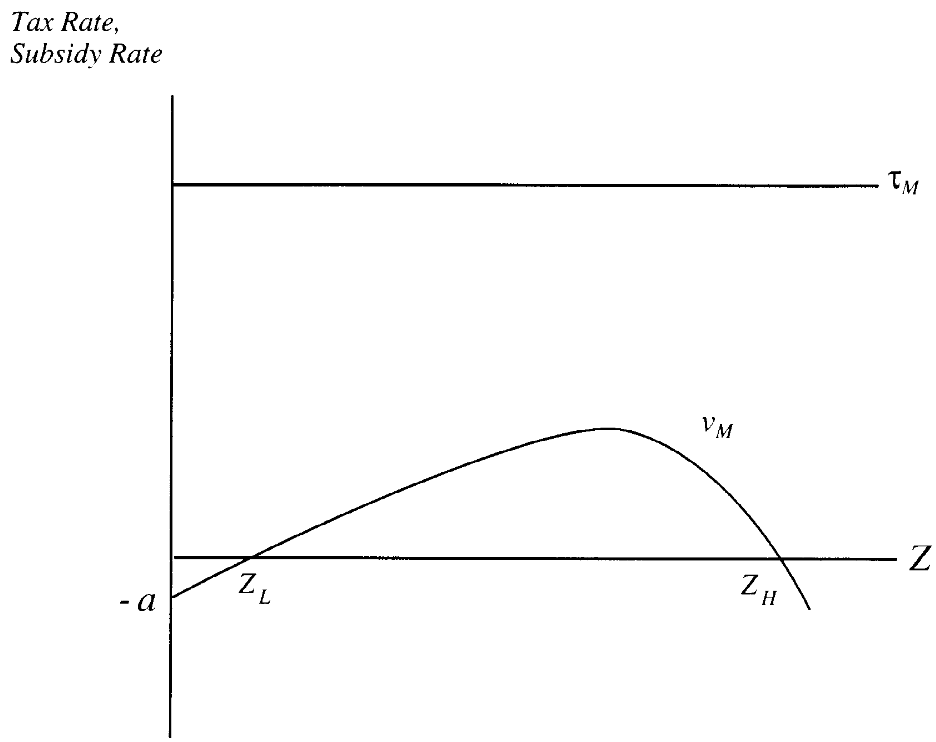

Figure 1. The myopic tax rate and subsidy rate.

(Jomo, 1996). According to the model, we would observe this case if

$$1 < \kappa < \frac{Z_H}{n}. \tag{9b}$$

If $Z_H < 1$ (the case on which I focus, for reasons discussed below), then either (9a) or (9b) can be satisfied but not both. This means that only one possibility is excluded by the model: we should never observe an individually wealthier *and* numerically superior group being exploited.

3. Who Exploits Whom?

Nothing in the model gives one group an inherent advantage over the other. As a result, the direction of exploitation is endogenous and depends on groups' social importance. To

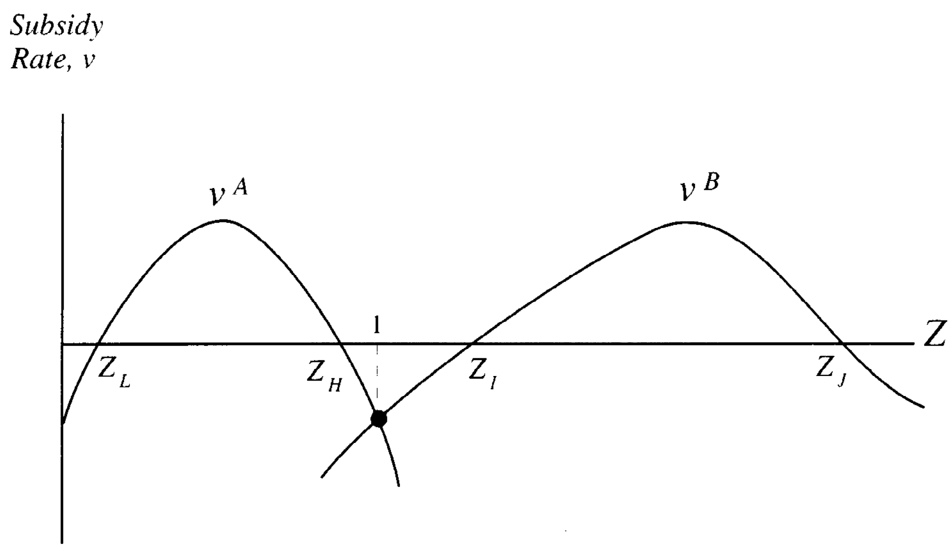

Figure 2. Symmetric subsidy rates for groups A and B.

explain why, it is convenient to introduce the classifications *weak* and *strong*. Define a weak group to be one that could not increase its utility by exploiting the other one, even if it were successful in imposing and collecting the tax subject to the cost. A strong group, on the other hand, could raise utility by exploiting. Relative wealth, Z, and the fixed cost, a, establish whether a group is strong or weak. In Figure 2, the subsidy curve derived from the myopic tax rate for Group A is drawn (it is now labeled ν^A) along with the analogous curve for Group B (labeled ν^B). If the two groups have identical parameters in their cost functions, symmetry guarantees that the two benefit curves cross at $Z = 1$ and that their peaks occur at reciprocal values of Z. Where a curve rises above the horizontal axis the group is strong; in the other regions, it is weak.

It can be shown (see Appendix A) that a strong group exploits a weak one, two weak groups live as equals, and two strong groups engage in perpetual struggle. The value of Z determines the equilibrium. In Figure 2, if Z lies between Z_L and Z_H then A exploits B; it Z were between Z_I and Z_J, then B would exploit A. In any other interval of Figure 2, since both groups are weak, there would be no exploitation.

Although the middle interval is drawn as a region of joint weakness, it could instead establish joint strength, for lower values a and γ. Then, for Z near 1, neither group would succeed in exploiting the other, in spite of a continuous struggle. This sort of equilibrium occurs in parts of Africa, where tribal fighting is endemic (Fukui and Markakis, 1994; Lemarchand, 1970). Such an equilibrium corresponds to the *anarchy* analyzed by Hirshleifer (1995), who applies his model to several historical cases and notes that it may break down into a more oppressive, one-sided form of political organization. Such a state of affairs would correspond to the exploitation analyzed here. Since my main theme is exploitation and not anarchy, in the remainder of this article, I rule out perpetual struggle. This means that Z_H is strictly less than 1.

Nations with many competing groups are less prone to either exploitation or struggle since each group is weak. That is, if any one group has to exploit all of the others simultaneously, then Z is effectively very large, and costs are prohibitively high. Indeed, this kind of argument was used by the Federalists in the eighteenth century to justify unification under the new constitution. The following quote from James Madison (1787) is illustrative:

> Extend the sphere and you will take in a greater variety of parties and interests; you make it less probable that a majority of the whole will have a common motive to invade the rights of other citizens; or if such a common motive exists, it will be more difficult for all who feel it to discover their own strength and act in unison with each other. . . . Does [the advantage of union] consist in the greater security afford by a greater variety of parties, against the event of any one party being able to outnumber and oppress the rest?[10]

The main implication of the static model is that exploitation can be a profitable activity: if a is not too high and if Z lies within certain intervals, then one group profits by institutionalizing exploitation. This result is important because it explains why exploitive situations are so common and spring from such a wide variety of historical circumstances.

