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Growth, Poverty and Asset Allocation: The Role of the State

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Abstract

This paper studies the consequences of certain widespread policies for the quality and sustainability of growth. These policies cause economic inefficiency, environmental destruction and increased poverty. The paper develops a political economy model to show why the existence of such policies is not likely to be the fruit of errors or miscalculations by policy-makers. A key characteristic that distinguishes this analysis from other political economy analyses is that it allows for an essential asymmetry in the political lobby, with the wealthy having the ability to influence governments through bribes and political contributions while the poor are unable to do so. The key consequence of this is that the policy setting tends to perpetuate or even worsen an initial level of concentration of wealth. Policies are biased in favor of those who can afford to lobby and pay bribes, thus generally preventing policies that improve the initial wealth distribution. At the same time these resulting policies are likely to be detrimental for growth in the long run. We illustrate some of these ideas with a formal general equilibrium model of an agrarian economy with emerging capitalist sectors, where the allocation of land between peasants and capitalists takes place via a political equilibrium instead of via market mechanisms. We show that the resulting land allocation not only reduces the income of peasants but is also inefficient and contributes to environmental degradation of the land left with the peasants. At the same time the model shows that in the early stages of capitalist accumulation wages are likely to fall while peasants' income continues to decline throughout all stages of capital accumulation.

Kurzfassung

Diese Studie untersucht die Folgen bestimmter weit verbreiteter Politiken, die für die Qualität und Nachhaltigkeit von wirtschaftlichem Wachstum von Bedeutung sind. Die entsprechenden Politiken sind häufig ökonomisch ineffizient, belasten die Umwelt und verursachen zunehmende Armut. Die Studie entwickelt ein politikökonomisches Modell mit dem gezeigt wird, weshalb diese Politiken wahrscheinlich nicht auf Irrtümern oder Fehleinschätzungen von Politikern basieren. Ein Schlüsselcharakteristikum, das diese Analyse von anderen politikökonomischen Analysen unterscheidet, ist die Berücksichtigung von Asymmetrie im System des politischen Lobbyismus: Während die Wohlhabenden die Möglichkeit haben, mit Bestechungsgeldern und Spenden Einfluss auf Regierungen zu nehmen, bleibt dies den Armen verwehrt. Die Konsequenz hiervon ist, dass die politischen Rahmenbedingungen häufig so gestaltet werden, dass die Konzentration des Wohlstands anhält bzw. sogar zunimmt. Politiken sind somit fehlgeleitet, da sie diejenigen unterstützen, die Lobbyismus betreiben und Bestechungsgelder zahlen können. Damit werden im allgemeinen Politikmaßnahmen, die zu einer Verbesserung der Einkommensverteilung beitragen könnten,

verhindert. Gleichzeitig erweisen sich die entsprechenden Politiken als nachteilig für langfristiges Wachstum. Die vorliegende Studie veranschaulicht einige dieser Vorstellungen mit einem allgemeinen Gleichgewichtsmodell einer agrarisch geprägten Gesellschaft mit entstehenden kapitalistischen Sektoren, in denen die Landverteilung zwischen Kleinbauern und Kapitaleignern über eine politische Einflussnahme statt über Marktmechanismen erfolgt. Sie zeigt, dass die daraus resultierende Landverteilung nicht nur die Einkommen der Kleinbauern senkt, sondern auch ineffizient ist und die Degradation des Bodens erhöht, der den Kleinbauern zur Bewirtschaftung bleibt. Gleichzeitig zeigt das Modell, dass in frühen Phasen der Kapitalakkumulation die Löhne eher sinken, während das Einkommen der Kleinbauern in allen Phasen der Kapitalakkumulation rückläufig ist.

1 Introduction

The development experience over the last half-century has been largely a failure. With the exception of a few countries, mostly in East Asia, economic growth has been either largely absent (sub-Saharan Africa) and/or not persistent over time (Latin America and parts of Asia). Over the period 1975-95, developing countries experienced an average GNP growth rate of 3.9% per annum, only about 1.2 percentage points higher than their population growth rate over the same period.[1] More importantly, the *quality* of growth in many countries that have experienced relatively fast economic expansion during certain periods has not been satisfactory. Income distribution has worsened or not improved in most countries, absolute poverty has been reduced only marginally, human capital of the majority of the population has improved rather slowly and the environment and natural resources have relentlessly deteriorated (World Bank, 2000). Periods of relatively rapid economic expansion (typically lasting less than 10 years) have been frequently followed by periods of economic stagnation and crises. That is, LDCs have generally not been able to sustain rapid growth.

Qualitative features have generally deteriorated during stagnation or slow growth while some indicators, such as poverty, have only marginally improved in periods of fast growth. Others, such as the environmental indicators, tend to deteriorate under rapid growth even faster than in periods of stagnation. Thus, we have experienced consistent unsatisfactory trends affecting two of the most vital assets of society: Social equity and human capital on the one hand, and natural capital on the other.

The objective of this paper is to analyze the forces underlying the less-than-adequate evolution of such important assets. It is shown that both processes represent two sides of the same coin. At the root of this phenomenon is the state and the political factors at play that condition systematic policy biases that favor physical (and financial) capital accumulation against human and natural capital formation. These biases also contribute to explain the general lack of persistency of economic growth over time.

We present empirical evidence of such biases and analyze the consequences of the biases for the patterns of (GDP) growth and/or stagnation and for the asset structure of the economy (part I). In part II we develop a formal model of politico-economy equilibrium of natural resource allocation between dominant economic groups and peasants for a poor rural economy affected by ill-defined land property rights. This analysis is preceded by empirical evidence on natural resource allocations that at least in part support the specification used in the formal

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[1]   Even over the 1990s, considered one of the most successful decades for growth in developing countries, only 10 out of 133 countries experienced GDP growth rates above 4% per annum, while 59 had negative growth rates! (World Bank Atlas, 1999).

model. We show that the emergence of a commercial (capitalist) sector which is able to influence a (rent-seeking) government leads to biased (and inefficient) land allocation through expropriation (rather than through a land market), lower wages, increased poverty among peasants and progressive degradation of the land that remains in the hands of peasants. These findings are consistent with stylized facts documented by a large number of case studies in poor rural economies.

2   Economy-Wide Forces

In this section we provide hypotheses supported by some empirical evidence on how the state in many countries conditions a pattern of growth that is both difficult to sustain and at the same time gives rise to social inequities and degradation of natural capital.

The central hypothesis of this paper is that failure to sustain economic growth for prolonged periods and the poor quality of growth, where and when it has been present, are, in part, the result of biased government policies that systematically favor powerful economic interests to the detriment of the vast majority of the population (Lopez, 2000). These policy biases may arise from political economy forces related to the fact that governments, far from seeking maximization of social welfare, are indeed concerned with several other objectives that in many cases conflict with social welfare. Recent literature on political economy and government policies emphasizes corruption, rent seeking and the search of campaign contributions by government bureaucrats and politicians as prime reasons for systematic policy biases favoring powerful economic interests largely to the detriment of the rest of society.

Such policy biases have resulted not only in the introduction of distortions and regulations favoring special interest groups but, more importantly, in the allocation of massive volumes of public financial and physical resources to the benefit of such groups, with the consequent crowding-out of public investment that promotes human and natural capital. With the purported objective of "creating jobs" and "promoting growth" huge amounts of scarce public funds are routinely used to subsidize large corporations through grants, credit subsidies, tax holidays and concessions, and other mechanisms. Both industrialized and developing countries engage in massive public subsidies to capital, but the burden of such subsidies as a proportion of GDP and of government revenues is much larger in developing countries than in industrialized countries.

2.1 Policy Biases and Subsidies to Capital: Empirical Evidence

During the mid 1990s, OECD countries spent about $440 billion per year in subsidizing just energy, irrigation and agriculture, or about 2.2% of GDP and 10-12% of total government revenues, while developing countries spent between $215 and $270 billion annually in the same subsidies and same period.

For developing countries this represented almost 5% of GDP and more than 20% of total government revenues (de Moor, 2000).[2] Apart from these subsidies, which are mostly environmentally damaging, subsidies directed to the manufacturing sector appear also extremely large. On the basis of several country studies documenting them, and assuming they are somehow representative, one may speculate that they are at least as large as those directed to the energy and agricultural sectors.[3] Thus, this would imply that energy, agriculture and industry subsidies in developing countries amount to about 10% of GDP and 40% of government revenues!

These are direct subsidies to capital. The indirect subsidies, however, are probably much more important, and have included the giveaway of public enterprises, concessions to monopoly powers, lack of financial regulation and concomitant bail-out of large financial corporations when they fail, and the near or total giveaway of natural resources to large cattle, plantation, mining, logging, oil and other natural resource based industries. The giveaway of natural resources affects not only government-owned natural resources but also resources that have been ancestrally used by local communities which frequently end up expropriated.[4]

The vast majority of empirical studies evaluating the impact of direct capital subsidies have concluded that such subsidies have only short-term positive effects on growth at the cost of falling productivity and efficiency over the long run (see for example, Bergstrom, 1998 for Sweden; Beason and Weinstein, 1996 for Japan; Lee, 1996 for Korea; Fakim, 1995 for Poland; Fournier and Rasmussen, 1986 for the U.S.; Harris, 1991 for Ireland, and Bregman, Fuss and Regev, 1999 for Israel.) Moreover, their effects on employment are generally found to be either negligible or even negative. Thus, if capital subsidies are seemingly not in the interests of economic efficiency and are generally regressive in terms of wealth distribution, the motives behind their existence have to be associated with governments having interests other than social welfare.

