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Natural Capital, Resource Dependency, and Poverty in Developing Countries: The Problem of “Dualism within Dualism”

Edward B Barbier

Task Force on Environmental Economics

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Introduction

The purpose of the following chapter is to explore the problem of resource degradation and poverty in developing countries. As this is a potentially huge topic – over 1 billion people in the world live on less than \$1 day and most are dependent on some form of resource use – any meaningful analysis of the linkage between resource degradation and poverty must be organized around a consistent theme. In this chapter, the theme is “dualism within dualism”.

That is, there are currently two types of “dualism” in patterns of resource use within developing countries that are very much relevant to the problem of resource degradation and poverty.¹

The first “dualism” concerns aggregate resource use and dependency within the global economy. Most low and middle-income economies are highly dependent on the exploitation of natural resources. For many of these economies, primary product exports account for the vast majority of their export earnings, and one or two primary commodities make up the bulk of exports. Moreover, recent evidence suggests that increasing economic dependence on natural resources is negatively correlated with economic performance. The implications for low income countries is that the “take off” into sustained and structurally balanced economic growth and development is still some time away, and thus the dependence of their overall economies on natural resources will persist over the medium and long term.

The second “dualism” concerns aggregate resource use and dependency within a developing economy. A substantial proportion of the population in low and middle-income countries is concentrated in marginal areas and on ecologically 'fragile' land, such as converted forest frontier areas, poor quality uplands, converted wetlands and so forth. Households on these lands not only face problems of land degradation and low productivity but also tend to be some of the poorest in the world.

Although most studies of resource degradation and poverty tend to focus on the problems posed by the second type of dualism, a major innovation of the proposed chapter is to show how this dualism is linked to the first. Hence, the sub-title of the chapter is “dualism within dualism”.

¹ It should be noted that, given the topic of resource degradation and poverty, the focus of the proposed chapter will be on natural resource use and economic development in present-day low and middle-income countries in Africa, Asia and Latin America. Many themes explored in this chapter are addressed in fuller detail in a forthcoming book by the author on natural resources and economic development (Barbier 2005b).

Specifically, the chapter seeks to demonstrate the following processes.

First, most low and middle-income economies are highly dependent on the exploitation of their natural resource endowments for commercial, export-oriented economic activities.

Second, the major investors in export-oriented resource-based economic activities, whether in commercial agriculture, mining, timber-extraction or other activities, tend to be relatively wealthier households. These households generally have education and skilled labor advantages that allow them to attain higher income levels, accumulated wealth available for investment and the collateral for and access to formal credit markets for financial loans.

Third, the process of resource exploitation in resource-dependent developing economies tends to involve the following “cumulative causation” cycle.

Development in low and middle-income economies is accompanied by substantial resource conversion. In particular, expansion of the agricultural land base in these economies is occurring rapidly through conversion of forests, wetlands and other natural habitat. In addition, many developing regions of the world are also placing greater stress on their freshwater resources as a result of increasing population and demand.

Although it is commonly believed that poor rural households are mainly responsible for much of this resource conversion, what is often overlooked is that inequalities in wealth between rural households also have an important impact on resource degradation processes. Moreover, such problems are exacerbated by government policies that favor wealthier households in markets for key resources, such as land.

The consequence is that resource dependency of developing economies is usually accompanied by excessive resource conversion, and the benefits of this conversion are inequitably distributed. That is, the abundance of land and natural resources available in many developing countries does not necessarily mean that exploitation of this natural wealth will lead either to sustained economic growth, widespread benefits or substantial rural poverty alleviation. The increased concentration of the rural poor in marginal land and resource areas continues, and this in turn will generate the conditions for additional resource conversion through a process called “frontier resource expansion”.

The proposed chapter will explore this “dualism within dualism” link between resource degradation and poverty in developing countries in the following way.

The next section examines four key structural features, or “stylized facts”, of natural resource use underlying the two types of dualism in developing economies. The subsequent section will elaborate on how resource exploitation in resource-dependent developing economies produces these “dualism within dualism” characteristics. The fourth section will focus on the economy-wide implications of this pattern of resource use: increased frontier resource expansion and conversion, disappointing economic performance and persistent, widespread rural poverty. The final section will examine the potential role of policies in reversing this “cumulative causation” cycle.

Natural Capital and Developing Economies: Four “Stylized Facts”

Economists now recognize that, along with physical and human capital, the natural and environmental resource endowment of a country should be viewed as an important economic asset, which can be called *natural capital*. Moreover, it is also accepted that management of this natural capital stock is critical to the country’s ability to attain sustainable economic development. This is particularly relevant to low and middle-income, or “developing”, countries, many of which have abundant stocks of environmental and natural resources that they must exploit efficiently and sustainably if these economies are to develop successfully (Barbier 2003).

In order to determine whether present-day developing economies are exploiting successfully their natural capital stocks to achieve sustainable development, it is useful to examine some of the key patterns of natural resource use in these economies. Such an examination reveals four key structural features, or “stylized facts”, of natural resource use in these economies.

Stylized Fact One: The Majority of Low and Middle Income Countries Have Resource-Dependent Economies

Most low and middle-income economies today are highly dependent on the exploitation of their natural resource endowments for commercial, export-oriented economic activities. For these economies, primary product exports - and often one or two main commodities - account for nearly all export earnings.

Appendix 1 depicts the export concentration in primary commodities for 95 low and middle-income economies.² As indicated in the appendix, 72 of the countries – more than three quarters - have 50% or more of their exports from primary products, and 35 countries – more than a third – have an export concentration in primary commodities of 90% or more.³

Appendix 1 also indicates the share in total exports of the two main primary commodities for each country. For those low and middle-income countries with an export concentration in primary products of 50% or more, two commodities account for most of these exports and for a large share, if not the majority, of total exports. On average, for countries with a primary product export share of 50% or more, the two main commodities accounted for about 60% of total exports. For those countries with a primary product export share between 10-50%, the two main primary commodities still account for over 25% of total exports.

Although since the 1960s, some low and middle-income countries have reduced their resource dependency, there are important regional differences. Figure 1 shows the average regional changes from 1965 to 1990/99 in primary product export concentration for Sub-Saharan Africa, North Africa and the Middle East, Latin America and the Caribbean, and Asia and Oceania. In 1965 low and middle-income economies in all four regions had on average 85-92% of their exports based on primary commodities, but regional trends have varied considerably over the next thirty years. In the 1990s, African countries still remained highly dependent on primary product exports (85%), and North African and Middle Eastern countries also maintained high resource dependence (73%). Latin American and Caribbean economies reduced their primary commodity export share much more, but still have a relatively high export share (67%). Only in

² As indicated in Appendix 1, the designation of “low and middle-income countries” in Africa, Latin America, Asia and Oceania, is based on the World Bank’s definition. The World Bank lists a total of 142 such countries in these regions. However, many of the countries not included in Appendix 1 are small island states and nations (e.g., Antigua and Barbuda, Gaza Strip, Cook Islands, Kiribati) or countries for which export data are not readily available (Democratic Peoples Republic of Korea). The 95 economies listed in the table have GDP per capita in 1994 at 1987 constant purchase power parity US dollars of less than \$10,500 with an average of \$2,691 and a median of \$1,604.

³ For all the low and middle income countries depicted in Appendix 1 for which the data are available (88 countries), the average export share of GDP is 31.4%. For those countries with a primary product share of 50% or more, the export share of GDP is 29.6%. As the importance of exports across low and middle income economies is fairly stable across these countries, around 30% of GDP, this suggests that the percentage share of primary products to total exports is a fairly good indicator of the degree of resource dependency of these economies. In fact, the importance of exports increases slightly with the degree of resource dependency. For economies with an export concentration in primary products of 70% or more, the export share of GDP is 30.7%; for those countries with a primary product export concentration of 90% or more, the export share rises to 34.6%.