4. Growth

Exploitation, like other departures from full property rights, results in a poor allocation of capital and low growth. A key feature of the dynamic solution is that a group's importance, as measured by its relative wealth, is endogenous and evolving through time. As a result, the rate of growth will not usually be constant, and there are likely to be temporary corner solutions, so that the exploitation intensity and growth rate may change discontinuously at a specific time. Migration and population growth, differences in underlying productivities, and international sanctions affect the rate of growth, the intensity and path of exploitation, and the groups' importance in equilibrium. I begin to develop these results by looking at households' rational behavior over time.

4.1. Household Growth with Exploitation

Each household accumulates capital by foregoing consumption. Capital per person in Group i rises according to

$$\dot{k}^i = y^i - c^i - \eta^i k^i, \tag{10}$$

where η^i is the growth rate of the group's population. Households choose a path for consumption to maximize their discounted utility over an infinite horizon, taking relative wealth as given. The representative household in Group i maximizes:

$$U^i = \int_0^\infty N^i(t) \ln c^i(t) e^{-\rho t} dt, \tag{11}$$

where ρ is the common subjective rate of time preference and utility is logarithmic. Because of the nature of the competition between groups, it is appropriate to include family size N^i as well as the utility of each member in the household objective function (Rebelo, 1992).

If the two groups coexisted without exploitation, it is straightforward to show that the members of Group i would select the constant saving rate $s^i = 1 - (\rho - \eta^i)/P$, where $\rho - \eta^i > 0$ is the net rate of time preference. This guarantees growth of consumption and individual capital at the rate[11]

$$g \equiv \frac{\dot{c}^i}{c^i} = \frac{\dot{k}^i}{k^i} = P - \rho. \tag{12}$$

With the tax τ on the capital stock of each member of B, we replace P with $(P - \tau)$, which reduces B's growth rate to

$$g^B = P - \tau - \rho. \tag{13}$$

The government of Group A distributes the proceeds as before, so the growth rate for this group becomes

$$g^A = P + \nu(\cdot) - \rho, \tag{14}$$

where the $\nu(\cdot)$ function is given by (7). To reach the new accumulation paths, A-members save a larger fraction of income, and B-members a smaller fraction. The new saving rates are

$$s^A = 1 - \frac{\rho - \eta^A}{P + \nu(\cdot)}, \tag{15a}$$

$$s^B = 1 - \frac{\rho - \eta^B}{P - \tau}. \tag{15b}$$

The tax does not affect immediately the consumption *level* of either group: with or without exploitation consumption is the same fraction of an individual's stock of capital:

$$c^i(t) = (\rho - \eta^i)k^i(t). \tag{16}$$

However, since the fraction of income saved changes for each group, A's up and B's down, the consumption *paths* will soon diverge from their original positions.

4.2. Exploitation Policy

In the growth models of Tornell and Velasco (1992), Benhabib and Rustichini (1996), and Bénabou (1996), two or more groups have equal access to a common pool of capital. Here, in contrast, when Z is low only Group A is a potential exploiter, while when Z is high it is Group B that may choose to exploit. As a consequence, the dynamic game-theoretic aspects of the problem here are not as crucial as they are for the common-access literature. Under the assumption that Z is relatively low to begin (that is, below Z_H in Figure 2), Group A is the sole controller because both parties know that B would always lose if it attempted to exploit. As in Alesina and Rodrik (1994), I rule out once-and-for-all expropriation of the capital stock and focus on the tax path, $\tau(t)$, that would be chosen by A's government to maximize the welfare of the representative household in the group. The path that results is time-consistent since the state variable Z cannot take discrete jumps.

Although each member of A takes Group B's relative wealth Z as given, it is logical to assume that A's ruling agent fully accounts for the effect of Z when choosing the path of the exploitive tax. Nevertheless, we can think of cases in which A's ruling agent would rationally ignore the future. If, for example, the ruler's tenure is not secure because a rival is in a position to oust him, either through a vote or coup, then he may appear to act shortsightedly. In what follows, I concentrate on *rational* action but at times contrast it with the *myopic* behavior that would be appropriate for an insecure ruler.

The government of A seeks to maximize the discounted total utility of each household in the group. Normalizing the initial population at 1, and substituting (16) for the consumption of each person, yields

$$Max_{\tau}\, U \equiv \int_0^{\infty} \ln[\rho_n k^A(t)] e^{-\rho_n^t} dt, \tag{17}$$

subject to

$$\dot{k}^A = k^A(P + \nu(\tau, Z, a) - \rho) \tag{18}$$

and

$$\dot{Z} = Z(\Gamma - \tau - \nu(\tau, Z, a)), \tag{19}$$

where $\rho_n \equiv \rho - \eta^{\mathrm{A}}$ and $\Gamma \equiv \eta^{\mathrm{B}} - \eta^{\mathrm{A}}$ is the difference between population growth rates.

The details of the maximization are given in Appendix B. Let ω be the capital-value of additions to Z multiplied by the ratio (Z/k^{A}). The following conditions must be satisfied for an optimal plan:

$$\tau = \tau_R \equiv \tau_M - \left(\frac{1}{2\alpha Z}\right)\left(\frac{\omega}{1-\omega}\right), \tag{20}$$

$$\dot{\omega} = \omega\rho_n - (1-\omega)\nu_Z Z. \tag{21}$$

If ω is positive, increments to Z have a positive influence on utility and (20) says that the tax should be set below its myopic level so that Z can grow faster than it normally would.[12] It is quite possible, however, for ω to be negative, signaling that Z is too large already, thus requiring a tax rate in excess of the myopic rate. The second relation (21) is derived from the arbitrage condition that the appreciation of ω should fill the gap between the return to consumption (the net discount rate) and the productivity of Z in generating subsidies for A's members. Finally, it is necessary that ω approach a constant as time goes to infinity. Z need not do so, but I shall be most concerned with situations in which it does.

The optimal policy is illustrated in Figure 3. The interior region, where conditions (20) and (21) apply, is bounded above by FF and below by VC. Above this region, ω is so high—increments to B's relative wealth are so highly valued—that it is preferable to forego

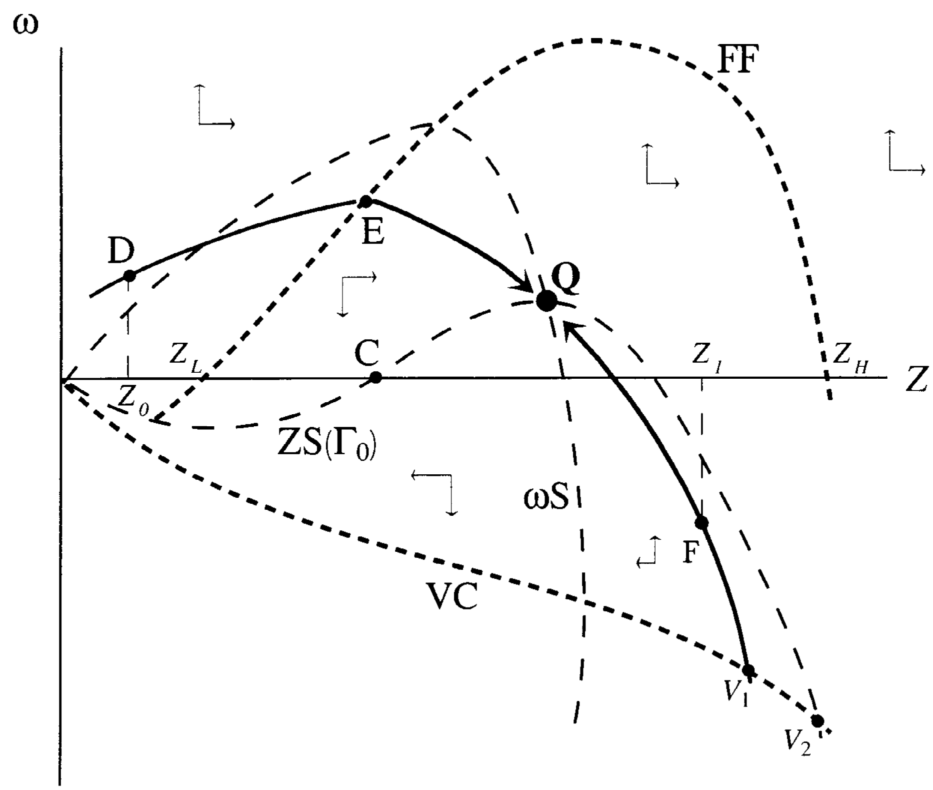

Figure 3. Exploitation through time.

exploitation and live in harmony with the B group ($\tau = 0$) so their number can grow. Below VC (for "viability constraint") τ_R is so high that B's current income would be negative. There, it is rational to set τ as high as is compatible with B's survival. By (20) myopic policy corresponds to points located along the horizontal axis ($\omega = 0$). The FF boundary crosses the axis at the same points, Z_L and Z_H, identified in earlier figures.