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[2] It has been argued that these are mostly subsidies to consumers and small farmers, not corporate subsidies or subsidies to the rich. Detailed country studies clearly show that this is generally not true: More than 55% of fertilizer subsidies in India, for example, are indeed absorbed by three large fertilizer manufacturers (Gulati and Narayan, 2000); most irrigation subsidies favor a few large farmers; and a significant part of energy subsidies are captured by large firms (World Bank, 2000).

[3] To illustrate the possible magnitudes of manufacturing capital subsidies consider the following: In Malaysia subsidies associated with just special tax treatment to foreign investment amounted to $2.4 billion in 1996, or more than 10% of the total government revenues (Sieh, 1998). In India, Ford has benefited from a 14-year tax exemption, estimated to cost India's government $0.4 billion or $420,000 for each new job created (Oman, 2000). In Brazil, subsidies to just one large corporation (EMBRAER) cost the government more than $1 billion a year over the mid 1990s and the implicit subsidy costs per job in motor vehicle plants amount to $130,000 to $340,000 (Oman).

[4] In a subsequent section we provide references to a large number of studies illustrating how governments have provided almost free access to large commercial interests to both natural resources owned by the state and resources in the hands of the rural poor.

2.2 The Political Economy of Capital Subsidies

The motivation for such biased allocation of resources varies across countries and circumstances, but can be classified as follows:

(i)   Corruption.   Government officials obtain bribes in return for favors to those rich enough to bribe them (e.g., large corporations);

(ii)   Nepotism.   Especially in non-democratic governments, bureaucrats are forced to favor firms owned by families and close associates of those who hold absolute political power;

(iii)   Political support. Remaining in power (under both democratic and non-democratic regimes) is costly.   Governments need to convince people that they are efficient, compassionate, transparent, concerned about social welfare, etc.   To do this they can either be truthful and/or they can spend large amounts of resources on government propaganda to keep the general public misinformed and, in democracies, to finance political campaigns.   In reality they seem to opt for a combination of policies, some of them consistent with social welfare improvements and many others not.   A key source of political contributions is the corporate sector, which is willing to provide such contributions in exchange for direct and indirect public subsidies;

(iv)   International and national recognition. High-level government figures seek recognition as a means to remain in power and to be rewarded by respect and even high-level and influential jobs in international organizations after they have left government.   One of the best ways of obtaining recognition by the national and international elites is to achieve macroeconomic stability quickly by using the most direct means, which typically includes compressing the income of workers and the poor.   Another important mechanism to achieve recognition is by maximizing short-term GDP growth (as measured by conventional national accounts) at all costs, even if such growth cannot be sustained once the current government abandons power or if its effectiveness as a means to enhance social welfare is negligible or frankly immiserizing.

The importance of corruption as a source of perverse government allocations and distortions has been thoroughly analyzed both conceptually (e.g., Mookherjee and Png, 1995; Lopez and Mitra, 2000) and empirically (Kaufmann et al., 1999).   Additionally, a number of recent works have developed rigorous political support models.   Since the pioneering work of Bernheim and Whinston (1986), a number of authors have applied their model to a variety of government policy biases such as those arising from over-weighting the income of large

corporations that provide political campaign contributions to the government in the government's objective function (Grossman and Helpman, 1994 and 1995; Fredriksson, 1997).

2.3 Capital Subsidies, Asset Structure and the Quality of Growth

The systematic favoring of capital makes it difficult for governments to raise the amount of financial resources necessary to expand human capital pari-passu with physical capital accumulation. In a context of generalized lack of access to credit by the vast majority of the population, this rapid expansion of human capital is highly dependent on government financial resources; but the policy biases discussed above imply that much public resources needed to expand human capital assets are instead channeled to subsidize capital.[5] Additionally, the promotion of large physical capital investment, especially in natural resource rich countries, has implied free or cheap access to natural resources for the large investors as a means to entice them. The lack of pricing of natural resources (and the lack of adequate monitoring and control on their use due to chronic funding shortages affecting public agencies in charge of such activities) implies that rapid physical capital accumulation and growth over the short run result in a fast degradation of natural resources. But such a degradation of natural capital, in turn, causes decreased incentives for further investments and, hence, slows down growth.

The government's priorities in favor of large economic interests imply a biased asset accumulation pattern in favor of physical capital and against human and natural capital. This, in turn, has two consequences: (i) the resulting economic growth is difficult to sustain over time; (ii) the qualitative features of such growth periods are generally not satisfactory and the majority of the population fail to improve their welfare significantly.

Such biased growth is difficult to sustain because as physical capital accumulation takes place, its marginal returns fall quickly due to the lack or slow pace of expansion of the other complementary assets.[6] In fact, several recent empirical analyses have shown that growth tends to decline quite fast as physical capital deepens vis-à-vis other assets and thus that the rather sobering predictions of the neoclassical (Solow) growth model fit better with the evidence than the more optimistic predictions of endogenous growth models (see for example, Mankiw, Romer and Weil, 1992; Young, 1994, 1994; Jones, 1995; and Lopez, Thomas and Wang, 2000). It appears that economies of scale and productivity spillovers linked to physical capital accumulation do exist but their strength is not sufficient to prevent declining returns to physical

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[5] In fact, while developing country governments are spending about 10% of GDP and 40% of government revenues in subsidies to capital and to the rich, their public expenditures on education and health was estimated at only 6% of GDP and 24% of government revenues (UNDP, 2000). Additionally, even the public health and education expenditures are in many countries directed more to subsidize the rich than the poor. In Brazil, Indonesia and Ghana, for example, the richest quintile received two and a half times more public monies for health care and three to four and a half times more of public resources used for education than the poorest quintile (UNDP, 2000).

[6] This is the prediction from the Neoclassical Solow type of growth model. Versions of endogenous growth models, however, predict that growth can be self-sustained if economies of scale and positive externalities or technological spillovers associated with capital accumulation are powerful.

capital as investment takes place if other assets do not expand at a minimum rate. Moreover, in LDCs the failure of the endogenous growth predictions is even worse because human capital accumulation is much more dependent on government support than in industrialized countries. Thus, the idea that the private sector is able to expand human capital (as physical capital investments increase) and increase research and development investments and, consequently, productivity (see, for example, Lucas, 1988), is simply of little relevance to most developing countries.

The quality of growth based on such a biased asset accumulation is unsatisfactory for several reasons: (a) the direct subsidies used to promote physical capital accumulation deepen social inequities as the financial resources used for this purpose subtract from allocations to education, health and social expenditures for the poor; (b) the indirect subsidies used to entice capital investment often imply perverse land reforms and the expropriation of resources from the poor (e.g., giving away natural resources used by the poor, concessions of monopoly powers that lead to higher cost of living, etc.); (c) the slow expansion of human capital and degradation of natural capital that this mode of growth implies, affects welfare of the majority of the population negatively. For the poor, human and natural assets are their main source of income, so a model of development that neglects such assets is likely to have negative impacts on them.

As growth based mostly on physical capital accumulation tends inevitably to decline, a frequent response of governments is to expand even further the direct and indirect subsidies to capital as a means to revive investment. Paradoxically, this intensification of the procapital biases may have only a short-run effect in arresting the declining growth rate, but as these greater subsidies are in one way or another at the cost of human and natural capital, the structural problems that cause stagnation worsen in the long run.

2.4 Globalization

In analyzing the impact of globalization on developing countries, a disproportional effort has been allocated to look at the impact of (North-South) trade (Chichilnisky, (1994), Copeland and Taylor (1994); Brander and Taylor (1997) and Low (1992) to cite just a few). By contrast, despite the fact that international capital mobility was a prominent concern of several early writers (Mundell (1957); Bhagwati (1958); Brecher and Choudri (1982)), relatively few modern analyses exist on this issue, particularly considering the poverty and environmental consequences of capital inflows. This is surprising because over the 1990s the expansion of North-South capital flows has been as large as the increase of North-South trade. In general, the abundant conceptual and trade literature has found that the effects of increased trade for LDCs have been positive. Even when externalities affecting the environment are considered, the net effects of greater trade integration are mostly positive. The effects of trade on the environment are generally country-specific, with as many empirical studies showing environmental improvement as other studies showing the opposite.

The potentially immiserizing growth impact of capital inflows may arise as a consequence of a combination of negative terms-of-trade impacts, preferential tax treatment to foreign investors, and remittances of profits of foreign enterprises (for a dramatic such case, see evidence for the terms-of-trade effects of the massive foreign investment in copper production, which combined with low taxation has apparently led to large losses for Chile (Lopez and Ulloa, 2000)). But apart from terms-of-trade effects, developing countries (generally the recipients of capital flows from the North) are also likely to obtain reduced benefits out of foreign investment if such countries engaged in competition with each other in order to attract foreign investment. This is the so-called "race to the bottom".