Asia and Oceania has resource dependency fallen dramatically over the thirty-year period, to less than half of all exports (42%).

The World Bank has attempted to measure recently the extent to which the overall "wealth" of an economy consists of natural capital. For low and middle-income countries dependent on export revenues from primary commodities (other than petroleum), 20% of their national wealth comprises natural capital (World Bank 1997). These economies are typically located in the Caribbean, East and Southern Africa, the Middle East, South Asia and West Africa. As a comparison, natural capital accounts for only 5% of wealth for developed economies in North America, and 2% for developed economies in the Pacific and Western Europe. The most important source of natural capital in resource-dependent low and middle-income countries is agricultural land, especially for economies without substantial petroleum reserves. For example, in the poorest countries, agricultural cropland comprises around 80% of the natural capital.⁴

Stylized Fact Two: Resource Dependency in Low and Middle-Income Countries is Associated with Poor Economic Performance

Low and middle-income countries tend to be dependent on their natural resource endowments for economic growth and development because in poor economies natural capital may be the only source of capital readily available to them. Moreover, many countries are fortunate to have abundant natural resources to exploit, although as we have just seen, the most likely form of natural capital available to the poorest countries is likely to be land.

Given the importance of natural capital to sustainable development, one might conclude that greater resource abundance should improve economic performance. That is, economies that have a greater endowment of natural resources must surely have a much better chance of attaining higher economic growth rates and prosperity than relatively resource-poor economies. This must be particularly true with respect to low and middle-income countries, whose economies are generally more dependent on exploiting their natural capital stock in the transition

⁴ Although the vast majority of the low and middle income countries listed in Appendix 1 can be considered resource dependent, in terms of 50% or more of their exports are primary products, the latter countries do not contain the majority of the developing world's population. For example, the total population estimate (in 1999 or nearest year) for 94 of the countries listed in Appendix 1 is just under 4.52 billion, whereas the population in resource dependent economies totals around 1.33 billion (30% of the total). That is because five of the most populous developing countries, China, India, Brazil, Pakistan and Bangladesh, in the world cannot be classified as resource dependent as each has less than 50% of the exports from primary products.

to developing industrial and service sectors and the "take off" into higher and more balanced rates of long-run growth.

As we shall discuss further below, it has been difficult to determine from the empirical evidence whether greater *resource abundance*, in the terms of a larger natural resource endowment or stocks, is associated with lower long-run growth in developing economies. However, recent evidence does provide some evidence that *resource dependency* may be associated with poorer economic performance.⁵ For example, many low and middle-income economies that can be classified as highly resource dependent today, in terms of primary product export share as in Appendix 1, also currently display low or stagnant growth rates (Barbier 1999).

Cross-country analysis has confirmed that countries with a high ratio of natural resource exports to GDP have tended to grow less rapidly than countries that are relatively resource poor (Sachs and Warner 1997; Rodríguez and Sachs 1999). Economies with a high primary product export share of GDP in 1971 also tended to have low growth rates during the subsequent period 1971-89 (Sachs and Warner 1995). This finding is confirmed for the 1970-90 period, even when direct controls for the influence of geography, climate and growth in the previous decade are included (Sachs and Warner 2001).

There is also evidence that low and middle-income economies that are more resource-dependent tend to have lower levels of GDP per capita. Figure 2 indicates this relationship. The average export share of primary commodities in the total exports of low and middle-income countries over 1990/99 appears to be negatively correlated with the real GDP per capita of these countries in 1994.⁶

⁵ Recent claims of a "resource curse" hypothesis, i.e that resource-abundant economies grow less fast than resource-poor ones, are based largely on empirical estimations by Jeffrey Sachs and colleagues. However, these authors use primary products exports as a percentage of GDP as the measure of a country's "resource abundance". Strictly speaking, such a variable cannot be a true indicator of "resource abundance" *per se*, as it is not a measure of the total resource endowment or stocks of a country. Instead, throughout this chapter, indicators such as primary products exports as a percentage of GDP or of total exports will be referred to as measures of a country's *resource dependency*, as in Appendix 1 and subsequent figures, as these indicators are really a measure of the degree to which an economy is dependent on natural resource-based exports. Hence, the second stylized fact is stated in terms of the correlation between resource dependency, and not abundance, with poor economic performance in low and middle-income countries.

⁶ As indicated, the relationship depicted in Figure 2 is for the low and middle-income developing economies listed in Appendix 1 and for the 1990s. Rodríguez and Sachs (1999) appear to obtain the contradictory finding that GDP per capita is positively associated with "resource abundance". However, the latter relationship is established by regressing the log of GDP per capita in 1970 on exports of natural resources, in percent of GDP, also in 1970.

Finally, low and middle-income economies that are more resource-dependent tend to have higher poverty levels. Figure 3 illustrates this association. Resource dependency appears to be positively correlated with the proportion of the population living in poverty.

Stylized Fact Three: Development in Low and Middle-Income Economies is Associated with Increased Land Conversion and Stress on Available Freshwater Resources

As noted above, in developing economies, especially those without oil and natural gas reserves, the most important source of natural wealth is agricultural land. In these economies, expansion of this agricultural land base is occurring rapidly through conversion of forests, wetlands and other natural habitat. In addition, many developing regions of the world are also placing greater stress on their freshwater resources as a result of increasing population and demand. This trend for greater land and water use appears to be occurring in all low and middle income countries, regardless of their resource dependency or economic performance.

López (1998) identifies most of Sub-Saharan Africa, parts of Asia and the tropical forests of South America as regions with "abundant land" and open-access resource conditions that are prone to agricultural expansion. Widespread land and resource conversion is also occurring in Central America, parts of Mexico and tropical South America and some East and South East Asian countries, mainly due to the high degree of integration of rural areas with the national and international economy as well as population pressures. Agricultural land expansion in many tropical regions is also spurred by the prevailing structural conditions in the agricultural sectors of many developing countries, such as low irrigation and fertilizer use as well as poor crop yields (FAO 1997).

A study by the FAO (1995) indicates the long-run dependence of developing countries on agricultural land expansion for crop production. Over 1970-90 increased harvested area accounted for 31% of the additional crop production in these countries, and over 1990-2010 this contribution is expected to rise to 34%. However, some of the increase in harvested area is likely to come from cropping intensity (i.e. multi-cropping and multiple harvests on the same land area). Although improvements in cropping intensity and yields are expected to reduce the

Clearly, the results of Rodríguez and Sachs are for a different era, just before the oil and commodity price boom of the 1970s and early 1980s. In addition, as the authors indicate, their data set includes predominantly mineral and energy exporting countries, and countries other than the low and middle-income economies listed in Appendix 1.

developing world's dependency on agricultural land expansion over 1990-2010, about 19% of the contribution to total crop production increases in poorer economies are likely to be derived from expansion of cultivated land. Cropland expansion is expected to be particularly prevalent in Sub-Saharan Africa, East Asia (excluding China) and Latin America (including the Caribbean).

Fischer and Heilig (1997) combined the results of the FAO (1995) study with recent UN population projections to estimate the demand for additional cultivated land in developing countries in 2050. Their results suggest that all developing countries are expected to increase their demand for cultivated cropland considerably, leading to extensive conversion of forests and wetlands. Throughout the developing world, cultivated land area is expected to increase by over 47% by 2050, with about 66% of the new land coming from deforestation and wetland conversion.