The other two dashed loci in Figure 3 show where in the interior region ω and Z are stationary. These are labeled ωS and ZS(Γ_0), respectively, and where they cross determines a saddle-point equilibrium; the small arrows show movement in the relevant subregions. In the corner region above FF both ω and Z rise steadily. In Figure 3 the difference in population growth rates, $\Gamma = \eta^B - \eta^A$, is positive. For increases in Γ the ZS locus moves downward, but the other loci are not affected.[13]

The economy starts at Z_O, a value that is so low that A, being much richer than B, is weak in the sense that it is not worth the fixed cost to exploit. Given the value $\Gamma_0 > 0$, however, Group B's total wealth is rising relative to A's. A myopic government would set $\omega(t) = 0$ for all t. Until Z_L were attained, the tax would be set at zero, but at that point it would jump to τ_M, where it would stay. The economy would converge to an equilibrium at point C. The rational government behaves differently: it follows the path DEQ. Like the myopic government, it does not begin to exploit immediately, but it maintains this nonexploitation for a longer period: not until E is attained does the exploitation begin. When it does begin, it does so at lower level of intensity, and while it rises steadily to the steady state at Q, it never reaches the myopic rate. The long-run equilibrium level of B's relative wealth Z is higher, and the intensity of exploitation lower, under a rational exploiter than under a myopic one. This, as we shall see, is not generally true.

4.3. The Economy's Growth Rate

In this section, I contrast the growth rate of an economy without exploitation to one with rational exploitation. The economy's aggregate capital stock per person is

$$k \equiv \frac{K}{N} = \theta^A k^A + (1 - \theta^A)k^B, \tag{22}$$

where θ^A is Group A's share of the population. Using the definitions from Section 2—$n \equiv N^B/N^A$ and $\kappa \equiv k^B/k^A$—we can write $\theta^A = 1/(1+n)$ and Group B's relative wealth as $Z = \kappa n$. The growth rate of k in the absence of exploitation can be found to equal:

$$\gamma_k = g + \Gamma\left[\frac{1}{1+n} - \frac{1}{1+\kappa n}\right]. \tag{23}$$

When there is no exploitation, the stocks of capital grow at the same rate, g, so that κ is always constant at its initial value. The ratio n, on the other hand, grows steadily when $\Gamma = \eta^{\mathrm{B}} - \eta^{\mathrm{A}}$ is positive. Taking this to be true, the growth rate γ_k converges to g asymptotically. Whether it does so from above or below depends entirely on the value of κ. In the normal case in which B's members are less wealthy than A's ($\kappa < 1$), the convergence is from below, so the economy's measured growth rate begins low and rises through time. It is noteworthy that the existence of two groups generates transitional growth dynamics even when the groups' wealth is growing at the same rate. There are two exceptions to this: if either $\Gamma = 0$ (equal population growth) or $\kappa = 1$ (equal initial per capita amounts of capital), the second term in (23) vanishes and aggregate growth is equal to the common individual growth rate, g.

Growth under exploitation is given by

$$g_k = \gamma_k - \frac{\tau Z - \nu(\cdot)}{1+Z} = g + \frac{\Gamma}{1+n} - X, \tag{24}$$

where

$$X \equiv \frac{\Gamma + \tau Z - \nu(\cdot)}{1+Z}.$$

Table 1. Population growth: effect on exploitation and capital growth.

	1	2	3	4	5	6	7
$\Gamma = \eta^B - \eta^A$	$Z^* = \kappa$	τ_Y	ν_Y	γ_k	g_k	g_k/γ_k	τ_R/τ_M
0.012	0.363	0.241	0.059	0.027	0.026	0.969	0.386
0.020	0.458	0.397	0.103	0.026	0.024	0.917	0.635
0.028	0.494	0.576	0.124	0.025	0.021	0.830	0.922
0.036	0.510	0.786	0.114	0.024	0.017	0.685	1.257
0.040	0.512	0.908	0.092	0.024	0.014	0.581	1.453

Source: Author's calculations. Other parameter values: $P = 0.04$, $\alpha = 20.0$, $\gamma = 6.321$, $a = 0.0004$, $\rho = 0.01$, $\eta^A = 0$.

From the first equality in (24) we see immediately that growth with exploitation is *lower* than without it, since τZ exceeds ν by the amount of exploitation costs. Now look at the second equality. The middle term falls steadily since n keeps rising. On the other hand, X goes to a constant X^∞ as Z approaches its equilibrium at point Q. Thus, the growth rate goes to $g - X^\infty$ asymptotically.

In Grossman and Kim (1996a) growth is low because insecurity allows predators to use capital that would otherwise be productive to appropriate the output of others. This forces producers to expend resources to deter predation. These two expenditures of capital, along with the outright destruction of goods during appropriation, causes the rate of growth to fall. This is a valuable insight into a social process in which a poor group can force a richer one into an equilibrium with suboptimal accumulation. Here, in contrast, it is the *wealthy* group that expends resources to subdue and exploit a weaker one. Indeed, it is only by virtue of its high relative wealth that Group A is able to exploit B, since the cost of exploitation is endogenously determined by the state Z. The intensity of exploitation evolves over time with Z and may approach a constant value. Whether it does or not, the wealthy exploiter accumulates faster than before, while the poorer group accumulates at a much slower pace, since the tax that it bears exceeds the subsidy distributed to members of the exploiter group. The costs of exploitation constitute a drag on society's ability to accumulate and the economy as a whole slows down.

The strength of the exploitation effect on growth is shown in Table 1, specifically Row 3, which corresponds to the equilibrium at Q in Figure 3. I assume that nonexploitive group growth is $g = 0.03$ and that the population of each group is the same ($n = 1$) at the time the measurement is made. The latter means that $Z^* = \kappa$. As shown in Column 1, the B-members are roughly half as wealthy as the A-members in equilibrium. Other general assumptions are that $\tau_M = 0.025$ and $P = 0.04$, so that under a myopic exploiter the income-tax-equivalent exploitation rate would be 62.5 percent. Column 2 shows the income tax rate $\tau_Y = \tau_R/P$ under rational exploitation, and Column 3 shows the corresponding subsidy rate $\nu_Y = \nu_R/P$, where ν_R is the subsidy rate that results from imposing τ_R. Each member of A receives the equivalent of a 12.4 percent increase in income, while the members of B see their income reduced by 57.6 percent. Next, Column 4 shows the nonexploitive aggregate growth rate as given by (23), while Column 5 shows the exploitive growth rate from (24), and Column 6 presents the ratio of the two. For the equilibrium in

Figure 3, exploitation causes growth to fall by 17 percent. Finally, Column 7 shows the ratio τ_R/τ_M. In the base case, a rational exploiter imposes a tax that is 8 percent lower than that imposed by a myopic ruler.