A recent study by OECD (Oman, 2000) looking at six large developing countries concluded that incentive-based competition for foreign investment is a global phenomenon. Additionally, it finds that such competition has intensified over the 1990s as barriers to international investment have fallen. Governments have used a variety of "incentives" to entice foreign investment, including many of the same ones used to promote domestic capital, namely, financial and fiscal incentives, easy labor standards, and free or underpriced natural resources.[7]

Another important finding by Oman (2000) is that while governments often justify providing investment incentives by arguing that they are needed to steer corporate investment into poor areas, in reality "… incentives are often of limited effectiveness in this regard … and they sometimes actually reinforce inequalities instead" (p. 8). Other studies suggest that foreign investment does provide some positive externalities that could justify subsidies (see for example, Weigel, Gregory and Wagle (1977) for a well-balanced review of the benefits of foreign investment). Yet most of these studies have focused on foreign investment in the manufacturing sector, where positive spillovers are likely due to the generally skill-intensive nature of their operations, integration with the rest of the economy often leading to important backward and forward linkages of the foreign firm, and other favorable characteristics. However, in the case of foreign investment in natural resources it is questionable whether many of these desirable features apply. Foreign firms exploiting natural resources tend to be enclaves offering little technological spillover and few direct linkages with the rest of the economy.

Thus, the increased capital flows to developing countries due to globalization appear to have reinforced the pro physical capital biases of governments as they compete with each other to provide the best conditions to foreign investors. It appears that the potential greater volumes of foreign investment that globalization entails, has caused greater emphasis on capital subsidies.

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[7] One issue in this respect that has attracted concern in the literature is the competition for foreign investment via lowering environmental standards, the "pollution haven" idea. However, this hypothesis has been shown to be empirically irrelevant (Birdsall and Whealer (1992)).

Further, globalization has apparently led to intercountry bidding wars to attract foreign investors, which greatly increases the profitability of investment and reduces benefits to the host country.[8]

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[8]   The term "bidding war" may seem an exaggeration, but the press is full of reports of such "wars": Argentina and Brazil intensively compete to attract, among others, investors in the automobile industry. Oman (2000) reports that, in part as a consequence of this, the costs to the state per job in such industry in Brazil fluctuates between $130,000 and $340,000. Several other bidding wars, greatly stimulated by large multinational firms, are routinely reported in the specialized media.

3   Natural Resource Allocations and Rural Poverty: Evidence and a Formal Model

In this section we first present empirical evidence showing how the pattern of growth discussed in the previous section has manifested itself in the allocation of natural resources between the rural poor and the emerging resource-thirsty, capital-intensive corporations. This is followed by a formal model of politico-economy natural resource allocation that uses assumptions consistent with the empirical evidence.

3.1 Giving away Natural Resources: Evidence

There is quite significant evidence showing how publicly owned natural resources are given free of charge or nearly so to both domestic and foreign investors. Binswanger (1991) and Browder (1988) provide detailed analyses of policies implemented by the Brazilian government that have encouraged deforestation in the Amazon and that are in fact responsible for almost half of the total deforestation in the region. This has included not only free access to the forest and land resources but also the development of specific public infrastructure and services, preferential tax treatment and outright subsidies. Similar public policy incentives to deforestation in the case of Colombia are discussed in Heath and Binswanger (1996). Large-scale mining operations in many countries receive implicit subsidies by being allowed to pay nothing or very little in royalties that would permit governments to obtain a share of the Hotelling (and Ricardian) rents associated with the exhaustibility of the resource (Castaneda (1997); Lopez and Ulloa (2000)).

Perverse land reforms, where the rural poor are simply expelled and lose entitlement to vast natural resources with the tacit or, many times, explicit support of the government, have been documented for several regions in the world by Kates and Haarman (1992). In Honduras, Stonich (1988) describes the expulsion of rural communities from their forests and cropland to give way to expansion of large cattle operators that demanded more land to exploit the beef bonanza of the early 1970s. Massive amounts of land in Honduras and other parts of Central America were expropriated from the rural communities.

Anderson (1987) documents the expropriation of vast tracts of low-lands from peasants to allow for the expansion of banana and other type of large-scale plantations in Philippines. Lopez and Ulloa (2000) discuss the generous allocation of water resources to large copper mines in an extremely water-scarce area, the desert in the north of Chile, to the detriment of the rural communities. This de facto expropriation of water resources was apparently a major factor

explaining the depopulation of the Chilean Altiplano. Hundreds of thousands of peasants were left with only one option: to migrate.

These are just a few examples of the vast and growing case study literature showing the pervasiveness of the expropriation of the natural resources of the poor in favor of commercial interests. Apart from this, millions of acres of public lands in Latin America, Africa and parts of Asia (many of them environmentally fragile) are routinely assigned to firms and "development projects" at no cost or nearly so. Corporations investing in natural resource extraction generally pay no royalties and pay little, if anything, in taxes. Additionally, the chronic lack of funding for park rangers and other government environmental agencies implies that governments effectively allow illegal logging, hunting and mining in areas that theoretically are protected or reserved for native communities.

Thus, governments in developing countries have been willing to offer natural resources for free or nearly so. In doing this they have given away to investors both resources hitherto unused as well as resources that were originally in the hands of rural communities. This process has had negative consequences for both the environment (due to the expansion of the frontiers into usually more fragile ecosystems) and the rural poor (who have suffered the expropriation of some of their most vital resources). One may speculate that this approach has been an important determinant of domestic and foreign investment in developing countries, especially in resource-rich countries.[9] The real issue is apparently the "natural resource giveaway haven", rather than the "pollution haven", as a mechanism guiding North-South capital flows.

3.2 Allocation of Natural Resources and Political Economy Forces: A Formal Model

In this section we provide a formal general equilibrium model focused on the allocation of resources between peasants and capitalists in a poor rural economy.[10] But unlike most analyses, we do not assume that natural resources are allocated through market mechanisms. We assume instead that in such allocation the government plays a crucial role, taking into consideration not only social welfare but also benefits to government officers due to potential "contributions" from capitalists.

We use here a model of political contributions based on the menu auction game originally studied by Bernheim and Whinston (1986) and later popularized by Grossman and Helpman (1994). Although the derivation of the model is based on the selling of government policies in

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[9] Foreign investment in resource-rich countries in Latin America, Asia and Africa is still overwhelmingly directed to the exploitation of natural resources. Even in a relatively high income country such as Chile, the share of foreign investment in natural resources has been estimated at about 70% of total foreign investment in the mid-nineties (Foreign Investment Committee, Chile, 1999).

[10] By "poor rural economy" we mean an economy where a high proportion of the population is comprised of (mostly self-employed) peasants and the process of capitalist exploitation of the natural resources is still expanding.

exchange for political contributions to the government, the final optimizing framework is similar to a Nash bargaining model of corrupt government officials accepting bribes and firms willing to provide such bribes. Thus, to some extent the ensuing model may be regarded as applying to two of the four sources of biased resource allocation discussed in section II, political contributions and corruption.

3.2.1 *Description of the Economy*

The economy is assumed to be comprised of two types of producers, capitalists or firms (e.g., commercial logging, cattle, plantation, mining and oil interests) and peasants.[11] The main difference between the two groups is related to technology and the outputs being produced. Capitalists produce goods using a complex technology that includes physical capital, (hired) labor, and natural resources. By contrast, the peasants' production technology is much simpler, using only their own labor and natural resources as factors of production. Also, peasants produce different outputs than capitalists. Peasants produce mostly staples (say, cereals and tubers) while capitalists produce more capital-intensive goods, say, beef, plantation products (such as bananas), and others.[12] Both peasant outputs and capitalist outputs are internationally traded. Moreover, we assume that the economy is small so that domestic commodity prices are exogenous equal to the border price.[13]

The peasants have no legal property rights on the land that they use. This largely prevents the existence of land market transactions involving peasants' land. And the land "reallocated" from peasants to capitalists through government intervention or direct occupation of peasant land by commercial interests is usually not titled thereafter either.[14] Apart from largely preventing the operation of the land markets, lack of legal rights to land also has implications for the evolution of the natural resources (biomass, soil quality, biodiversity, etc.) attached to the land.

The peasant sector. The production function of peasants is assumed to be

$$(1) \qquad Q_p = L_p (\lambda_p T_p)^{\alpha},$$

where Q_p is peasants' output, L_p is peasants' labor used in their own production, and T_p is the level of land that peasants use. The coefficient λ_p reflects land productivity and is related to the underlying stock of the natural resource, say biomass and/or soil quality, that affects the

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[11] In a subsequent section (Section 2.4) we extend the model to allow favor a third sector, the industrial sector.
[12] The assumption that each sector produces different outputs helps only to sharpen some of the results but is not crucial for the analysis. If some outputs are produced by both sectors the qualitative analysis is not altered much.
[13] The model can be easily adapted to allow for domestic prices being different from border prices.
[14] This assumption is consistent with stylized facts where commercial operators in many cases do not receive titles for a long period of time and in most cases land is simply given in concession for a limited period of time. Legalization of occupied land titles may take decades (Kates and Haarman, 1992).

productivity of land. We first consider λ_p as constant, but in the second part of the analysis we allow for λ_p to change over time. The coefficient $0 < \alpha < 1$ reflects decreasing marginal product of the resource due to the low resource extraction capability of peasants. That is, the marginal capacity of extracting output declines with the level of T_P. The fact that output in the peasant sector is linear in labor is certainly restricted. We use this mainly for algebraic simplicity. We will, however, discuss how some of the ensuing results are affected by this specification. Also in Section 2.4 we extend the analysis using a functional form that is not linear in labor.