Recent hydrological projections of the world's freshwater resources have pointed to an emerging global threat, the dwindling supply of freshwater relative to the growing demand for water worldwide (Falkenmark *et al.* 1998; Revenga *et al.* 2000; Rosegrant *et al.* 2002; Vörösmarty *et al.* 2000). According to various scenarios, water scarcity is expected to grow dramatically in some regions as competition for water increases between agricultural, urban and commercial sectors. The cause of this global water crisis is largely the result of population growth and economic development rather than on global climate change (Vörösmarty *et al.* 2000). The problem is expected to be particularly severe in low and middle-income countries, especially in selected river basins within those countries (Rosegrant *et al.* 2002).⁷

A study by Rosegrant *et al.* (2002) provides global projections over 1995 to 2025 for total water withdrawal and the share of withdrawal to renewable water supply.⁸ Already, developing countries account for 71% of global water withdrawal. Water demand in these countries is expected to grow by 27% over 1995 to 2025. The ratio of water withdrawals to total

⁷ Hydrologists distinguish two concepts of water use: water withdrawal and water consumption (Gleick 2000, p. 41). Withdrawal refers to water removed or extracted from a freshwater source and used for human purposes (i.e. industrial, agricultural or domestic water use). However, some water withdrawal may be returned to the original source, albeit with changes in the quality and quantity of the water. In contrast, consumptive use is water withdrawn from a source and actually consumed or lost to seepage, contamination, or a "sink" where it cannot economically be reused. Thus water consumption is the proportion of water withdrawal that is "irretrievably lost" after human use. For example, in 1995 total global freshwater withdrawals amounted to 3,800 km³, of which 2,100 km³ was consumed.

⁸ These reported projections correspond to the "business as usual" baseline scenario in Rosegrant *et al.* (2002).

freshwater resources per year is often referred to as relative water demand or the water "criticality ratio". Hydrologists typically consider criticality ratios for a country or a region between 0.2 and 0.4 to indicate medium to high water stress, whereas values greater than 0.4 reflect conditions of severe water limitation (Cosgrove and Rijsberman 2000; Vörösmarty *et al.* 2000). Although criticality ratios are projected to remain low across all developing countries, there are important regional exceptions. By 2025 Asia is expected to show signs of medium to high stress (see Rosegrant *et al.* 2002). West Asia/North Africa is currently facing severe water limitation, and this problem is expected to reach critical levels by 2025.

As shown in the Rosegrant *et al.* (2002) study, the problem of water stress and scarcity is likely to be worse for key developing countries and regions. The two most populous countries of the world, China and India, together account for around 35% of global water withdrawal. Both countries are already displaying medium to high water stress, which is expected to worsen by 2025. However, the problem is worse still for specific river basin regions within these two countries. Some of these river basins have or will have in coming years criticality ratios exceeding 100%, suggesting chronic problems of extreme water scarcity.⁹ Other countries facing worsening water stress and scarcity include Pakistan, the Philippines, South Korea, Mexico, Egypt and virtually all other countries in West Asia/North Africa.

Increasing land conversion and stress on freshwater resources in developing countries may be symptomatic of a more general correlation between environmental deterioration and growth in these economies. A World Bank study noted that GDP growth and higher incomes in developing economies are associated with better sanitation and improved water supply, as well as investments in cleaner technologies (Thomas *et al.* 2000). However, the same study tested for a correlation between growth and an overall environmental quality change index (EQI) across developing countries, where the EQI was constructed by attaching equal weights to changes in indicators of water quality, air quality and deforestation. For 56 developing economies, the study found a statistically significant negative correlation ($r = -0.27$) between EQI and growth

⁹ According to Rosegrant *et al.* (2002, Table B.3), by 2025 the Huaihe, Haihe, Huanghe and Inland Regions in China will display criticality ratios higher than 100%, whereas in India the Cauvery Region will have a criticality ratio of 91% and the India-Coastal-Drain and the Mahi-Tapti-Narmadi Regions will have criticality ratios well over 100%.

rates over 1981-98. Countries with higher growth rates displayed deteriorating overall environmental quality.¹⁰

Stylized Fact Four: A Significant Share of the Population in Low and Middle-Income Economies Is Concentrated on Fragile Lands.

Between the years 2000 and 2030, the world's population is expected to increase by more than a third, from 6.06 billion to 8.27 billion (Population Division of the United Nations 2001). Virtually all of this population growth will occur in the less developed regions, and mainly in urban areas. Rural populations are expected to fall in more developed regions over 2000-2030, from 0.29 billion to 0.21 billion. Only a modest rise in rural populations will occur in less developed regions over the same period, from 2.90 billion to 3.08 billion.

However, these aggregate trends in world population obscure two important facts concerning rural populations in developing countries. First, rural population growth is much higher for those low and middle-income economies that are more resource dependent, and second a large share of the rural populations in these economies are concentrated on poor, or "fragile", lands.

Figure 4 illustrates that rural population growth rates are positively correlated with the degree of resource dependency in low and middle-income economies. The trend line in the figure indicates that, on average, rural populations are expanding at 1% per year in developing economies that have a primary commodity export share of 70% or higher. In contrast, for those economies with a primary product export share of 25% or less, rural populations are stagnant or even declining.

The World Bank has launched a major study of the concentration of rural populations in developing economies on "fragile lands", which they define as "areas that present significant constraints for intensive agriculture and where the people's links to the land are critical for the sustainability of communities, pastures, forests, and other natural resources" (World Bank 2003, p. 59). The main findings of the study are:

- Since 1950, the estimated population on fragile lands in developing economies has doubled.

¹⁰ Controlling for per capita income in 1981 also yielded a correlation coefficient of -0.27 that was significantly significant at the 95% confidence level.

- Currently one quarter of the people in developing countries – almost 1.3 billion – survive on fragile lands. More than 1.2 billion people on fragile lands are in the developing regions of Latin America, Africa and Asia.
- The developing country populations on fragile lands include 518 million living in arid regions with no access to irrigation systems, 430 million on soils unsuitable for agriculture, 216 million on land with steep slopes and more than 130 million in fragile forest systems.
- These populations living on fragile land in developing countries account for many of the people in extreme poverty, living on less than \$1 per day.

The World Bank study also identified specific developing countries with significant shares of their populations on fragile lands, i.e. from 20-30% of their population, to 30-50%, to 50-70% to over 70% (World Bank 2003, Table 4.3). Seventy-two low and middle-income economies from Appendix 1 can be grouped into these four categories.

The results are indicated in Figure 5, which shows that resource-dependent low and middle-income economies contain large concentrations of their populations on fragile lands. Moreover, greater resource dependency is associated with a large percentage of population on fragile land. For example, as the concentration of populations on fragile lands in low and middle-income economies increases from 20-30% to 30-50% to 50-70% to over 70%, the average share of primary products in exports rises from 62.9% to 72.8% to 87.6% to 98.3% respectively.

The “Dualism within Dualism” Pattern of Resource Use

Together, the four “stylized facts” suggest that there are currently two types of “dualism” in patterns of resource use within developing countries that are very much relevant to the problem of resource degradation and poverty.

The first “dualism” is revealed by the first two stylized facts, and concerns aggregate resource use and dependency within the global economy. For example, the first stylized fact suggests that most low and middle-income economies are highly dependent on the exploitation of natural resources. For many of these economies, primary product exports account for the vast majority of their export earnings, and one or two primary commodities make up the bulk of

exports. The second stylized fact suggests that, currently for developing countries, increasing economic dependence on natural resources is negatively correlated with economic performance. The implications for low income countries is that the “take off” into sustained and structurally balanced economic growth and development is still some time away, and thus the dependence of their overall economies on natural resources will persist over the medium and long term.