5. Comparative Dynamics

5.1. Initial Conditions and Migrations

The beginning value of Z, Group B's relative wealth, matters a great deal for the pattern of exploitation that evolves over time. Consider a larger initial Z brought about by a sudden immigration of members of the exploited group. If this migration drove the initial value to Z_1 in Figure 3, then for the rational exploiter ω would have to be *negative* (see point F) and exploitation would become more severe than under a myopic exploiter. This phase is only transitory, however, and the economy would head back to Q along the FQ arm of the saddle path.

But migrations can have far more profound consequences. If the migration were large enough exploitation would come to an end. The reason is that as one moves down the path FQ in Figure 3, the tax τ_R is rising and will eventually encounter the maximum—say, $P - \varepsilon$—that just allows survival. When that happens—at Point V_1 in Figure 3—A's government is maximally harsh, although only at the very beginning. If the immigration were greater than this, the government would be forced to move down the viability constraint VC and impose the maximal tax over a period of finite duration. If the migration were so large, however, that it placed the initial Z beyond V_2, then no policy would allow A to maintain its superiority over B. It would abandon exploitation. For societies in Africa, where tribal migrations between political units are not uncommon, such changes in initial conditions are potentially important.

If the economy were near its steady state at Q, small immigrations would be helpful to the exploiter since $\omega > 0$. It is only after they have become so large that the initial $\omega < 0$ that the exploiter's welfare declines. The onset of greater-than-myopic exploitation is actually a signal of lower welfare for the exploiting group. It is normal, therefore, that exploiter groups observe the influx of new members of the exploited group warily: any temporary benefit must be weighed against the possibility that they will be overrun and either incur extraordinary costs to maintain the exploitive position, or lose the position altogether.

5.2. Population Growth Rate Differential: $\Gamma = \eta^B - \eta^A$

An increase in Γ moves the ZS stationary locus downward, sliding the steady-state point down the ωS curve in Figure 3. The effect of increasing Γ on exploitation intensity and aggregate growth are shown in Table 1. The steady-state tax rate rises steadily with Γ (column 2) and, for Γ in excess of 3 percent, the steady-state point lies below the horizontal axis, so τ surpasses the myopic income-tax rate of 62.5 percent. When this happens, the government of A passes up current revenue and could, by reducing τ, raise the subsidy rate to its members. This seemingly irrational behavior—taxing so harshly that current receipts are lower than possible—is actually warranted since it preserves A's dominant position indefinitely. This is reflected in column 3, which shows that ν_Y rises then falls as Γ gets larger.

Aggregate growth falls as B's population growth rises relative to A's. This is due in part to the fact that the poorer B group is becoming a steadily greater fraction of the nation's population. This effect is shown in column 4, which reports the growth rate that would have existed without exploitation but with the same steady-state Z. Exploitation causes growth to be significantly lower. The growth rate with exploitation is shown in column 5, and the ratio of the two is reported in column 6. The exploitation effect becomes increasingly important as Γ rises because costs increase at both margins.

If Γ were too large ($\Gamma = 0.042$ here), the intersection point would lie under the VC border, and no steady state would exist. Exploitation would end in finite time.[14] Population growth of the exploited group is too great to control. I argue below that this was instrumental in ending apartheid.

Now consider the other extreme: if population grew at the same rate across groups ($\Gamma = 0$), again no steady state would exist. B's population must grow faster than A's by a *threshold amount* for ZS to intersect ωS in the interior. Faster growth in B's population is a *cause* of its long-term exploitation. This result is ironic for two reasons. First, because it is often assumed that it is exploitation that leads to greater population growth of the exploited group, not the reverse. And, second, because the positive Γ that exploiters fear (and not without reason, as we saw above) is responsible for its long-term dominant position.

5.3. Productivity Differences

To this point, I have assumed that P is the same for each group. Productivity differences between groups may result, however, from cultural attitudes that give rise to different work habits or systems of property rights, or from the existence of an asset or skill possessed by only one group. Such differences can be handled in the model with the addition of the term $(P^B - P^A)$ to Γ.

This extension permits the analysis of a very interesting case, that of a numerically small minority group with productivity and individual income that exceeds that of the majority group, even when they possess the same amount of capital. If $\Gamma = 0$ (equal population growth) but $P^B - P^A > 0$ is within the range reported in column 1 of Table 1, there will exist an exploitation equilibrium as in Figure 3. As a result, the minority group will be exploited indefinitely; the tax is imposed at a sufficiently high level that the natural increase in k^B, which would have caused Z to rise out of the zone of A's strength, is held in check at the level of the rise in k^A. Ironically, the productivity difference is the source of the equilibrium exploitation. This may help explain the situation of the Chinese minority in Malaysia and Indonesia, whose governments "have often been preoccupied with constraining Chinese wealth expansion and enhancing accumulation by politically influential (non-Chinese) 'indigenous' rentiers" (Jomo, 1996, p. 12).

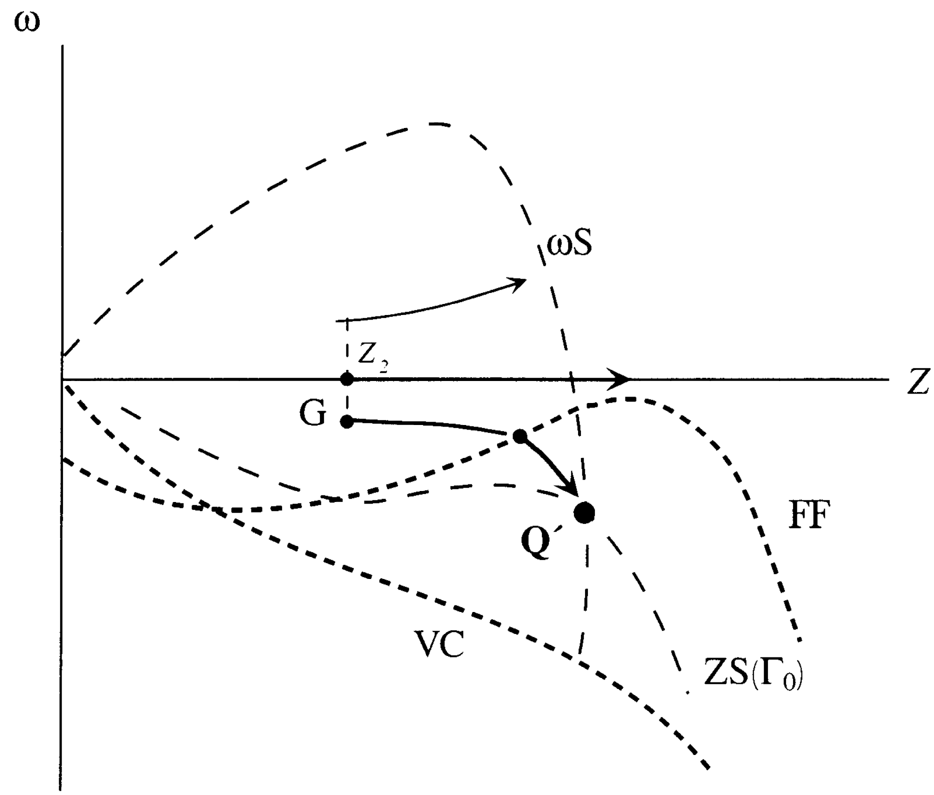

Figure 4. Sanctions may end exploitation.