The total labor force is assumed fixed, $\overline{L}$. Peasants allocate their total labor between working for themselves within the peasant sector and working as hired laborers in the capitalist sector. Thus, the total labor (we assume that capitalists do not work directly), is allocated as

$$(2) \qquad \overline{L} = L_p + L_c,$$

where L_c is the labor supplied by the peasants to the capitalist sector.

The capitalist sector. Firms in the "modern" or capitalist sector have a different production technology,

$$(3) \qquad Q_c = F(L_c, \lambda_c T_c K),$$

where Q_c is output from the capitalist sector, T_c is land area used by capitalists, K is the stock of capital, and λ_c is land productivity that is related to the underlying natural resource, biomass and soil quality. We assume that $F(\cdot)$ is homogenous of degree one in L_c and $\lambda_c T_c K$. The natural resource acts as a productivity-enhancing factor of physical capital (technical change B la Harrod). Thus, the marginal product of K $(F_2(\cdot)\lambda_c T_c)$ is declining in K but increasing with T_c. The idea with this specification is to underline the capital-intensive nature of resource extraction in the capitalistic sector. Using the homogeneity assumption we can express (3) as

$$(4) \qquad Q_c = F(L_c / \lambda_c T_c K, 1)\,\lambda_c T_c K \equiv f(L_c / \lambda_c T_c K)\lambda_c T_c K \,.$$

The net revenue function of capitalists is

$$(5) \qquad \tilde{R} \equiv \max_{L_c} \left\{ qF(L_c, \lambda_c T_c K) - wL_c \right\},$$

where q is output price and w is the market wage rate. Using (4) it follows that the net revenue function of capitalists can be written as

$$(6) \qquad \tilde{R} = \lambda_c T_c K \, R(q, w),$$

where R(q, w) is increasing in q and decreasing in w, convex and a linearly homogenous function.[15]

The total land available, T, is assumed to be fixed. Hence the land constraint for the economy implies that

(7) $T = T_p + T_c$.

3.2.2 Initial Land Allocation: Temporary Equilibrium

The analysis of the dynamics of the natural resource is left for the next section. In the meantime, we proceed the analysis assuming that $\lambda_c = \lambda_p$ and given. We assume that *initially* all land is used by peasants and that its productivity is homogenous. That is, at the time of the initial land reallocation from peasants to capitalists, $\lambda_c = \lambda_p$. This is the solution obtained for given values of λ_c and λ_p which is consistent with what has been sometimes called temporary equilibrium of dynamic systems. Once land is allocated to each group, it is subject to different degrees of pressure and, consequently, as we will see later, λ_c and λ_p may change over time in a different manner. So, in second-round reallocations, after the dynamics of the land quality is allowed to take place, λ_c and λ_p become different between each other.

Labor market. If labor is allocated competitively between the two sectors, we have that $w = (\lambda_p T_p)^{\alpha}$, e.g., for a *given* allocation of land, and land productivity λ_p, the wage rate is fixed. (We normalize the price of the commodity produced by the peasants to one.) However, as the land shifts to the capitalist sector, peasants' marginal labor productivity falls and thus the wage rate also declines. This unambiguous negative effect of L_c on w is, of course, due to the linearity of the peasants' production function in L_p. However, it can be shown that under a general specification for the peasants production function with constant returns to scale that

$$\frac{dw}{dT_c} \underset{<}{\overset{>}{=}} 0 \ \text{ iff } \ \frac{L_p}{T_p} \underset{>}{\overset{<}{=}} \frac{L_c}{T_c} \ .$$

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[15] This structure of the revenue function follows from the fact that F(·) is linearly homogenous in L_c and $\lambda_c T_c K$. This can be seen by dividing and multiplying the right-hand side of (5) by $\lambda_c T_c K$. Thus, the following maximization is equivalent to (5):

$$\overset{..}{R} = \lambda_c T_c K \ \underset{L_c / \lambda_c T_c K}{\max} \left\{ qF\left[\frac{L_c}{\lambda_c T_c K}, 1 \right] - w\left(\frac{L_c}{\lambda_c T_c K} \right) \right\}$$

$$\overset{..}{R} = \lambda T_c K_c \ R(q, w)$$

That is, shifting land from peasants to capitalists will have a negative impact on the wage rate as long as the labor to land intensity of peasant production is higher than the labor to land intensity of capitalists.   Given the fact that unlike peasants, capitalists also use capital, which is generally a substitute for labor, this is a plausible assumption.

Welfare of peasants and capitalists. Peasants/workers and capitalists have budget constraints as follows:

$$(8) \qquad e(q,1)\mu_p = L_p(\lambda_p T_p)^\alpha + w(\overline{L} - L_p)$$

$$(9) \qquad e(q,1)\mu_c = \lambda_c T_c K\, R(q,w),$$

where $e(\cdot)$ is a unit (dual) expenditure function (or cost-of-living index), μ_p and μ_c are welfare of peasants/workers and capitalists, and $\overline{L} - L_p = L_c$ is the labor demand from the capitalist sector.   We have assumed that peasants/workers and capitalists have homothetic preferences (and, hence, the linearity of expenditure functions in μ_p and μ_c).

Political equilibrium.   The key issue is how land is allocated between the two groups. The conventional approach is to assume a competitive land market that yields an "efficient" land allocation between the two sectors by equalizing the marginal land productivities.   Here, instead, we recognize the vast empirical evidence pointing to the great power of the state in such allocations, especially in situations (so frequently encountered in poor countries) where peasants do not have legal land titles or, when they do, the rule of law is inadequate to give them full protection against pseudo legal or openly illegal expropriation.

We assume that, unlike peasants, capitalists (the owners of K) have political influence by being able to finance the costs required to keep the government in power (e.g., costs associated with repression, media propaganda, political campaigns, etc.).   So the allocation of land, with the government's active or passive influence, will be determined via a menu auction type game where the government considers *both* the "contributions" of the capitalist sector and social welfare each with different weights.

The welfare of the government (μ_G) is therefore defined by

$$(10) \qquad e(q,1)\mu_G = C(T_c) + a\,[\lambda_c T_c K\, R(q,w) + L_p(\lambda_p T_p)^\alpha + w(\overline{L} - L_p)]$$

where $C(T_c) \equiv \sum_{j=1}^{s} C(T_c^j)$ is the contribution of the capitalist sector to the government ("s" is the number of firms offering contributions to the government bureaucrats), "a" is a non-negative constant, and the term in square brackets is the total welfare of capitalists and peasants.

The contribution schedule $C(T_c)$ is an increasing function of the amount of land awarded to capitalists, T_c.

The total welfare of the participants of the game, capitalists and government, is defined by the following equation:

$$(11) \qquad e(q,1)(\mu_c + \mu_G) = C(T_c) + a\,[\lambda_c T_c K\,R(q,\,w) + L_p(\lambda_p T_p)^\alpha + w(\overline{L} - L_p)]$$
$$+ \lambda_c T_c K\,R(q,\,w) - C(T_c)$$

As Bernheim and Whinston (1986) and Grossman and Helpman (1994) have shown, a sub-game-perfect Nash equilibrium requires that $C(T_c)$ be feasible (non-negative and not greater than the total income of capitalists); the equilibrium land allocation, T_c^0, must maximize the government's own welfare, μ_G; and T_c^0 must at the same time maximize the joint welfare of the participants in the game, $\mu_c + \mu_G$.

From (11) the equilibrium allocation of T should satisfy,

$$(12) \qquad T_c^0 = \underset{T_c}{\mathrm{argmax}} \{\ \lambda_c T_c KR(q,\,w) + a\ [(\lambda_c T_c KR(q,\,w))$$
$$+ L_p(\lambda_p(T - T_c))^\alpha + w(\overline{L} - L_p)]\}\ .$$

We note that in (12) we have included the land constraint (9) and that the maximized equation should be deflated by the cost-of-living index $e(q,1)$. But since this does not affect the maximization conditions, we omit it in (12). Thus, (12) postulates that the equilibrium land allocation level, T_c^0, is the result of a maximization of an objective function where the income or welfare of capitalists is overrepresented vis-à-vis that of peasants. The implicit weight to capitalist welfare is $1 + a$, while that of peasants is only a. That is, the coefficient "a" is associated with government preferences for political contributions. It is easy to see that if $a \to 0$, governments give no consideration to peasants' income in its objective function, while if $a \to \infty$, the government would be fully balanced and would indeed maximize social welfare (e.g., the resulting land allocation would be consistent with competitive equilibrium).

In determining the first order conditions of (12) one may assume two alternative specifications: (i) Decentralized bargaining: There are many firms negotiating with the government. This implies that each bargaining process takes wages as given in the determination of land allocation. That is, in this case the land allocation process is completely independent of labor market equilibrium. Formally this is equivalent to maximizing the objective function in (12), taking w as given. (ii) Centralized bargaining: There is only one capitalist negotiating with the government, or all firms bargain using a single representative. This may imply that the optimization in (12) needs to explicitly consider the effect of T_c on

wages. That is, the absence of competitive allocation in the land market spills over into the labor market.