Thus, one indicator of this first type of dualism might be the degree of resource dependency of an economy, as measured by the share of primary commodities in total exports. For instance, an economy with a primary product export share of 50% or more would be considered highly resource dependent and more susceptible to this first type of dualism.

The second “dualism” is revealed by the last two stylized facts, and concerns aggregate resource use and dependency within a developing economy. The third stylized fact suggests that economic development in low-income countries is associated with high rates of land conversion and degradation as well as increased stress on available freshwater resources. However, the fourth stylized fact suggests that many poor people in rural areas may not necessarily be benefiting from this increased resource use. Instead, a substantial proportion of the population in low and middle-income countries is concentrated in marginal areas and on ecologically 'fragile' land, such as converted forest frontier areas, poor quality uplands, converted wetlands and so forth. Households on these lands not only face problems of land degradation and low productivity but also tend to be some of the poorest in the world.

Two indicators of this second type of dualism might be the share of the total population concentrated on fragile lands, as defined by the World Bank (2003, p. 59) and discussed above, and the share of the rural population living under conditions of absolute poverty. Combining these two indicators gives us an approximate benchmark, or “20-20 rule”, for the degree of rural poverty-resource use dualism within a developing economy: a country with 20% or more of its population concentrated on fragile land and 20% or more of its rural population living in rural poverty shows evidence of the second type of dualism.

Table 1 combines the above two sets of indicators to show the extent of “dualism within dualism” for 72 low and middle-income economies. The countries are grouped in terms of their degree of resource dependency, as measured by the share of primary products in total exports, and the extent to which their populations are concentrated on fragile land. The figure in the

parentheses by each country also indicates the percentage of the rural population below the national poverty line.

According to the table, 56 out of the 72 economies have a primary product export share of 50% or more, and therefore display evidence of the first type of “dualism”, i.e. resource dependency within the global economy. All the economies have 20% or more of their population on fragile land and all but seven also have 20% or more of the rural population living in absolute poverty. Thus by the “20-20 rule”, virtually all the economies listed in Table 1 show signs of the second type of dualism, i.e. a high incidence of rural poverty-resource degradation linkage within the economy. What is more striking is that, with the exception of the Yemen Arab Republic and Indonesia, all 56 highly resource-dependent countries also satisfy the “20-20 rule”.¹¹ That is, three-quarters of the countries listed in Table 1 show considerable evidence of “dualism-within-dualism” characteristics.

Of the 16 countries that do not show strong signs of the first type of dualism, i.e. they have a primary product export share of less than 50%, many of the countries nevertheless show a high degree of the second type of dualism. For example, Haiti, Lesotho, Nepal and Pakistan have 30-50% of their populations on fragile land and display an incidence of rural poverty of 30-70%. The Dominican Republic, India, Jamaica and Vietnam have 20-30% of their populations living in fragile areas and around 30-60% of their rural populations in poverty. Only China and Mexico, and to a lesser extent Jordan and Malaysia, do not conform very strongly to the second type of dualism, according to the “20-20 rule” for population concentrated on fragile and the degree of rural poverty.

In sum, the “dualism within dualism” characteristics of most developing countries suggest that the process of resource-based development undertaken by these economies is not yielding widespread benefits. Agricultural land expansion, and natural resource exploitation by primary sector activities more generally, appears to be a fundamental feature of economic development in many of today's poorer economies. Yet, as we have seen, many developing economies have a large concentration of their populations on fragile land and high incidence of rural poverty. Also, developing countries that are highly dependent on exploiting their natural

¹¹ In fact, with over 50% of its population in fragile areas and with a rural poverty incidence of 19.2%, Yemen shows distinct signs of the second type of dualism. Indonesia is also not far off from satisfying the “20-20 rule”, given that the country has over 20% of its population on fragile land and 15.7% of its rural population in absolute poverty.

resource endowments tend to exhibit a relatively poor growth performance. This poses an intriguing paradox. Why is it that, despite the importance of natural capital for sustainable economic development, increasing economic dependence on natural resource exploitation appears to be a hindrance to growth and development in today's low and middle-income economies?

Conventional explanations suggest that the comparatively poor growth performance of low-income countries can be attributed to failed policies and weak institutions, including the lack of well-defined property rights, insecurity of contracts, corruption and general social instability (Pack 1994; World Bank 1992). More recent explanations have focused on the *resource curse hypothesis*, i.e. the poor potential for resource-based development in inducing the economy-wide innovation necessary to sustain growth in a small open economy, particularly under the "Dutch disease" effects of resource-price booms (Matsuyama 1992; Sachs and Warner 1995). Other theories have suggested an *open access exploitation hypothesis*, i.e. opening up trade for a developing economy dependent on open access resource exploitation may actually reduce welfare in that economy (Brander and Taylor 1997 and 1998).

While elements of these conventional explanations are relevant to explaining the paradox, the rest of this chapter develops an alternative explanation as to why current efforts of resource-based development are not more successful for low and middle-income economies.

Resource-Based Development and Frontier Expansion

Once again, an important clue to unravelling the paradox of the poor economic performance of today's resource-based developing countries can be found in the four "stylized" facts of natural resource use in these economies.

For example, the first three stylized facts suggest that developing countries today are embarking on a pattern of resource-dependent development that culminates in frontier resource exploitation, particularly in the form of agricultural land expansion and chronic stress on freshwater resources, but the end results do not yield much in the way of sustained economic progress. In fact, stylized fact four indicates the "symptoms" of malaise associated with frontier land expansion and resource-based development today: In many developing economies a significant proportion of extremely poor households are concentrated on fragile lands, and both rural population growth and the share of population on fragile lands seem to increase with the

degree of resource dependency of a developing economy. That is, frontier land expansion appears to be serving mainly as an outlet for the rural poor in many developing countries.

But why should frontier land expansion be associated with “unsustainable” resource-based development in many low and middle-income countries today? Historically, this has not always been the case.

For instance, finding “new frontiers”, or “reserves”, of natural resources to exploit became the basis of much of global economic development for the past five hundred years (Cipolla 1976; di Tella 1982; Findlay and Lundahl 1994; Webb 1964). Such frontier-based economic development can be characterized by a pattern of capital investment, technological innovation and social and economic institutions dependent on “opening up” new frontiers of natural resources once existing ones have been “closed” and exhausted (di Tella 1982; Findlay and Lundahl 1994). Particularly noteworthy is the period 1870 to 1913, which is often dubbed the “Golden Age” of resource-based development, because so many resource-dependent economies with unexploited “frontier” natural resources benefited from exporting primary products to the “industrial” core of the booming world economy (Findlay and Lundahl 1999; Green and Urqhart 1976; Taylor and Williamson 1994; Schedvin 1990). This was also the era of rapid migration of settlers and inflows of foreign capital into the “Great Frontier” regions identified by Webb (1964): temperate North and South America, Australia, New Zealand and South Africa. The economies of these regions therefore also expanded as a consequence of the world economic boom. Finally, a number of primary-producing “developing” or “periphery” regions, also experienced considerable growth as a consequence of growing world demand for raw materials and food. These included not only temperate Argentina but also a number of tropical countries that exported cash and food crops to the rest of the world.¹²