5.4. International Sanctions

Exploitive regimes run the risk that their behavior will attract attention abroad and result in penalties designed to force an end to their policy. This can be handled in the model as an increase in the parameter a in (7). The increase has two effects: like a rise in Γ, it pushes the ZS stationary locus downward, but it also moves the FF boundary downward. For a particular value of a—call it a^*—the FF locus lies entirely below the horizontal axis, as in Figure 4. When this occurs, the steady-state subsidy rate ν_R becomes *negative*: to keep Z constant would be so costly that the exploiter group would have to actually pay to do so. This would not be optimal, since the transversality condition could, in this case, also be satisfied by setting $\omega = 0$. In other words, for a value of a greater than or equal to a^* it becomes rational to cease exploitation altogether. From Z_2 in Figure 4, the path GQ′ is

Table 2. International sanctions: effect on exploitation and capital growth.

a	1 $Z^* = \kappa$	2 τ_Y	3 ν_Y	4 γ_k	5 g_k	6 g_k/γ_k	7 τ_R/τ_M
0.0004	0.494	0.576	0.124	0.025	0.021	0.830	0.922
0.001	0.496	0.591	0.109	0.025	0.020	0.806	0.945
0.003	0.501	0.640	0.060	0.025	0.018	0.725	1.024
0.004	0.504	0.666	0.034	0.025	0.017	0.684	1.065
0.006	NA	0.000	0.000	0.025	NA	NA	NA

Source: Author's calculations. Other parameter values: $P = 0.04$, $\alpha = 20.0$, $\gamma = 6.321$, $\Gamma = 0.028$, $\rho = 0.01$, $\eta^A = 0$.

possible, but the optimal strategy is to set $\omega = \tau = 0$ and allow Z to rise indefinitely.[15]

While strong penalties have the desired effect, weak sanctions have the exact *opposite* effect from what was intended, leading the ruler to *increase* the intensity of exploitation. A weak penalty—one that leaves $a < a^*$—moves the equilibrium from Q in Figure 3 down toward or even below the horizontal axis but keeps a portion of FF above the horizontal axis. Along the new optimal path, the ruler chooses a greater tax than he did before the sanctions were imposed, to slow down the growth in B's capital. This is necessary to stabilize Z because A's growth has been slowed down by the higher fixed costs.

Table 2, which is organized like Table 1, shows the effects of raising a on growth and exploitation. As a is increased, aggregate growth declines, while the tax rate rises. When a reaches a value of about 0.0054, it is no longer feasible to exploit.

There is some truth on both sides of the debate over the effectiveness of international penalties: those who say that sanctions only make conditions worse and those who argue that sanctions are the best way to end exploitation permanently. This model suggests that strong, firmly applied sanctions will have the desired effect. Weak penalties, however, are not only useless: they are detrimental.

5.5. Inequality and Growth

Recent empirical work (see, e.g., Perotti, 1996) tends to support the theoretical prediction that the greater is a society's income inequality the slower its growth. Here, the best measure of inequality is the ratio of capital stocks, k^A/k^B, which in the steady state is *growing* at the constant rate Γ to keep Z at its equilibrium level. Since inequality is endogenous and changing even in the steady state, it is not possible to discuss its effect on the growth rate. It is true, however, that a rise in Γ both raises inequality (in the sense that incomes become more unequal at a faster pace) and that it reduces the economy's measured, aggregate growth rate given by (24). (This was shown in Table 1.) The same relationship holds for a rise in a. It therefore appears that there is a significant set of shocks that generate an inverse relationship between overall growth and a measure of income inequality. To this extent, the theoretical predictions are consistent with recent evidence.

6. Segregation and Apartheid

Data on the wealth of different groups within countries is largely unavailable. As an alternative to an empirical analysis, I present a brief case study of segregation and apartheid to show that the theory proposed above can help explain exploitation in the past. Although I do not claim that the wealth tax formulation can provide a comprehensive account of the two episodes, I do think that it contains an essential part of the reason that exploitation arose the way it did in these two cases and also why it fell.

The Jim Crow laws that separated the races did not follow hard on the heels of Reconstruction. Woodward (1974) argues persuasively that there was much progress in race relations, especially in the Old South, between the end of Reconstruction in the 1870s and the turn of the century. Blacks were often served in the same dining rooms as whites, traveled in the same rail cars, and were allowed to engage in legal action and to vote. Black votes, in fact, were actively courted by the various factions that competed for power after the Union presence was diminished in the 1870s. Although the region was certainly not completely free of either hostility or forced separation, it may have been little different from the situation then prevalent in the rest of the United States. Contemporary black travelers from the North were often impressed with the relative freedom of blacks in the South (Woodward, ch. 2), and it was only in the late 1890s that strict, legal racial segregation began to appear throughout the southern states. By the 1940s racial separation was considered a deeply ingrained feature of the Southern psyche that legislation could do nothing to change (Myrdal, 1962).

Apartheid's development was also relatively recent. Racial laws were enacted in the inland, agricultural republics founded by Afrikaners quite early on, but were absent from the British controlled Cape Colony (Sowell, 1983). Not until 1902, following the Anglo-Boer Wars, did apartheid begin to take shape. The process of institutional exploitation in South Africa was marked by a series of battles between the white mining and manufacturing interest—who favored an integrated work force—and the older Afrikaner agricultural and labor interests, who strove to enact the so-called Colour Bar into law (Lundahl, 1992; Hutt, 1964). Legislation in 1911 and 1926 marked early victories for the repressive interest, but they triumphed only in 1948 with the election of the Nationalist Party. After this, a massive and costly bureaucracy arose to administer the racial separation.

Laws dividing the races in the two countries took a relatively long time to develop. The model of this article suggests that it may have been because the relative wealth of the black population, Z, was at first too small to warrant the cost of exploitation. In terms of Figure 3, Z started out small, perhaps at Z_0.

Following the Civil War, the former slaves in the southern United States were extremely poor. Few of them had been able to accumulate any physical or human capital so, even though their numbers were not trivial, their wealth relative to their previous owners must have been minuscule. In the context of the model, it would have been in the interest of whites to wait for Z to rise, both through population increase and individual accumulation, before enacting a policy of overt segregation. In terms of Figure 3, the initial phase of the path, DE, lasted until about 1900. After that, it became rational to impose the Jim Crow laws to divert income from blacks to whites. Z rose increasingly slowly along the segment

EQ, as the degree of exploitation became more intense, and the steady state might have been achieved in the 1920s.

Was Z rising between 1870 and 1900 in the south of the United States? Support for this interpretation of segregation depends on the fact that blacks as a group were becoming closer in living standards to their white counterparts before the onset of legal restrictions. Data for this period is poor, but Higgs (1977) constructs estimates to show that in fact the income of blacks in the South rose at about 2.7 percent per year in the thirty years before the turn of the century. While the U. S. economy as a whole grew at 2 percent, the southern economy, depressed by stagnant agricultural prices, probably grew even slower. In Higgs's words: "Nevertheless, the likelihood that over a third of a century black incomes advanced more rapidly than white incomes is a matter of great significance" (p. 102). He also provides data that show a significant rise in black land ownership (p. 78) and modest gains in other property. One of the most significant indicators of the accumulation of human capital is the fact that literacy went from about 5 to 10 percent in 1865 to 50 to 70 percent in 1910 (Higgs 1977, p. 120). Relative income of blacks to whites—which should be highly correlated with Z—rose, according to Higgs, from about .25 to .40 over this period (p. 126), which is in line with my example in Table 1. Although these estimates cannot be treated as precise in the least, they establish the presumption that the total share of the wealth owned by blacks increased dramatically right before the onset of formal segregation.