Thus, under *decentralized bargaining* we have that the first order condition of (12) is

$$(13) \qquad (1+a)\lambda_c \, KR(q, w) - a \, \alpha \lambda_p L_p (\lambda_p (T - T_c))^{\alpha-1}$$

$$+ a((\lambda_p (T - T_c))^{\alpha} - w) \frac{\partial L_p}{\partial T_c} = 0 \, .$$

But using the fact that a labor market equilibrium implies that the wage rate is equal to the marginal product of labor, e.g., that $(\lambda_p (T - T_c))^{\alpha} = w$, we have that (13) reduces to,

$$(14) \qquad (1+a)\lambda_c \, KR(q, w) = a\alpha \lambda_p L_p (\lambda_p (T - T_c))^{\alpha-1} \, ,$$

in addition to the labor market equilibrium conditions,

$$(14') \qquad w = (\lambda_p (T - T_c))^{\alpha}$$

and

$$(14'') \qquad \overline{L} = L_p - \lambda_c T_c K \, R_2(q, w) \, .$$

The latter condition follows from the fact that the labor demand in the capitalist sector is $L_c = \dfrac{-\partial \mathbb{R}}{\partial w} = -\lambda_c T_c K \, R_2(\cdot)$, where we use that $R_2 \equiv \partial R / \partial w$.

Thus, (14), (14′), and (14″) solve for three endogenous variables, T_c, L_p and w for given levels of λ_p and λ_c and exogenous variables K and q. Equation (14) shows that the marginal product of land in the peasant sector is undervalued by a factor $\left(\dfrac{a}{1+a} \right)$, which is clearly increasing with a. That is, as the government weights more heavily the interests of capitalists vis-B-vis that of peasants, the value of "a" falls and the size of the anti-peasant bias increases. Also, the land allocation to the capitalist sector increases at the same time. The more "pro-business" a government is the larger will be the efficiency losses due to land allocation.

If property rights were well defined and if a land market operated, then the allocation of land would be efficient, e.g., the marginal revenue products of land would be equalized across the two sectors. That is, the competitive land allocation, T_c^*, solves a condition similar to (14)

but with $\dfrac{a}{1+a} = 1$. Additionally, if such well-defined property rights existed, a competitive land market would imply that the capitalists would pay peasants for the land that they acquire (or rent) rather than pay government bureaucrats.

In the case of political allocation of the land, how are the rents extracted from peasants distributed between capitalists and government? If the capitalist contribution schedule is globally truthful (as defined by Grossman and Helpman, 1994), then firms will increase their share of the rents until the government is indifferent between accepting the political contribution and allocating the land without political influences. That is, an important fraction of the rents arising from the political allocation of land are retained by capitalists.

If firms are able to bargain in a *centralized way* the outcome will reflect the effect of T_c on w. Thus, under centralized bargaining the first order condition is

$$(15) \qquad (1+a)\lambda_c\,KR(q,\,w) + \lambda_c T_c\,KR_2(\cdot)\,\partial w/\partial T_c = a\alpha\lambda_p L_p (\lambda_p (T-T_c))^{\alpha-1},$$

where $R_2(\cdot) \equiv \partial R/\partial w < 0$. In (15) we have used $\lambda_p (T-T_c)^\alpha - w = 0$ and the labor market equilibrium condition $-\lambda_c T_c KR_2(\cdot) = \overline{L} - L_p$.

What is $\partial w/\partial T_c$? From the wage condition $w = (\lambda_p (T-T_c))^\alpha$, we have that

$\partial w/\partial T_c = -\alpha\lambda_p (T-T_c)^{\alpha-1}$. Therefore, using this in (15) we have,

$$(15') \qquad \lambda_c KR(q,w) = \left(\dfrac{a}{1+a}\right)\alpha L_p \lambda_p (\lambda_p (T-T_c))^{\alpha-1}$$

$$+\left(\dfrac{1}{1+a}\right)\alpha\lambda_c T_c KR_2 \lambda_p (\lambda_p (T-T_c))^{\alpha-1},$$

or, equivalently, using $\lambda_c T_c KR_2(\cdot) = -(\overline{L} - L_p)$,

$$(15'') \qquad (1+a)\lambda_c KR(q,w) = [(1+a)L_p - \overline{L}]\,\alpha\lambda_p (\lambda_p (T-T_c))^{\alpha-1}.$$

The following propositions describe the implications of the political equilibrium.

Proposition 1. Under either centralized or decentralized equilibrium the land allocation resulting from political equilibrium is biased in favor of capitalists as long as $a < \infty$. That is, if

T_c^* is the competitive land allocation equilibrium, and T_c^0 and T_c^{00} denote decentralized and centralized equilibrium, respectively, then $T_c^0 > T_c^*$ and $T_c^{00} > T_c^*$.

A formal proof is not really necessary. It suffices to observe that in the decentralized case, equation (14) can be written as

$$(14''') \qquad \lambda_c \; KR(q, w) = \left(\frac{a}{1+a} \right) \alpha \lambda_p L_p (\lambda_p (T - T_c))^{\alpha-1}.$$

In general $\frac{a}{1+a} < 1$ except in the limit when $a \to \infty$, in which case $\frac{a}{1+a} \to 1$. In this case the competitive land allocation equilibrium is equal to the political equilibrium as the marginal value products of land in both sectors are equalized. Thus, only in the case when $a \to \infty$, is $T_c^0 = T_c^*$. Since otherwise $\frac{a}{1+a} < 1$, we have that the marginal value product of land in the peasant sector is underestimated. Therefore, when $\frac{a}{1+a} < 1$, we have that $T_c^0 > T_c^*$. That is, there is a distortion and a corresponding efficiency loss due to an excessive transfer of land out of the peasant sector as a consequence of an undervaluation of the peasants' marginal land productivity.

In the case of a centralized bargaining process, we have that (15′) or (15″) applies instead of (14). Since $R_2 < 0$, the extent of the undervaluation of the marginal value product of land in the peasant sector is now even greater than in the decentralized case. From the undervalued marginal product of land in the peasant sector, we now subtract the wage effect of transferring land from peasants to capitalists. Hence, we have the following proposition.

Proposition 2. If we denote the centralized bargaining equilibrium by T_c^{oo}, the decentralized bargaining equilibrium by T_c^o, and the competitive land equilibrium by T_c^*, we have that $T_c^{oo} > T_c^o > T_c^*$. That is, the capitalist sector receives a greater land allocation (and the peasants a lower one) with centralized rather than decentralized bargaining, while the competitive one would be even lower.

What happens is that in the centralized case the firms and government are able to consider wage effects as well. Increasing land allocation to capitalists becomes more rewarding for capitalists because the wage rate falls thus increasing their profit per unit of land. That is, there is a "double dividend" for them (more land and lower wages) which allows capitalists to increase their contributions to the government, thus leading to an extra land allocation for the capitalist sector.

Corollary 1. Denoting w^* as the wage rate resulting from competitive land market equilibrium, w^0 the wage rate resulting from decentralized political equilibrium, and w^{00} the wage resulting from centralized political equilibrium, then $w^{00} < w^0 < w^*$. Moreover, the total income of peasants under any form of political equilibrium is lower than in competitive equilibrium.

Using the fact that $T_c^* < T_c^0 < T_c^{00}$, it is clear from (14′) that $w^* > w^0 > w^{00}$. Also, given that the total income of peasants is $Y_p = L_p(\lambda_p(T - T_c))^\alpha + w(\overline{L} - L_p) = w\overline{L}$, it follows that $Y_p^* > Y_p^0 > Y_p^{00}$.

We note that the results of Corollary 1 (as well as those of Propositions 1 and 2) are still valid if the peasants' production function is not linear in L_p provided that the labor/land intensity condition, $\dfrac{L_p}{T_p} > \dfrac{L_c}{T_c}$, is satisfied. For example if $Q_p = L_p^{1-\alpha}(\lambda_p T_p)^\alpha$ then the peasants' income is $Y^p = L_p^{1-\alpha}(\lambda_p(T - T_c))^\alpha + w(\overline{L} - L_p)$. Differentiating with respect to T_c using the first order condition associated with maximizing Y^p with respect to w we have,

$$dY^p\Big/dT_c = -\alpha L_p^{1-\alpha}\lambda_p^\alpha(T - T_c)^{\alpha-1} + (\overline{L} - L_p)\partial w\Big/\partial T_c .$$

Since the first right-hand-side is negative we have that $dY^p\Big/dT_c < 0$ as long as $\partial w\Big/\partial T_c < 0$. But $\partial w\Big/\partial T_c < 0$ if $L_p\Big/T_p > L_c\Big/T_c$.

3.2.3 Implications of the Expansion of the Capitalist Sector

This next proposition concerns the effect of capital accumulation in the capitalist sector (i.e., an increase in K) and of improved prices of the capital intensive outputs vis-à-vis the price of labor-intensive outputs, i.e., an increase in q.

Proposition 3. The effect of capital accumulation (an increase in K) or of improvements in prices of the outputs produced by capitalists is to increase land transfers from peasants to capitalists.

This can be seen by performing the usual comparative statics on equation (14) or (15) using labor market conditions (14′) and (14″) and assuming that second order conditions for maximization of (12) are met. An increase in K or q raises the marginal value product of T_c,

thus leading to an increase in T_c and a consequent reduction of T_p. The effects of "economic growth" on wages and peasants' income are presented in Corollary 2.

Corollary 2. An increase in capital accumulation (K) or an improvement in the terms-of-trade of capital-intensive outputs (increase in q) causes wages to fall and the income of peasants to decline.