¹² Findlay and Lundahl (1994 and 1999) suggest that five types of developing economies benefited from resource-based growth over 1870-1914: regions of recent settlement (Argentina), plantation-based tropical economies (Brazil), peasant-based tropical economies (Burma, Siam, Gold Coast), “mixed” peasant and plantation-based economies (Colombia, Costa Rica, Ceylon and Malaya), and finally, mineral-based economies (Bolivia, Chile, South Africa). As suggested by Findlay and Lundahl, the economic development in these four types of economies conform largely to the “staples thesis”, which has argued that the development of many countries and regions has been led by the expansion of export sectors, and in particular, natural resource exports, and the “vent for surplus” theory, which suggested that trade was the means by which idle resources, and in particular natural resources in poor countries, were brought into productive use (Chambers and Gordon 1966; Myint 1958; Smith 1976; Southey 1978; Watkins 1963). A common theme in both the staples and vent for surplus is the existence of excess resources – “land” and “natural resources” – that are not being fully exploited by a closed economy. The function of international trade is to allow these new sources of natural resources that previously had no economic value to be exploited, for increased exports and growth. Thus, as both the staples and vent-for-surplus theses have been mainly

In addition, it has been argued that the origins of rapid industrial and economic expansion in the US over 1879-1940 were strongly linked to the exploitation of abundant non-reproducible natural resources, particularly energy and mineral resources (Romer 1996; Wright 1990). Other examples of successful mineral-based development have been cited for today's economies (Davis 1995; Wright and Czelusta 2002). In the developing world, most prominent have been the mineral-led booms in the 1990s in Peru, Brazil and Chile, although Davis (1995) identifies up to 22 mineral-based developing economies who appear to have fared comparatively well compared to other developing countries.

Recent reviews of successful resource-based development, both past and present, have pointed to a number of key features critical to that success (David and Wright 1997; Wright and Czelusta 2002).

First, the given natural resource endowment of a country must be continuously expanded through a process of *country-specific knowledge in the resource extraction sector*. As argued by Wright and Czelusta (2002, pp. 29 and 31): "From the standpoint of development policy, a crucial aspect of the process is the role of country-specific knowledge. Although the deep scientific bases for progress are undoubtedly global, it is in the nature of geology that location-specific knowledge continues to be important....the experience of the 1970s stands in marked contrast to the 1990s, when mineral production steadily expanded primarily as a result of purposeful exploration and ongoing advances in the technologies of search, extraction, refining, and utilization; in other words by a process of learning."

Second, there must be *strong linkages between the resource and other, more dynamic economic sectors (i.e., manufacturing)*. "Not only was the USA the world's leading mineral economy in the very historical period during which the country became the world leader in manufacturing (roughly from 1890 to 1910); but linkages and complementarities to the resource sector were vital in the broader story of American economic success....Nearly all major US manufactured goods were closely linked to the resource economy in one way or another: petroleum products, primary copper, meat packing and poultry, steel works and rolling mills, coal mining, vegetable oils, grain mill products, sawmill products, and so on" (Wright and Czelusta 2002, pp. 3-5).

concerned with "surplus" natural resources as the basis for the origin of trade and export-led growth, it is not surprising that both theories derived their inspiration from the Golden Age of Resource-Based Development.

Third, there must be *substantial knowledge spillovers* arising from the extraction and industrial use of resources in the economy. For example, David and Wright (1997) suggest that the rise of the American minerals economy can be attributed to the infrastructure of public scientific knowledge, mining education and the "ethos of exploration". This in turn created knowledge spillovers across firms and "the components of successful modern-regimes of knowledge-based economic growth. In essential respects, the minerals economy was an integral part of the emerging knowledge-based economy of the twentieth century....increasing returns were manifest at the national level, with important consequences for American industrialization and world economic leadership" (David and Wright 1997, pp. 240-241).¹³

However, there are two important caveats attached to the above conditions for successful resource-based development.

First, all of the past and present examples of development with the above three features are clearly based largely on minerals-based development (David and Wright 1997; Wright and Czelusta 2002). There is little evidence to date that a small open economy dependent on frontier agricultural land expansion is likely to foster the above conditions for successful resource-based development. In fact, there is some evidence that agricultural-based development based on land expansion may be negatively correlated with economic growth and development (Barbier 2003 and 2004; Stijns 2001).

Second, the existence of policy and market failures in the resource sector, such as rent-seeking behavior and corruption or open-access resource exploitation, will mitigate against successful resource-based development. Unfortunately, it is well documented that resource sectors in many developing countries are prone to problems of rent-seeking and corruption, thus ensuring that natural resource assets, including land, are not being managed efficiently or sustainably (Ascher 1999; Tornell and Lane 2001; Torvik 2002).¹⁴ Several studies have also

¹³ Wright and Czelusta (2002, p. 17) cite the specific example of the development of the US petrochemical industry to illustrate the economic importance of knowledge spillovers: "Progress in petrochemicals is an example of new technology built on resource-based heritage. It may also be considered a return to scale at the industry level, because the search for by-products was an outgrowth of the vast American enterprise of petroleum refining."

¹⁴ There is also an obvious link between rent-seeking activities in frontier areas and the lack of government enforcement of efficient regulation of these activities. For example, Ascher (1999, p.268) points out: "The weak capacity of the government to enforce natural-resource regulations and guard against illegal exploitation is an obvious factor in many of the cases reviewed. In every case of land and forest use, illegal extraction and failure to abide by conservation regulations reduce the costs to the resource exploiter and induce overexploitation, while failing to make the exploiter internalize the costs of resource depletion and pollution."

noted the rent-dissipation effect of poorly defined property rights, including the breakdown of traditional common property rights regimes, in developing countries (Alston *et al.* 1999; Baland and Plateau 1996; Bromley 1989 and 1991; Deacon 1999; Ostrom 1990). Brander and Taylor (1997 and 1998) note that over-exploitation of many renewable natural resources – particularly the conversion of forests to agricultural land – occurs frequently in developing countries if property rights over a resource stock are hard to define, difficult to enforce or costly to administer. They demonstrate that opening up trade for a resource-abundant economy with an open access renewable resource may actually reduce welfare in that economy over the long run.

Many studies of resource-rich countries emphasize how political economy factors more generally, in particular the existence of policy and institutional failures that lead to myopic decision-making, fail to control rent-seeking behavior by resource users and weaken the political and legal institutions necessary to foster long-run growth (Ascher 1999; Auty 1994 and 1997; Broad 1995; Gylfason 2001; Karl 1997; Ross 1999 and 2001; Stevens 2003; Torvik 2002). If “bad” policies and institutions lie at the heart of translating resource abundance and windfall gains into negative economy-wide effects, then “good” policies and institutions may explain why some developing economies with resource wealth may have avoided the “resource curse” In other words, “the natural resource curse is not necessarily the fate of resource abundant countries....sound economic policies and good management of windfall gains can lead to sustained economic growth” (Sarraf and Jiwanji 2001, p. 3). However, judging by the outcome – sustained economic growth – very few resource-abundant developing economies have achieved such success. For example, Gylfason (2001b, p. 566) examined the long-run growth performance of 85 “resource-rich” developing economies and concluded: “Of this entire group there are only four resource-rich countries which managed to achieve (a) long-term investment exceeding 25% of GDP on average in 1965-1998, equal to that of various successful industrial states lacking raw materials, and (b) per capita economic growth exceeding 4% per year on average during the same period....These countries are Botswana, Indonesia, Malaysia and Thailand. The three Asian countries achieved this success by diversifying their economies and by industrializing; Botswana without doing so.”¹⁵

¹⁵ However, Gylfason (2001, p. 566 n. 12) maintains that Indonesia should at best be considered only a qualified success, given the widespread corruption in the country and because Indonesia has recovered much less well from the 1997-98 Asian crisis compared to Malaysia and Thailand.