Segregation lasted over sixty years, a period during which blacks' material progress ceased to outpace that of whites. The evidence suggests that during this time Z was nearly constant (Myrdal, 1962; Sowell, 1983). If a steady-state equilibrium was achieved during this period, it did not survive two important developments. First, political conditions changed in the early twentieth century resulting in a curtailment of immigration from Europe and subsequent labor shortages in the industrial North of the United States. The response was a large and steady migration of blacks from the rural South, causing a decline in the relative growth in the black population, and possibly a discrete shift back in Z. Woodward (1974, p. 128) estimates that in the 1940s the white population in the South grew thirty-three times faster than the black, largely because of migrations. Second, national attitudes changed, perhaps partly in response to the migrations, and became far less tolerant of segregation.[16] The federal government effectively raised the cost of institutional exploitation (the parameter a) by first requiring ever-greater improvements in segregated school facilities (Woodward, 1974). Later, stronger and more direct sanctions were imposed. As detailed in the last section, if sanctions are strong enough, exploitation will be brought to an end voluntarily.

Apartheid's onset also appears to have been preceded by a steady increase in the relative wealth of blacks. The upward movement in Z that triggered apartheid was the result of a fast-growing black population, labor shortages in the mines, and bottlenecks arising from the lack of skilled and semiskilled workers in growing industries in the first quarter of this century (Lundahl, 1992). While blacks were often "crowded" into rural areas to prevent competition with white labor, high demand increased black employment in the urban industrial sector. The political response by the powerful nonindustrial element was the full institutionalization of separation in 1948.

Apartheid could not sustain itself either. Two reasons appear plausible. One was the imposition of international sanctions in the 1980s, although it is debatable whether or not they were strong enough to avoid having the perverse effect noted in the last section. Second, and perhaps just as important, was the fact that the numerical increase in the black population was extremely high relative to whites; Γ was very large. Unlike the American South, moreover, blacks were well in the majority throughout the exploitation period. In 1960 blacks outnumbered whites by about 3 to 1; by 1990 that figure had risen to 5 to 1. If current population trends continue, blacks will outnumber whites 17 to 1 by the year 2040.[17] As we saw in the last section, if Γ were high enough there would have been no steady state, and Z would have risen in spite of the exploitive regime until it was no longer profitable to continue the exploitation.

7. Conclusion

Exploitation distorts the economy's growth path by forcing the ruling group to spend resources to subdue and extract wealth from other groups. Although this activity raises the return to capital for the exploiter, the group that suffers exploitation sees a steep decline in its net return, resulting in a reduction in the growth rate of aggregate capital. The phenomenon of exploitation—meaning a systematic, institutional process for transferring wealth between groups—leads to increasingly unequal distribution and low growth. As in other cases of incomplete property rights, many of which have been analyzed recently in the literature, the distortion shows up in underaccumulation of wealth.

Relative wealth plays a key role in the analysis, since it provides a measure of the importance of the two groups. When one group's wealth, summed over all of its members, is very small in comparison to the total wealth of the other group, then exploitation is not likely to occur. It is not worth the cost to put in place the machinery of exploitation. On the other hand, if a group's wealth is considerable, it is beyond the reach of exploitation by virtue of its size and strength. In a particular range of its relative wealth, however, a group is vulnerable. If its initial state of importance falls in this range, it will be exploited.

As accumulation continues and the economy grows, it may approach a steady state in which the exploited group's total wealth keeps a constant relation to the total wealth of its exploiter. This is only possible, however, if the exploited group's numbers grow *faster* than the population in the exploiter group. Otherwise, exploitation would guarantee that the total wealth of the exploited group fell continuously in relation to that of the exploiter. From this perspective, population growth differences are a cause, and not an effect, of exploitation.

Immigration of members of the exploited group provokes temporarily harsher exploitation, and lower growth, in order to regain the original growth path. A permanent increase in the population growth rate of the exploited group causes a permanently greater level of exploitation. The results on population growth transfer, perhaps surprisingly, to innate productivity differences. As long as the productive group is small in number, so that its importance is low even if the members are each wealthy, the difference in productivity provides a foundation for steady-state exploitation. Ability differences alone would make the small group become increasingly important; once it hits the critical range, the other group is presented with the opportunity to exploit. When it seizes this chance, the very act of exploitation arrests the natural increase in importance and creates a steady state with the productive group in the inferior position. This may account for the low growth rates in the economies in which productive minorities experience discrimination.

International sanctions have a discontinuous effect. When applied weakly, they exacerbate the problem and reduce the rate of growth. If their level is increased steadily, however, there will come a point when they induce the exploiter to stop its exploitation. Growth rises. Sanctions of this sort may have assisted the demise of both segregation and apartheid.

In an ideal world, economic growth reflects the true productivity of capital. In the natural world, this is not always the case. Exploitation distorts the return to capital and reduces aggregate growth, even as it drives a wedge between the growth rates of the two groups, and generates increasing inequality.

Appendix A. Who Exploits Whom?

The identity of the exploiter in static equilibrium can be established with basic game theory. First, assume that two strategies can be played: *attack* or *rest*. *Attack* means to seek to dominate the other by force, incurring the fixed cost a, whether successful or not. *Rest* means to do nothing. The simultaneous play of the two strategies leads to the following outcomes. *Exploitation* is the result when either (1) one group attacks and the other rests or (2) a strong group attacks a weak one, even if the weak group is also attacking. *Coexistence* is the result if both groups rest. Finally, *struggle* occurs when two groups of equal strength attack. Neither side prevails in a struggle.

A group can be either weak or strong, depending on the value of Z. We being by considering the strong against weak game. Panel 1 of Figure 5 shows the payoff matrix for the two groups when A is strong and B is weak. The $+$ sign means attack and the $-$ means rest. Each cell is divided by a diagonal: the payoff to A, relative to the coexistence equilibrium, is shown above this diagonal; the payoff to B appears below it. If both rest, they achieve coexistence and a joint payoff of 0. If both attack, A wins by virtue of its strength and receives ν^A. B, on the other hand, has a loss of $(a + \tau^A)$, the cost of its futile attack plus the tax imposed on it by A. If only A attacks, its payoff is the same and B's loss is smaller, since it did not incur the attack cost. If only B attacks, it "wins" and imposes a tax of τ^B on the A group. The victory is Pyrrhic, though, since it is weak and its payoff ν^B is negative. Inspection of this game reveals that there is a single Nash equilibrium: A attacks and B rests. This is the *exploitation equilibrium*.

The strong-versus-strong case is illustrated with Panel 2. If both attack, then both lose $-a$, since neither side can dominate the other. Second, if A attacks and B rests, A's payoff is now positive. The unique Nash equilibrium for this game is joint attack or *struggle equilibrium*. This result is clearly inferior to the joint rest strategy, but the latter is not a Nash equilibrium.