These results follow because an increase in K or q induces a fall of T_p, which consequently reduces wages and peasant income. Capital accumulation and the increase of the relative price of capital-intensive goods is thus immiserizing for the peasant/workers. Of course if K continues to increase, there is a level of K at which conditions (14) or (15) no longer hold as equalities. This happens when all the land is transferred to the capitalist sector. From this point on, further capital accumulation increases wages and workers' income.

3.2.4 Implications of the Expansion of the Capitalist Sector: Generalizations

We now consider two generalizations from the previous model: (i) the production function of the peasant sector is not linear anymore in labor. Instead we allow for the peasants' production function to be non-linear in labor and to exhibit constant returns to scale in labor and effective land; (ii) we allow for a third sector in the economy, say the industrial sector, that competes with the two agrarian sectors for labor but that does not use land. We have already mentioned throughout the text how some of the results are affected by (i). The purpose of generalization (ii) is to show that in a more "realistic" framework the results remain with relatively minor adjustments.

If the peasants' production function is $g(L_p, \lambda_p T_p)$, where $g(\cdot)$ is an increasing, concave and linearly homogenous function of L_p and $\lambda_p T_p$, we have that we can represent the peasants' variable profit or revenue function conditional on a level of effective land, $\lambda_p T_p$, as

$$\lambda_p T_p G(w) \equiv \max_{L_p} \left\{ g(L_p, \lambda_p T_p) - w L_p \right\},$$

where G(w) is a decreasing and convex function, i.e., $G_w(w) < 0$ and $G_{ww} > 0$, that satisfies Hotelling's lemma, $L_p = -\lambda_p T_p G_w(\cdot)$.

The Government's objective function is now

$$(12') \qquad \max_{T_c} \lambda_c T_c KR(q, w) + a[\lambda_c T_c KR(q, w) + \lambda_p(\overline{T} - T_c) G(w) + K_I \Pi(p, w) + w\overline{L}],$$

where $K_I \Pi(p,w)$ is the variable profit function of the industrial sector, K_I is capital stock in the industrial sector, p is output price of the industrial commodity and $\Pi(\cdot)$ is increasing in p, decreasing in w, linearly homogenous and convex. The term in square brackets is thus national income defined as the sums of the profits in the three sectors plus the labor income, $w\bar{L}$. The first order conditions in the case of decentralized bargaining are analogous to (14),

$$(14''') \qquad (1+a)\lambda_c KR(q,w) = a\lambda_p G(w) .$$

We note that despite the fact that now T_c does not appear in this condition, we still impose $(14''')$ as an equality, e.g., w is endogenous and can adjust to maintain equilibrium condition $(14''')$. What happens is that the level of T_c and w are jointly solved for using $(14''')$ and the labor market clearing condition,

$$(19) \qquad \lambda_p(\bar{T} - T_c) G_w(w) + \lambda_c T_c KR_w(\cdot) + K_I \Pi_w(\cdot) = -\bar{L} ,$$

where the left-hand-side of (19) is minus the total demand for labor in the economy.

Capital accumulation, wages and land allocation. Figure 1 depicts the equilibrium arising from $(14''')$ and (19) under the assumption that the labor to land ratio in the capitalist sector is lower than in the peasant sector. That is, if $L_c/T_c = -\lambda_c KR_w < -\lambda_p G_w = L_p/T_p$. In this case the schedule LL, showing equilibrium in the labor market, in Figure 1 must slope down, i.e., equilibrium in the labor market requires that a higher wage be compensated with a smaller allocation of land to the capitalist sector and higher allocation of land to peasants, and vice-versa. For a given T_c (and T_p), a higher w creates an excess supply of labor. A greater allocation of land to peasants (and less land to capitalists) increases the demand for labor because the peasant sector is more labor-intensive. Hence, such a reallocation of land would eventually reestablish labor market equilibrium. Similarly, if T_c is increased, at the original level of w, there will be excess supply of labor which would require a lower w to reestablish equilibrium in the labor market. The government allocation equilibrium (equation $(14''')$) is represented in Figure 1 by the horizontal line w*w*. If w>w*, it means under the same assumption, $L_c/T_c < L_p/T_p$, that the marginal value of land in the capitalist sector as perceived by the government is higher than the perceived marginal value of land in peasants' hands, i.e., $(1+a)\lambda_c KR(\cdot) > a\lambda_p G(w)$. Hence the government will inject more land into the capitalist sector (subtracting it from the peasant sector). But equilibrium in the labor market (equation 19) implies that w falls as this process occurs. Given that the gap $(1+c)\lambda_c KR(\cdot) - a\lambda_p G(w)$ is decreasing in w, eventually w falls enough to completely erase such gap. At this point we are in equilibrium.

Figure 1: Land Allocation and the Wage Rate
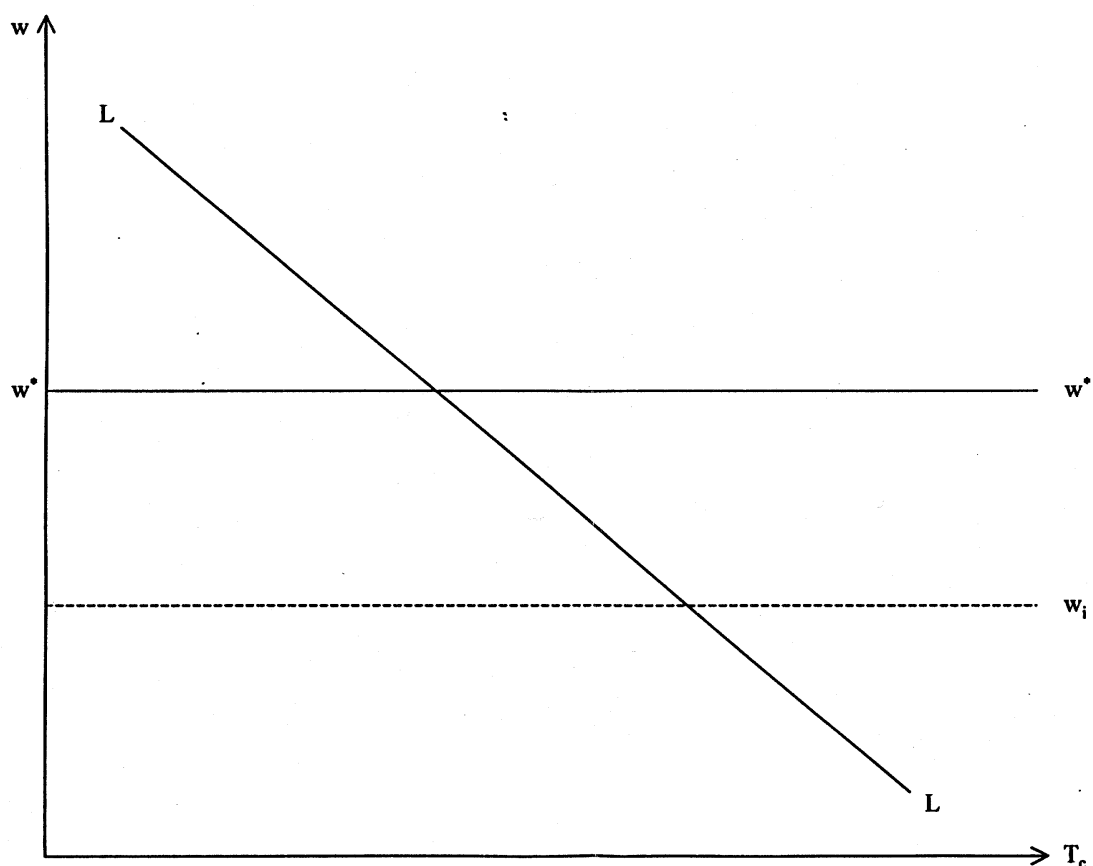
Capital accumulation in the rural capitalist sector (increasing K) will cause a fall in the w^*w^* schedule and a shift outwards of the LL curve in Figure 1 – as long as $L_c/T_c < L_p/T_p$. Thus, the equilibrium level of the wage rate falls and the land allocation to the capitalist sector increases.

Capital accumulation in the industrial sector (an increase of K_I) shifts the LL schedule outwards and does not affect the w^*w^* schedule. Thus industrialization has no effect on wages while it does promote a greater reallocation of land from peasants to capitalists (T_c increases and T_p falls). What happens is that an increase of K_I causes excess demand for labor, inducing incipient increases in w. But since a slightly higher w causes the returns to land in the capitalist sector to increase relative to that in the peasant sector, the government reallocates land from peasants to capitalists that effectively prevents the wage increase.

Effects of capital accumulation on the income of peasant/workers. What happens with income of peasants and workers? The combined income of peasants and workers is

(20) $\qquad Y^P = \lambda_p T_p G(w) + w\overline{L}$.