Botswana is a particularly interesting case because its economy has remained heavily dependent on mineral export earnings, principally diamonds, and has experienced substantial commodity export booms and windfalls periodically since the 1970s, yet since 1965 the country has one of the highest rates of long-term growth in the world and in the 1990s the highest ratios of government expenditures on education to GDP (Gylfason 2001). Botswana's success in managing cycles of resource booms and busts is attributed largely to its adoption of appropriate and stable economic policies, including managing the exchange rate to avoid excessive appreciation during boom periods, using windfalls to build up international reserves and government balances that provide a cushion when booms end, avoiding large-scale increases in government expenditure and instead targeting investments to public education and infrastructure, and finally, pursuing an economic diversification strategy that has led to modest increases in labor-intensive manufactures and services (Hill 1991; Sarraf and Jiwaji 2001). However, such long-term policies for stable management of the economy are only possible if legal and political institutions function well. Compared to most African countries, Botswana has had considerable political stability and lack of civil conflict. In addition, the government has an international reputation for "honest public administration", and overall Botswana is generally rated the least corrupt country in Africa (Gylfason 2001b).

In many developing economies, inequalities in wealth between rural households also have an important impact on land degradation and deforestation processes, which may explain why so many poorer households find themselves confined to marginal lands (Barbier 1999). There is also increasing evidence in developing countries that more powerful groups use their social and economic power to secure greater access to valuable environmental resources, including land, minerals, energy, gems, water and even fuelwood, (Alston *et al.* 1999; Barbier 1999; Barbier and Homer-Dixon 1999; Binswanger and Deininger 1997; Fairhead 2001; Homer-Dixon 1999; Lonegran 1999; Swain 2001). Such problems are exacerbated by government policies that favor wealthier households in markets for these key natural resources, and especially land. For example, "rural elites" in developing countries are often "able to steer policies and programs meant to increase rural productivity into capital-intensive investment programs for large farms, thus perpetuating inequality and inefficiency" (Binswanger and Deininger 1997, p. 1996).

First, poorer households are often unable to compete with wealthier households in land markets for existing agricultural land. The result is two segmented land markets: the wealthier rural households dominate the markets for better quality arable land, whereas the poorer and landless households either trade in less productive land or migrate to marginal lands.

Second, although poorer households may be the initial occupiers of converted forestland they are rarely able to sustain their ownership. As the frontier develops economically and property rights are established, the increase in economic opportunities and potential rents makes ownership of the land more attractive to wealthier households. Because of their better access to capital and credit markets, they can easily bid current owners off the land, who in turn may migrate to other frontier forest regions or marginal lands.

Third, because of their economic and political importance, wealthier households are able to lobby and influence government officials to ensure that resource management policies favorable to them continue. This means that policy reform is very difficult to implement or sustain.

For example, in Colombia distortions in the land market prevent small farmers from attaining access to existing fertile land (Heath and Binswanger 1996). That is, as the market value of farmland is only partly based on its agricultural production potential, the market price of arable land in Colombia generally exceeds the capitalized value of farm profits. As a result, poorer smallholders and of course landless workers cannot afford to purchase land out of farm profits, nor do they have the non-farm collateral to finance such purchases in the credit market. In contrast, large land holdings serve as a hedge against inflation for wealthier households, and land is a preferred form of collateral in credit markets. Hence the speculative and non-farming benefits of large land holdings further bid up the price of land, thus ensuring that only wealthier households can afford to purchase land, even though much of the land may be unproductively farmed or even idled.

Similar to Colombia, land titling, tax and credit policies in Brazil generally reinforce the dominance of wealthier households in credit markets and the speculative investment in land as tax shelters (Alston *et al.* 1999; Mahar and Schneider 1994). Because poorer households on the frontier do not benefit from such policies, their ability to compete in formal land markets is further diminished. This reinforces the “sell out” effect of transferring frontier land ownership from poorer initial settlers to wealthier and typically urban-based arrivals, forcing the poorer

households to drift further into the frontier, or enter into land use conflicts with wealthier landowners (Alston *et al.* 1999; Schneider 1994).

Throughout the developing world, the ability of poor farmers to obtain credit for land improvements is limited either by restrictions on the availability of rural credit for this purpose, or because insecure property rights mean that poor farmers are not eligible for credit programs. In particular, legal land titles prove to be significant in helping alleviate liquidity constraints affecting the purchase of working inputs, as well as land improvements generally, yet many smallholders do not have legally recognized titles to their land (Feder and Onchon 1987; López and Valdés 1998). In any case, often the only asset available to poor rural households for collateral is their land, and this may not always be allowed as the basis for acquiring loans (Zeller *et al.* 1997). In addition, for many poor rural households, “imperfect insurance markets, spatial dispersion, and covariant incomes add to the difficulties of obtaining access to credit” (Binswanger and Deininger 1997, p. 1971; see also Hoff and Stiglitz 1990; Stiglitz 1987).

Thus even if formal credit is available in rural areas, poor smallholders usually are not eligible or unable to take advantage of it to finance the inputs needed for improved land management and productivity (Binswanger and Deininger 1997; Feder 1985). Estimates suggest that only 5 percent of farmers in Africa and around 15 percent in Latin America and Asia have access to formal credit. Moreover, around 5 percent of all borrowers receive 80 percent of all credit (Hoff *et al.* 1993). A study across five countries in Latin America indicates that access to either extension assistance or credit for input purchases by smallholders ranges between 13% and 33% (López and Valdés 1998). Of the rural producers surveyed across Mexico who received rural credit, only 9.6% had holdings of 0-2 ha (Deininger and Minten 1999). In Malawi, although approximately 45% of rural smallholders have holdings of less than 1 ha and over 21% are 'core poor' households with less than 0.5 ha, only 17% of medium-term credit is allocated to households with less than 2 ha of land (Barbier and Burgess 1992). Many poor smallholders in developing countries are therefore forced to meet both consumption and input needs by borrowing from informal credit sources, often at much higher effective rates of interest (Binswanger and Sillers 1983; Chaves and Sánchez 1998; Zeller *et al.* 1997).

Economy-Wide Implications: The Frontier Expansion Hypothesis

Having provided evidence that the significant frontier land expansion accompanying resource-based development is not leading to sustainable economic development in poor economies, we now must try to explain why. We refer to this explanation as the *frontier expansion hypothesis*.¹⁶ This hypothesis is based on four key observations of the process of frontier-based development in developing economies today (Barbier 2003 and 2004).¹⁷

First, frontier land expansion and resource exploitation may be associated with poor economic performance in resource-dependent developing countries but not necessarily a cause of it. That is, frontier-based development is symptomatic of a pattern of economy-wide resource exploitation that: a) generates little additional economic rents, and b) what rents are generated are not being reinvested in more productive and dynamic sectors, such as manufacturing.

Second, one important reason that frontier land expansion is unlikely to generate much rents is that, as such expansion results largely from conversion of forest, wetlands and other natural habitat, it is likely to yield mainly “marginal” or “fragile” land exhibiting low productivity as well as significant constraints for intensive agriculture (World Bank 2003). This in turn implies that very little effort is invested, either by poor farmers working this land or government agricultural research and extension activities, in developing *country-specific*

¹⁶ Further elaboration of the frontier expansion hypothesis and a formal model illustrating the hypothesis can be found in Barbier (2005a). See also Barbier (2005b) for further discussion of the frontier expansion hypothesis in the overall context of natural resource use in economic development in low and middle-income economies.