Finally, the weak *versus* weak game is shown in Panel 3. *Joint rest is always a Nash equilibrium*, but there may be another one, too. Because of the model's symmetry, if one country is weak for $Z = 1$, then so is the other one. At that point, if $a < \tau_M$—where τ_M is given by (8)—it pays to incur the attack cost *defensively*, to avoid being taxed by the other group. I assume, however, that the groups would select joint rest, leading to the *coexistence equilibrium*. My reason for this is that, even if there are two equilibria, the joint

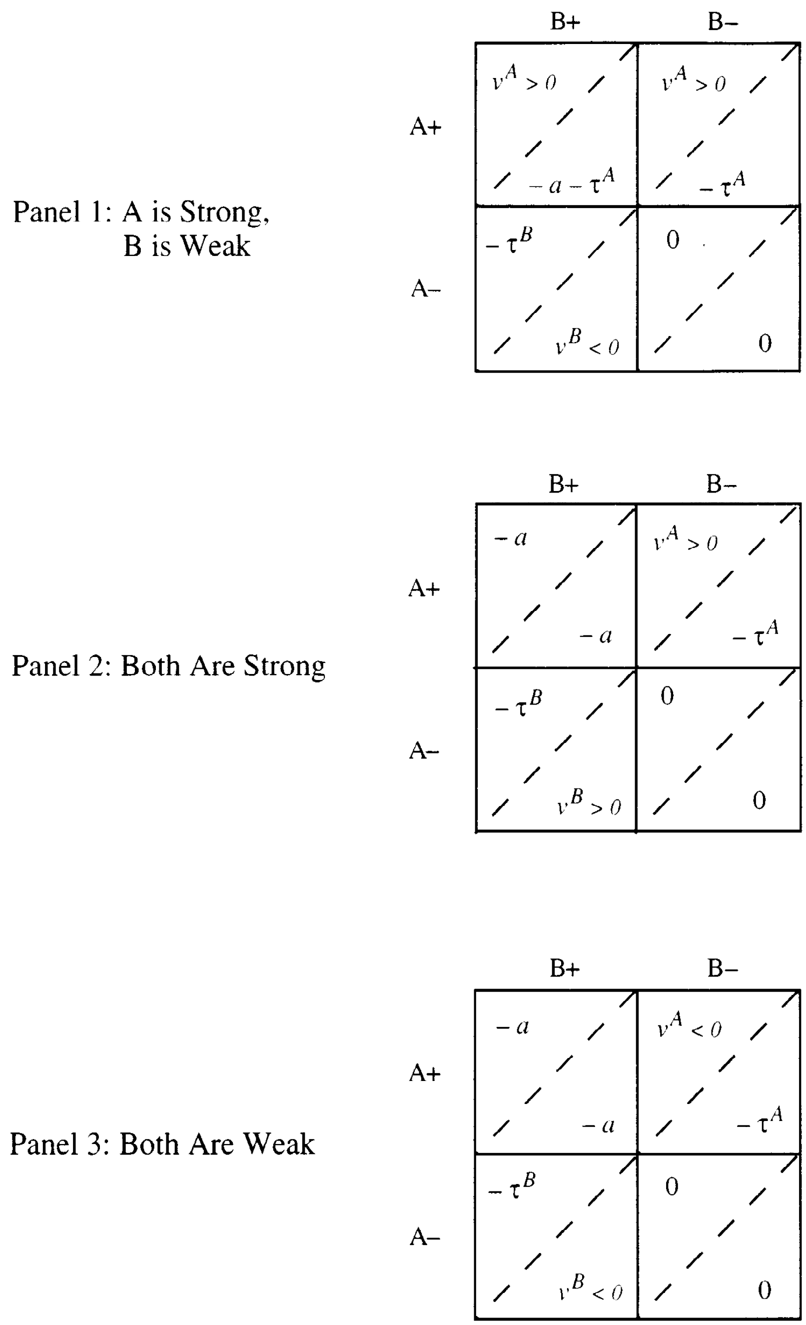

Figure 5. Payoffs.

rest equilibrium is Pareto dominant and may serve as a focal point even without cooperation or communication.

Appendix B. Exploitation Policy

1. Necessary Conditions

The current-valued Hamiltonian for the tax-policy problem is

$$H = \ln[\rho_n k^A] + q_k k^A (P + \nu(\tau, Z, a) - \rho) + q_Z Z(\Gamma - \tau - \nu(\tau, Z, a)), \tag{25}$$

where $\rho_n \equiv \rho - \eta^A$, and q_k and q_Z refer to the shadow prices of k^A and Z, respectively. The single control variable is τ. Let $u_k \equiv q_k k^A$, $u_Z \equiv q_Z Z$, and their ratio $\omega \equiv u_Z/u_k$.

The following are necessary for an optimal path:

$$\frac{\partial H}{\partial \tau} = 0 \Rightarrow \nu_\tau = \frac{\omega}{1-\omega}, \tag{26}$$

$$\dot{q}_k = \rho_n q_k - \frac{\partial H}{\partial k} \Rightarrow \frac{\dot{u}_k}{u_k} = \rho_n - \frac{1}{u_k}, \tag{27}$$

$$\dot{q}_Z = \rho_n q_Z - \frac{\partial H}{\partial Z} \Rightarrow \frac{\dot{u}_Z}{u_Z} = \rho_n + \nu_Z Z \left(1 - \frac{1}{\omega}\right), \tag{28}$$

$$\lim_{t\to\infty} e^{-\rho_n} u_k(t) = 0, \tag{29}$$

$$\lim_{t\to\infty} e^{-\rho_n} u_Z(t) = 0. \tag{30}$$

Equation (20) follows directly from (26) and (7) using (8). There is one important qualification to the use of (20): *for $\omega > 1$, this condition picks out the minimum to the Hamiltonian*. Thus, if $\omega > 1$, the optimal policy would be to set $\tau = 0$. In all of the examples, however, ω remained far below 1. To get (21) in the text, combine (27) and (28) and set $u_k(t) = 1/\rho_n$. The latter is sufficient to satisfy (29) because of (27). The remaining transversality condition can be satisfied if $\omega(t)$ approaches a constant; $Z(t)$ need not become constant.

2. The FF Boundary and the Corner

A's government can always avoid all costs by stopping its exploitation. This means that there may exist a region where A can earn a positive subsidy yet elects not to exploit so that Z grows faster. To see if this region exists, compare the maximized Hamiltonian that comes from using (20), H^R, to the alternative Hamiltonian, H^0, that is determined by letting $\tau = \nu = 0$. The two Hamiltonian forms are just equal for values of ω and Z that satisfy

$$\nu_R = \omega(\nu_R + \tau_R), \tag{31}$$

where ν_R is the subsidy rate that results from using the rational tax (20) in (7). Condition (31) defines the FF boundary in Figure 3. In other words, the maximum of the Hamiltonian H^R is only *local* if ω lies above the FF locus: the *global* maximum of H occurs in the $\tau = 0$ corner.

For $\omega = 0$, we know $\nu_R = \nu_M$ by (20), whereas by (31) $\omega = 0$ means that $\nu_R = 0$. Together, these imply that FF crosses the horizontal axis at the points that define a myopic exploiter's zone of strength, Z_L and Z_H, as in Figure 1.

The FF boundary moves downward for increases in *a* (which affect ν_R) but is not affected by B's relative population growth, Γ.

In the corner above FF the motion in ω and Z is given by[18]

$$\dot{\omega} = \rho_n \omega, \tag{32}$$

$$\dot{Z} = \Gamma Z. \tag{33}$$

3. Γ *Too High for a SS*

If B's population growth were very high, the steady state in Figure 3 would lie *below* the viability constraint, rendering it nonfeasible. An alternative plan is illustrated in Figure 6, panel 1. If the initial relative wealth were Z_3, the planner would follow HIJK. This path has the property that it reaches $\omega = 0$ at the precise moment that it hits the FF boundary, so that by (32) ω remains constant at zero thereafter. Along this path, exploitation is only temporary and ceases at point J. This is an example of a path that satisfies the necessary conditions, but along which Z grows forever (assuming that Group B does not begin to exploit A later). This scenario corresponds to the end of apartheid.

There is one caveat: the above path may not exist, since the upper unstable arm from saddle-point Q$''$ may intersect FF to the left of point J. If so, a new criterion, like that described below, is necessary.

4. Γ *Too Low for a SS*

When B's population growth is zero, or very low, no steady state exists under the FF boundary, and no path satisfies all of the necessary conditions for an infinite horizon. Instead, given a finite horizon T, the planner should select the plan that satisfies $\omega(T) = 0$. This path is shown in Panel 2 of Figure 6 beginning at L and ending at M. If T is long, there may be an initial phase over which no exploitation occurs. Compared to a myopic ruler, a rational one exploits less intensely until T.