Capital accumulation in the rural capitalist sector (increasing K) affects Y^p through three mechanisms: (i) A lower w; (ii) a lower T_p; (iii) an effect in the long-run affecting λ_p, the productivity of the land. We differ the discussion on effect (iii) for the next section. For a given λ_p, it is clear that Y^p falls as a consequence of the reduction in w and T_p as,

$$(21) \quad (a) \quad \frac{\partial Y^b}{\partial w} = \lambda_p T_p G_w + \overline{L},$$

$$(21) \quad (b) \quad \frac{\partial Y^b}{\partial T_p} = \lambda_p G(w).$$

The right-hand-side of 21(a) is necessarily positive despite that $G_w<0$. In fact, since $\lambda_p T_p G_w = -L_p$, the labor used by the peasant sector, we have that $\partial Y^b / \partial w = -L_p + \overline{L} > 0$. Of course $\partial Y^b / \partial T_p$ is also positive. Hence, capital accumulation in the rural sector deals two blows to the peasant-workers segment of the economy, by reducing wages and lowering T_p, thus causing an unambiguous fall in their income.

Capital accumulation in the industrial sector (increasing K_I) has a more modest effect as it does not reduce wages. But still, given λ_p, the combined income of peasants and workers necessarily falls.

It is important to realize that capital accumulation whether in the rural sector or in the industrial sector causes a shrinking of the peasant sector: More and more peasants become proletariat as K and/or K_I increase, because T_p keeps falling. There is a point at which the peasant sector land becomes small enough so that the issue of land allocation becomes "settled", that is, the government stops playing any role in land allocation and competition for land between capitalists and peasants becomes a non-issue. In the model this would happen when $T_p = 0$. But in reality this can occur when T_p is small.[16] At this point (14‴) ceases to play any role, in fact becomes an inequality and $T_c \approx \overline{T}$ with the first term of the left-hand-side of the labor market equilibrium vanishing. At this point, any further capital accumulation is translated into higher wages and higher income for workers. That is, wages (and the combined income of peasants and workers) exhibit a U-shaped relationship with capital accumulation (e.g., with economic growth): They fall during the capitalistic transition of the economy and then start increasing once such transition is completed. The only thing that could delay the turning point is, as we shall see in the next section, a possible reduction of λ_c and λ_p.

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[16] In the next section we will see a more plausible factor: when λ_p reaches a level so low that renders the peasant land unattractive to capitalists.

Figure 2 illustrates these points: The north-east panel shows the LL and ww curves introduced in Figure 1. As K increases the LL curve shifts outwards and the ww horizontal schedule keeps falling, implying that the equilibrium w falls and T_c increases. The process continues until $T_c = \overline{T}$, that is, capitalists absorb all land. This occurs when the LL curve reaches the level $L^m L^m$ and the ww line reaches $w_{min} w_{min}$. In the south-east panel we relate K to T_c showing a positive relation until T_c reaches $\overline{T}$ at which point the relationship becomes vertical once $K = K^m$. The north-west panel just maps w into itself and the south-west panel depicts the relationship between K and w. The wage rate falls until it reaches w_{min}. At that point as K continues to increase w starts increasing again; hence the U-shaped relationship between w and K.

Figure 2: Capital Accumulation, Land Allocation and Wages
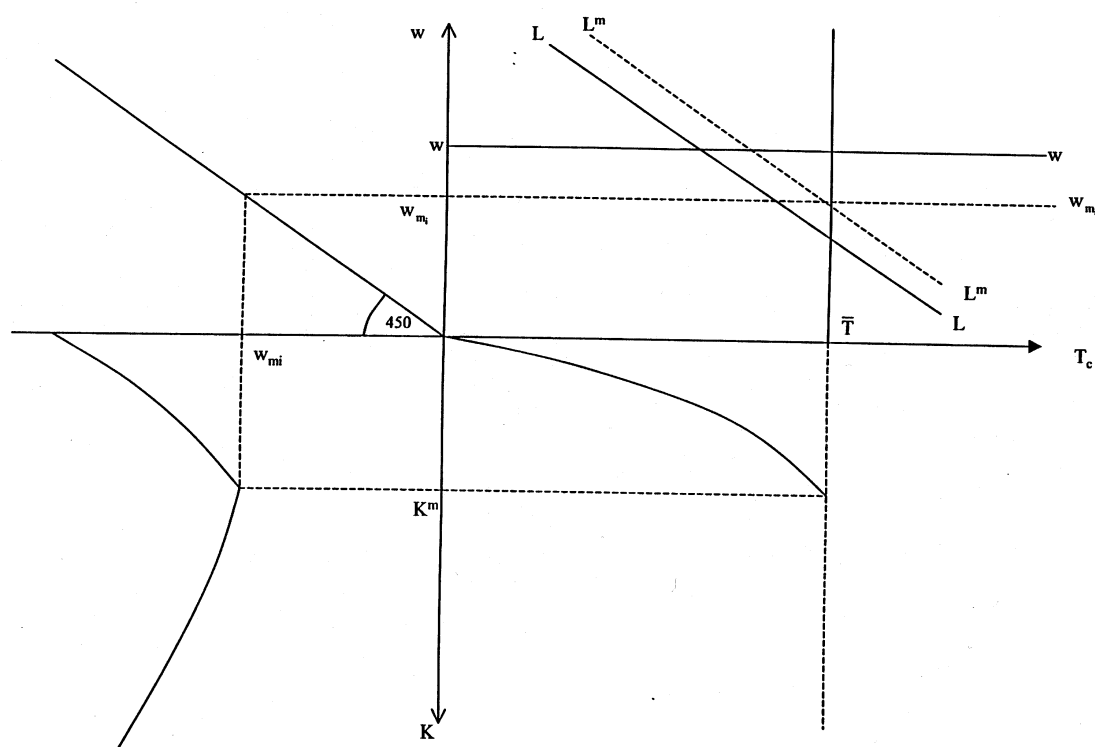
The following proposition and corollary summarize the results from this section. Proposition 4 below summarizes results for the case where the peasant sector is important, while the corollary focuses on a stage where the transition from a peasant to a capitalist economy is over.

Proposition 4. Capital accumulation in the rural capitalist sector causes shrinking of the peasant sector by increasing the incentives to expropriate their lands and causes a compression of wages. Assuming no change in land productivity, these two phenomena imply a fall in the combined income of peasants and workers. Capital accumulation in the industrial sector also induces shrinking of the peasant sector through greater land expropriation from peasants to rural capitalists but it does not compress wages. It also reduces the income of peasants.

Additional implications of the Proposition 4 are presented in Corollary 3.

Corollary 3. As capital accumulation takes place (in the rural and/or industrial sector) eventually the peasant sector ceases to exist as an important economic sector. At this point, any further capital accumulation leads to higher wages. Thus, wages, exhibit a U-shaped relationship with capital accumulation; they decline during the transition from a peasant to an increasingly capitalist economy, and they increase with capital accumulation once the economy becomes homogenously capitalist.

The following remarks about these results are important: (1) Capital accumulation in the industrial sector benefits agrarian capitalists by facilitating the expropriation of greater lands originally owned by peasants and capital accumulation by agrarian capitalists benefits industrial capitalists by compressing wages. That is, agrarian and industrial capitalists appear as natural allies as important complementary relationships between each other exist. This appears to be quite consistent with stylized facts that point to important events where such alliance appears to be in place. In particular, in occasions where exogenous forces (associated with revolutions or drastic changes in the parameter "a" that reduce government dependence on capitalist "donations") have led to stop and even revert the expropriation of peasants (through, for example, genuine land reforms), industrial capitalists have usually joined agrarian capitalists in their political fights to prevent such reversion.

(2) The model predicts that workers and peasants become worse-off in the transition from a peasant society to a fully capitalist society and that wages do not increase or even fall over this period. This generally implies that income distribution deteriorates during this transition. This is highly consistent with accepted stylized facts, particularly with the fact that poverty is deepest and improves very slowly, if at all, in rural areas (Lopez and Valdϑs, 2000). Moreover, recent studies in Latin America have shown that rural native communities (which typically do not hold legal rights to their land) have commonly become worse off as growth takes place (Korzeniewicz, 2000).

3.2.5 The Resource Dynamics

So far, we have assumed that the land allocation process takes place given an initial level of $\lambda_p = \lambda_c$. In reality, many of these resources are fragile and are, consequently, subject to change over time depending on the intensity of exploitation of the land and on possible investments to improve the natural resource. We assume, however, that because land property rights are not well-defined in either sector, such investments do not take place. Even the capitalists will not invest in the land resource especially in the usual case where governments give capitalists short- or medium-term concessions to exploit the resource rather than definitive legal property rights.

We assume that the natural resource evolves over time as follows:

(22) (a) $\dot{\lambda}_p = h(\lambda_p) - \beta(L_p / T_p)$,

(b) $\dot{\lambda}_c = h(\lambda_c) - \beta(1 + \phi(K))L_c / T_c$,

where $h(\cdot)$ is a function representing the natural growth of the resource over time (i.e., the maximum sustainable yield), L_p/T_p is a measure of the intensity of exploitation of the land in the peasant sector, and $(1 + \phi(K))L_c/T_c$ measures exploitation intensity in the capitalistic sector, where $\phi(\cdot)$ is an increasing function of the volume of capital applied in exploiting the resource. Thus, the exploitation intensity in the capitalist sector is similar to that in the peasant sector, except that in the capitalist sector labor power is magnified by capital. Finally, β is a coefficient inversely related to the capacity of the natural resource to withstand the pressure (e.g., it represents the degree of fragility of the natural resource).