¹⁷ As noted earlier, successful resource-based development in the United States was largely mineral-based development. In fact, there is increasing evidence that the considerable frontier agricultural expansion that did occur in the North America in the late 19th century had many of the features associated with frontier expansion occurring in developing economies today: it served mainly as an outlet for relatively poor smallholders, and what little rents were available were generally dissipated. For instance, the classic case of the “race for property rights” that often accompanies frontier agricultural expansion was the “land giveaways” and homesteading that opened up both the Canadian and United States West in the 19th century (Anderson and Hill 1975 and 1990; Southey 1978). As described by Anderson and Hill (1990, p. 177): “When property rights and the rents therefrom are ‘up for grabs’, it is possible for expenditures to establish rights to fully dissipate the rents, leaving the efficiency gains from privatization in question.” In the case of homesteading, individual farm families could establish freehold title by occupying and developing their land. In the case of land and natural resource giveaways (or grants), land and other natural resources were given away to large-scale landowners (e.g. railroad companies, ranchers, mineral exploiters) by the government as a reward for initiating development (e.g. building railways, establishing ranches, initiating mining operations). However, as argued by Southey (1978, p. 557) the latter activities could be considered “simply homesteading on a grand scale”. The result is that competition among homesteaders for the best land, and large-scale landowners for the best resource grants, will lead to premature development, as well as the complete dissipation of all net capitalized rents.

knowledge in improving the productivity and sustainable exploitation of frontier land and resources.

Third, in contrast to past and present examples of successful minerals-based development, there are unlikely to be *strong linkages between more dynamic economic sectors* (i.e., manufacturing) and the economic activities responsible for frontier land expansion (Wright and Czelusta 2002). This in turn limits the opportunities for *substantial knowledge spillovers* arising from the exploitation and conversion of frontier resources, including land. Thus frontier-based economic activities are unlikely to be integrated with the rest of the economy. There are two reasons for this. First, as noted above, frontier land expansion appears to be serving mainly as an outlet for the rural poor in many developing countries, which suggests that much of the output is either for subsistence or local markets. Second, by definition, frontier areas are likely to be located far away from urban and industrial centers.

Fourth, as discussed in the previous section, policy and market failures, such as rent-seeking behavior and corruption or open-access resource exploitation, are prevalent in the resource sectors of many developing economies. Frontier land expansion and resource exploitation is especially associated with open access.¹⁸ In addition, many large-scale resource-extractive activities, such as timber harvesting, mining, ranching and commercial plantations, are often responsible for initially opening up previously inaccessible frontier areas (Barbier 1997). Investors in these activities are attracted to frontier areas because of the lack of government controls and property rights in these remote areas mean that resource rents are easily captured, and thus frontier resource-extractive activities are particularly prone to rent-seeking behavior (Ascher 1999).

All of these factors combine to ensure that frontier-based economic development is unlikely to lead to high rates of sustained economic growth. In essence, all frontier resources, including land in forests and wetlands, are “reserves” that can be exploited potentially for economic rents. However, as we have seen, conversion of frontier land “reserves” tends to produce fragile agricultural land that is largely an outlet for absorbing poor households. Such frontier land expansion does not generate substantial rents, and any resulting agricultural output will increase mainly consumption of non-tradable goods (food for subsistence or local markets).

¹⁸ In this regard, the frontier expansion hypothesis shares many similarities with the open access hypothesis of Brander and Taylor (1997 and 1998). However, as noted, the open access problem is only part of one of the four key features of the frontier expansion hypothesis.

Frontier resource-extractive activities may yield more significant rents, but the rent-seeking behavior associated with these activities will mean that these rents will be re-invested into further exploitation of frontier resources. This process will continue until the economically accessible frontier resource “reserves” are exhausted and all rents are dissipated.

The lack of integration of frontier-based economic activities with the rest of the economy also decreases the likelihood that any rents generated by these activities will be reinvested in more productive and dynamic sectors, such as manufacturing. In essence, the frontier sector operates as a separate “enclave” in the developing economy. As already noted, frontier-based land expansion will result mainly in small-scale agricultural production that increases domestic, non-traded consumption. In contrast, more large-scale, frontier resource-extractive activities, such as mining, timber extraction, ranching and plantations, may generate increased resource-based exports. Such exports are more likely to result in either imported consumption or imported capital goods that are employed predominantly in the frontier resource-extractive industries. There are two reasons for this outcome. First, large-scale resource-extractive activities tend to benefit wealthier households in the economy, who have a higher propensity to consume imported goods. Second, as explained above, the re-investment of resource rents into further exploitation of frontier extractive reserves will require specific investments in imported capital goods for this purpose, such as mining machinery, milling equipment, road-building and construction tools, etc.

It follows that, although frontier-based economic development can lead to an initial "economic boom", it is invariably short-lived and the economic benefits are quickly dissipated. If the additional frontier "reserves" are used mainly to expand domestic consumption and exports (in exchange for imported consumption), then there will be little additional capital accumulation outside of the frontier resource-extractive sector. This implies that any economic boom will continue only as long as the frontier resource reserves last. Once resource rents are dissipated and the frontier is effectively closed, there will be no long-term take off into sustained growth for the economy as a whole.

If during the frontier expansion phase some rents are invested in capital accumulation in other sectors of the economy as well, then the initial boom period will coincide with increased growth. However, this growth path cannot be sustained. The additional capital accumulation is unlikely to overcome the poor linkages between other economic sectors (i.e., manufacturing) and frontier-based economic activities, and is therefore unlikely to yield substantial economy-wide

knowledge spillovers. As a result, any additional growth generated by this capital accumulation will last only as long as frontier expansion continues. Once the frontier is "closed" and any reserves of land and natural resources available to an economy have been fully exploited or converted, some economic retrenchment is inevitable, and an economic bust will occur.

In sum, the structural economic dependence of a small open low or lower middle income economy on frontier land and resource expansion precipitates a "boom and bust" pattern of development that is simply not conducive to sustained and high rates of long-run economic growth. Resource dependency, frontier-land expansion and populations concentrated on fragile lands are all indications that a developing economy is not exploiting its natural capital efficiently and sustainably. The result is a poor overall growth and development performance, and the "dualism within dualism" pattern of resource use and development described above.

Reversing the Cycle: The Role of Policy

If this "vicious cycle" is to be reversed, there are essentially two roles for policy reform within developing economies. First, specific policies must be aimed at overcoming the structural features of "dualism within dualism" in resource use patterns. Second, policies must also be introduced that improve the overall success of resource-based development that is accompanied by frontier land expansion. As we shall see, these two sets of reform are inherently inter-related.

One straightforward, but often politically difficult, approach to reducing "dualism within dualism" is economy-wide land reform. As noted by Binswanger and Deininger (1997, p. 1972), "where rural capital markets are highly imperfect and the distribution of wealth is unequal, a one-time redistribution of wealth, such as a land reform, may largely eliminate the need for distortionary redistributive policies later. As the authors point out, the experience of Japan, South Korea and Taiwan indicate that land reform is also likely to alter the growth path of the economy and lead to permanently higher levels of growth. Finally, the "greater wealth" arising through land reform "also increases the ability of the poor to directly participate in the political process" (Binswanger and Deininger 1997, p. 1999).

A related, but equally difficult, task is reform of tax, credit and other economic policies that generally reinforce the dominance of wealthier households in natural resource and land markets and promote the speculative investment in these resources as tax shelters. According to

López (2003, p. 271) such policies in Latin America over the past 50 years are symptomatic of the general economic policy failure in the region that has “focused on the generation of an expensive and often incoherent system of short-run incentives to promote investment in physical capital...by undertaxing capital income and wasted in massive subsidies to the corporate sector in a futile effort to promote investment and economic growth”. This has had two overall consequences on the land degradation and deforestation process in the region. First, as described above, the resulting market and tax distortions promote this process directly, in a deliberate strategy of “wasting natural resources as a way of enticing investors” López (2003, p. 260). Second, Latin American governments are dissipating scarce revenues and financial resources “instead of concentrating their efforts in raising enough public revenues to finance the necessary investment in human and natural capital and the necessary institutional capacities to effectively enforce environmental regulations” (López 2003, p. 271).