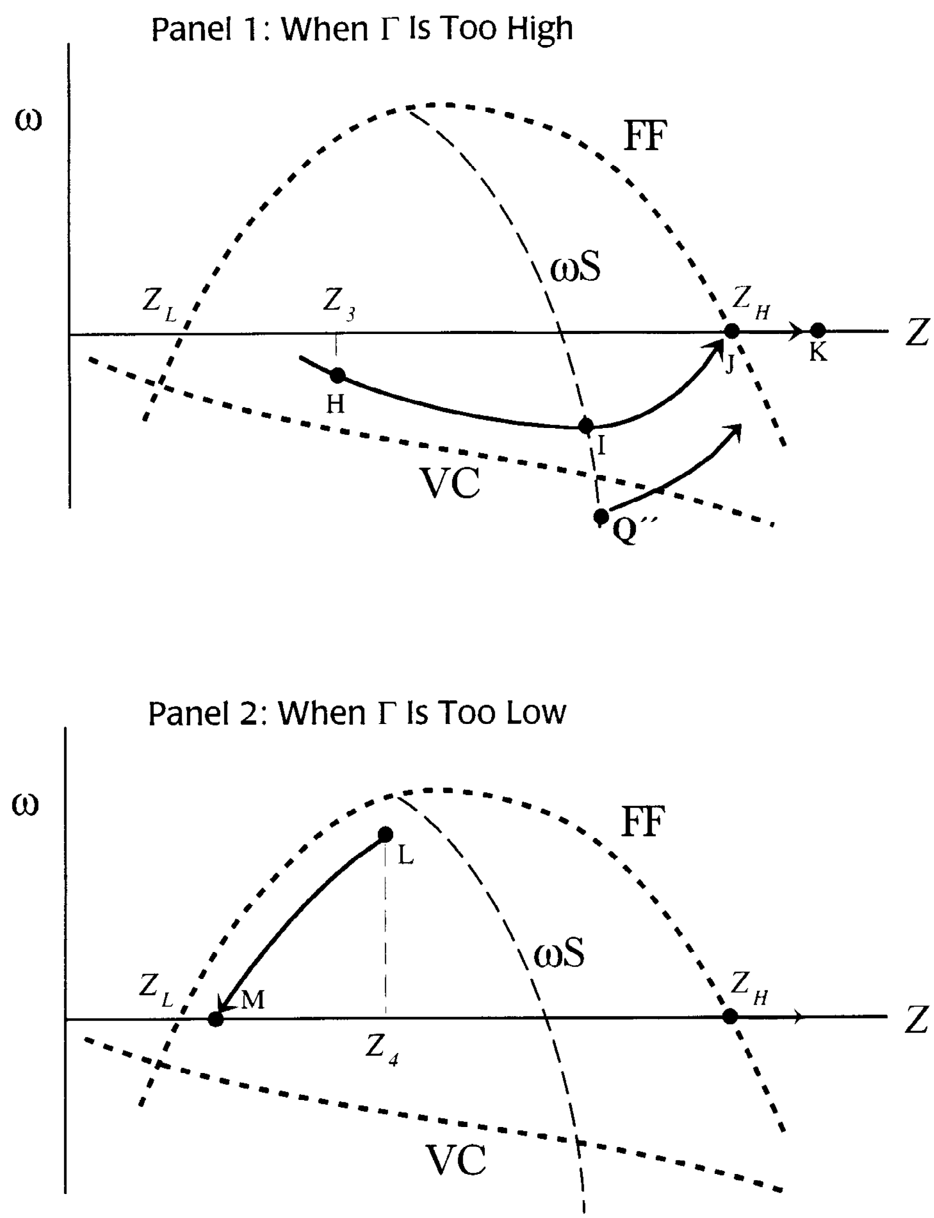

Figure 6. No steady state.

Notes

1. Much of this literature is concerned with the technology by which resources are seized, the ways to defend against it, and the nature of the ensuing equilibrium. Hirshleifer (1995), Skaperdas (1992), Grossman and Kim (1995), and Umbeck (1981) are notable theoretical examples, but they do not consider growth. Horowitz (1985) analyzes ethnic conflict from a political perspective.
2. See Bénabou (1996) and Perotti (1996) for surveys, both theoretical and empirical, on this issue. In a related paper, Galor and Zeira (1993) show that in the presence of imperfect capital markets, the initial distribution of income determines the rate of growth and the subsequent evolution of inequality.
3. A referee pointed out to me that endogenous coalition formation may quite important in related contexts. For example, Olson (1982) places the creation of distributional coalitions at the center of his historical analysis of growth. In their work on predation and morality, Grossman and Kim (1996b) allow endogenous group formation based on consumption maximization.
4. In a later section I allow one group to be more productive than the other. This basic production technology is used in the growth models of Tornell and Velasco (1992), Grossman and Kim (1996a), Benhabib and Rustichini (1996) (some examples), and Bénabou (1996).
5. A similar tax is used by Alesina and Rodrik (1994) to represent redistribution in their model of growth with public goods and income inequality. Because of the form of the production function, the wealth tax is identical to an income tax of τ/P.
6. McGuire and Olson (1996), in a model of autocracy and democracy, also assume that collection costs rise with the magnitude of the tax rate.
7. Grossman and Kim (1996b) employ a similar mechanism. There, the greater the *number* of producers relative to predators, the smaller the fraction of their output that can be plundered by the predator group.
8. Laban and Sturzenegger (1994) present a model of macroeconomic stabilization in which the richer of two groups is able to transfer assets abroad to avoid some taxation. In Tornell and Velasco (1992), groups transfer assets abroad to make them secure from general seizure.
9. Hutt (1964) noted that the budget of the South African Department of Native Affairs jumped from £3.5 million (185 employed) in 1948 to £13.5 million (735 employed) in 1962 following the institutionalization of apartheid.
10. Both quotes come from The Federalist No. 10 (November 22, 1787). See *The Federalist* (1961). I thank Thomas Fehsenfeld for suggesting this reference. These quotes reveal again that endogenous coalition formation, although beyond the scope of this article, is important in many situations of political exploitation.
11. To derive this result, construct the Hamiltonian, $H = \ln c + \lambda[Pk - c - \eta k]$, where λ is the utility-price of a marginal unit of capital, and the initial population is normalized to 1. It is necessary that $\lambda = 1/c$, the marginal utility of consumption, and that λ grow at the rate $\rho - \eta - \partial H/\partial k$. Together these deliver (12).
12. As explained in Appendix B, it is never optimal to let $\omega > 1$.
13. In what follows, η^A is held fixed to keep ρ_n unchanged. All changes in Γ are due to changes in η^{B}. Appendix B provides the explanations for the statements made in the text.
14. Cases where no steady state exists are dealt with in Appendix B, sections 3 and 4.
15. Two things should be clarified here. First, when FF lies entirely beneath the axis, a value of $\omega(t) = 0$ is feasible since the relevant motion equation is given by (32) in Appendix B. Second, this solution assumes that A's government does not worry about the fact that Z will grow indefinitely, thus eventually making B the potential exploiter. This is proper if B is also subject to the high a^*. But if it is not, then A would be willing to pay to keep Z constant, if the payment were not too high.
16. Woodward (1974) points out that between the 1890s and 1940 the United States was engaged in colonial expansion in Asia. The arguments made by Northerners in its support made it difficult to complain about Southerners' exploitation of blacks. After World War II this was no longer an obstacle to Northern pressure.
17. See Lundahl (1992, p. 336), who presents a rich theoretical and historical picture of apartheid.
18. To find these, first substitute the corner conditions into the Hamiltonian, then differentiate according to (27) and (28).

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