The function $h(\lambda_p)$ is commonly specified as an inverted U-shaped logistic type of curve. That is, allowing for the maximum sustainable yield to be increasing with the resource at low levels of λ_p but after a certain level to decline with λ_p. For our purposes, we postulate a simpler form where $h(\cdot)$ is increasing in λ_p for the relevant range. In many contexts it is indeed difficult to think in a downward-sloping segment of $h(\cdot)$. In the context of soil quality, this is certainly not plausible. In general, in an environment of resource scarcity, the downward-sloping segment of $h(\cdot)$ seems quite irrelevant. In particular, if population size is large relative to the land area, it is likely that the initial steady state takes place in the upward side of the curve.

We assume that $h(\cdot)$ is always increasing and strictly concave. Consider an initial situation where the capitalist sector does not yet exist. Assume that before the arrival of capital a steady state prevails,

(23) $h(\lambda_0) = \beta(\overline{L}/\overline{T})$.

Therefore, equation (23) provides a unique solution for the initial level of the natural resource, λ_0. The level of λ_0 is decreasing in $\overline{L}$ and increasing in $\overline{T}$. Thus, just at the time when capitalist and government arrive, $\lambda_0 = \lambda_p$ and the land that is expropriated from peasants and transferred to the capitalist sector is of the same quality, $\lambda_0 = \lambda_c = \lambda_p$. That is, we first solve (14) or (15) subject to (14′) to (14″) for a given level of land quality, λ_0.

What is the effect of the emergence of the capitalist sector on L_p/T_p? From the previous analysis it is clear that T_p falls as part of the peasants' land is transferred to the capitalist sector. L_p, however, also declines as some peasants are able to find employment in the capitalist sector, so the effect of the emergence and posterior expansion of the capitalist sector appears to have an

ambiguous effect on the intensity of resource extraction in the peasant sector. The next proposition, however, shows that the effect is indeed not ambiguous.

Proposition 5. An expansion of the capitalist sector (represented by increases in K) causes an unambiguous rise of L_p/T_p, the intensity of resource exploitation in the peasant sector.

This can be seen (for the case of decentralized bargaining) by manipulating the political equilibrium condition equation (14) (evaluated at the common initial level λ_0),

$$(24) \qquad KR(q,w) = \frac{a}{1+a}\alpha\lambda_0^{\alpha-1}L_p^\alpha\left(\frac{L_p}{T_p}\right)^{1-\alpha}.$$

The emergence and/or expansion of the capitalist sector implies that K increases and, as shown above, that w falls. Since $R_2(q, w) < 0$, we have that as K rises, $KR(\cdot)$ also increases. That is, the left-hand side of (23) goes up. Also, since L_p falls, we have that L_p/T_p must increase as long as $\alpha < 1$.

Thus, the intensity of the resource exploitation by peasants necessarily increases. This causes a decline of the natural resource in the peasant lands as $h(\lambda_0) < \beta(L_p/T_p)$. Hence $\dot{\lambda}_p < 0$ (and a new steady state at a lower λ_p may occur). This initiates a gradual process of decline of the marginal productivity of land and labor in the peasant sector.

What happens with productivity in the capitalist sector? Clearly, since $L_p/T_p > \overline{L}/\overline{T}$ once the capitalist sector appears, we have that $L_p/T_p > L_c/T_c$. Since $\overline{L}/\overline{T}$ is a weighted average of $\frac{L_p}{T_p}$ and $\frac{L_c}{T_c}$ with weights $\frac{1}{1+T_c/T_p}$ and $\frac{T_c/T_p}{1+T_c/T_p}$, respectively, it follows that $L_p/T_p < \overline{L}/\overline{T}$ implies that $L_c/T_c < \overline{L}/\overline{T}$ and, therefore, that $L_p/T_p > L_c/T_c$. Hence, from 22(b) and (23), it follows that land productivity in the capitalist sector, λ_c, may increase or decrease depending on whether $[1+\phi(k)]L_c/T_c$ is below or above $\overline{L}/\overline{T}$, respectively.

The new steady state for λ_p and λ_c can be obtained by making $\dot{\lambda}_p = \dot{\lambda}_c = 0$ in 22(a) and 22(b) using that $L_p/T_p = \lambda_p G_w(w)$ and $L_c/T_c = \lambda_c KR_w(\cdot)$,

$$(25) \quad (a) \qquad \frac{h(\lambda_p^*)}{\lambda_p^*} = \beta G_w(w)$$

(b) $\quad \dfrac{h(\lambda_c^*)}{\lambda_c^*} = \beta[1+\phi(K)]KR_w(\cdot)$.

Since $h(\cdot)$ is strictly concave, we have that $h(\lambda_p^*)/\lambda_p^*$ and $h(\lambda_c^*)/\lambda_c^*$ are decreasing in λ_p^* and λ_c^*, respectively. Thus, in steady state we have that,

$$\lambda_p^* < \lambda_c^*, \quad \lambda_p^* < \lambda_0.$$

That is, the natural resource still controlled by peasants necessarily deteriorates and its level becomes below that of the capitalist sector. Also, it follows that λ_p/λ_c falls as capital accumulation (in either the agrarian sector or the industrial sector) takes place.

Hence, two results follow: (i) Capital accumulation will reduce peasants/workers income through *all* three channels by which it affects it: Less land in peasants' hands, lower wages and by inducing a worsening of the productivity of peasants' land; (ii) the land productivity effect, in particular the emerging $\lambda_c - \lambda_p$ gap will magnify the land transfer process (note from (14''') that as $\lambda_c - \lambda_p$ increases the marginal benefits to the government of such transfer increases) and it will deepen the fall in wages.

Hence, we have two possible situations in the capitalist sector: (i) λ_c increases above λ_0 (or does not fall) if $(1+\phi(K))L_c/T_c \le \overline{L}/\overline{T}$. (ii) if $(1+\phi(K))L_c/T_c > \overline{L}/\overline{T}$, we have that $\lambda_c < \lambda_0$ and $\lambda_c^* < 0$, at least early on after the capitalist sector emerges. Whether case (i) or (ii) applies will depend on the size of K, the extent of the transfer of land (T_c) and labor (L_c), and the nature of the labor power function $\phi(K)$. In general, the larger is K, the more elastic the demand for labor and the less elastic the land demand from the capitalist sector, the more likely is that λ_c^* be negative. If, however, the transfer of land is quite massive and the wage effect is small it is more likely that λ_c will remain at or above initial levels.

If the labor enhancement power of resource exploitation is very large, e.g., $\phi(K)$ is large, then λ_c will also fall. Thus, in this case resource degradation would occur in both sectors. The natural resource would unambiguously degrade. Also in this case, a long-run steady state equilibrium with both sectors coexisting is likely.

4   Conclusion

A key implication of the analysis in this paper is that the widespread plundering of natural assets cannot be considered in isolation from the economic and political forces shaping the patterns of economic growth. The role of the state is crucial in this respect. The same factors that induce governments to seek rents and political support to finance their stay in power cause policy biases in favor of those that can provide such financial support, e.g., the rich and large commercial interests. The state affects not only policies through markets but, perhaps more importantly, by directly allocating their own budgetary resources as well as resources of the poor in favor of capital. This has led to economic growth patterns based on a biased structure of assets that favors physical capital to the detriment of human and natural capital. This role of the state has often been justified by a sort of double fetishism of growth and investment: That growth is the final objective and that this objective should be achieved by promoting physical/financial capital accumulation at any cost.

In promoting physical capital accumulation governments use several mechanisms, including direct subsidies to capital, which absorb a large share of the public budget. This necessarily implies low budgetary allocations for education, health and social sectors that, in turn, seriously slows down the development of human capital and contributes to the deterioration of social equity. Indirect subsidies, which consists in providing "enabling" conditions for investors, include insufficient regulations, access to child labor, and free or subsidized access to natural resources. The two mechanisms used to promote investment (direct subsidies and the giveaway of resources to capital) have serious consequences for natural capital degradation: Chronic budgetary shortages due to the large expenditures on capital subsidies leave little financial resources to pay for monitoring and enforcement of environmental laws. The giveaway of resources causes undervaluation and over-exploitation of natural capital as means to entice investors.

This common pattern of growth has been shown to increase poverty, particularly in rural areas, and at the same time to be in part responsible for rapid degradation of the natural resources used by the rural poor. The loss of entitlement to natural resources, which large numbers of rural poor suffer as a consequence of this pattern of growth, is in part responsible for a compression of (unskilled) wages, especially in poor countries where a large majority of the population is still rural.

A simple model of political rather than market allocation for land resources in a poor agrarian economy has been developed. The analysis assumes that commercial interests have the ability to purchase government political power in exchange for policies that allocate land resources ancestrally used by peasants to such interests. The main findings of this analysis are

the following: (i) Land is allocated inefficiently in the sense that capitalists receive a larger share of land than what a competitive land market would allow for; (ii) Income of peasants and the market wage rate are reduced; (iii) Under fairly general assumptions capital accumulation in the commercial sector, whether in the agrarian sector or the industrial sector, is immiserizing for peasants; (iv) Capital accumulation by agrarian capitalists in addition compresses the economy's wage rate while capital accumulation in the industrial sector has no effect on wages; (v) The biased political allocation of land causes resource degradation in the lands that remain in peasants' hands thus reducing the land productivity; (vi) Capital accumulation accelerates this resource degradation process in peasant land and leads to the eventual transformation of most peasants into wage earners. At this point further capital accumulation promotes higher wages. That is, wages first fall with capital accumulation and then start to increase.

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