Finally, the third structural problem associated with “dualism within dualism” is the under-investment in human capital in rural areas, particularly by those poor households concentrated on fragile land. As noted above, these households generate insufficient savings, suffer chronic indebtedness and rely on informal credit markets with high short-term interest rates. As a result, private investment in human capital improvement is a luxury for most poor rural households, and similarly the lack of education and marketable skills limits not only the earning potential of the rural poor but also their political bargaining power relative to wealthier rural and urban households. As argued by Binswanger and Deininger (1997, pp. 1988-9): “Primary education and health services, especially for the poor, rural inhabitants, and women, are important not only because they foster growth and help reduce poverty through several well known channels, but also because they reduce income inequality, and thereby enhance the collective action potential of the poor.”

Clearly, if resource-dependent development in poor economies is associated with frontier land expansion and resource exploitation, then the critical issue for these economies is how to improve the sustainability of such development. Based on our previous discussion, the key to sustainable economic development will be improving the economic integration between frontier and other sectors of the economy, targeting policies to improved resource management in frontier areas and overcoming problems of corruption and rent-seeking in resource sectors.

Better integration between frontier-based activities and more dynamic economic sectors means a greater commitment to promoting “agro-industrialization” generally. As argued by Reardon and Barrett (2000), such a strategy comprises three related sets of changes: a) growth of commercial, off-farm agro-processing, distribution and input provision activities; b) institutional and organizational change in relations between farms and firms both upstream and downstream, such as marked increased in vertical integration and contract-based procurement; and c) related changes in product composition, technologies, and sectoral and market structure. Such an integrated approach to agro-industrialization is essential for developing *country-specific knowledge* in improving the productivity and sustainable exploitation of land resources, *strong forward and backward linkages* between more dynamic economic sectors (i.e., manufacturing) and agricultural activities, and finally, the opportunities for *substantial knowledge spillovers* from the farm to firm level.

However, frontier-based agricultural activities will be largely left out of the development of such agro-industrial capacity in low and middle-income economies unless specific policy reforms are aimed at improving resource management and productivity of frontier lands, and targeted especially at poor rural households farming these lands. Nevertheless, recent economic analyses are beginning to indicate what kind of policy reforms may be necessary to improve the incentives for better land management in the frontier areas and marginal farmlands of developing countries. The good news is that overall agricultural sector policy reforms that reduce price distortions, promote efficient operation of rural financial markets, and make property rights enforceable should support these incentives (Barbier 1997). In some countries, there may be a 'win-win' situation between general macroeconomic and sectoral reforms and improved land management. For example, in the Philippines it was found that reducing import tariffs and export taxes may also reduce the rate of upland degradation (Coxhead and Jayasuriya 1995). Similarly, in Indonesia reducing fertilizer, pesticide and other subsidies for irrigated rice could be compatible with improved investment and credit strategies for the uplands of Java (Pearce *et al.* 1990).

However, other economy-wide and sectoral reforms may have unknown - and possibly negative - aggregate impacts on land and resource use strategies of rural households. It may therefore be necessary to complement these reforms with specific, targeted policies to generate direct incentives for improved rural resource management. The main purpose of such policies

should be to increase the economic returns of existing as opposed to frontier lands; improve the access of poorer rural households to credit and land markets; and alleviate any remaining policy biases in these markets that favor relatively wealthy farmers and individuals (Barbier 1997). In some cases, specific non-price transfers in the form of targeted subsidies could reduce significantly the incentives for land degradation and forest conversion in developing countries. This is particularly true for expenditures that aimed to improve access by the rural poor to credit, research and extension, investments to disseminate conservation, information and technologies to smallholders, and investments in small-scale irrigation and other productivity improvements on existing smallholder land. For example, in Mexico there is some evidence that a land improvement investment program for existing rainfed farmers, particularly in States and regions prone to high deforestation rates, could provide direct and indirect incentives for controlling deforestation by increasing the comparative returns to farming existing smallholdings as well as the demand for rural labor (Barbier 2002; Barbier and Burgess 1996).

Targeting public investments and expenditures to the agricultural sector to provide effective credit markets and services to reach poor rural households, while continuing to eliminate subsidies and credit rationing that benefit mainly wealthier households, may be important in achieving a more efficient pattern of land use - and a less extensive one - in many developing countries. An important inducement for many poor smallholders to invest in improved land management is to establish proper land titling and ownership claims on the land they currently occupy. To improve land tenure services in areas where frontier expansion is occurring it may be necessary to develop more formal policies for smallholder settlement, such as a policy to allocate preferentially public land with fully demarcated ownership and tenure rights to smallholders.

In addition, policies that have increased processes of land degradation and deforestation as an unintended side effect should be mitigated. For example, expansion of the road network in frontier areas has been identified as a major factor in opening up forestlands and thus making these lands artificially cheap and abundantly available. Tax policies that encourage the holding of agricultural land as a speculative asset not only artificially inflate the price of existing arable land but promote much idling of potentially productive land.

Finally, in many developing countries policy reform will have to be complemented by investments in key infrastructural services. Several have been mentioned already - availability of

rural credit, conservation and general extension services, land tenure and titling services, and irrigation and other land improvement investments for existing smallholder land. However, other services may also be important. For example, in most rural areas there needs to be a general development of adequate post-harvest and marketing facilities targeted to smallholder production, in order to ensure that such production participates in an overall agro-industrial development strategy. In frontier areas, there is a need not only to increase credit and extension services to initial settlers but also more basic services such as improved community, education and health care services.

Perhaps one of the greatest challenges for policy reform in developing countries will be to reduce the propensity for corruption and rent seeking in resource-based sectors. The institutional “failures” that promote such practices appear to be deep-seated and endemic, and will be difficult to change. Nevertheless, as argued by Ascher (1999, p. 299) there is some hope for reform even in this difficult area: “The fact that some government officials may intend to sacrifice resource-exploitation soundness for other objectives does not mean that they will necessarily have their way, even if they are chiefs of state. Prior arrangements, public outcry, and adverse reactions by international institutions can raise the political or economic costs too high. Other officials may be in a position to block their actions, especially if the structures of natural-resource policymaking reveal policy failures for what they are.”

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Appendix 1

Export Concentration in Primary Commodities for Low and Middle Income Developing Economies

	Export Share 1990/99 a/	Export Share 1980/81 b/	Export Share 1965 b/	Main Export Commodities c/			
				1		2	
	90%-100%						
Yemen A.R.	100	49	100	Fisheries	31.3%	Petroleum	14.1%
Botswana	100 c/	NA	NA	Diamonds	92.7%	Beef	5.3%
Angola	99	NA	82	Petroleum	77.1%	Coffee	2.6%
Nigeria	99	99	97	Petroleum	94.2%	Cocoa	2.5%
Mali	99	83	97	Cotton	41.9%	Groundnuts	0.8%
Ethiopia	99 d/	99	99	Coffee	66.6%	Sugar	1.1%
Iran	99 c/	NA	96	Petroleum	98.1%	Fisheries	0.2%
Rwanda	99 c/	99	100	Coffee	68.8%	Tea	8.4%
Eq. Guinea	99 c/	91	NA	Cocoa	53.5%	Timber	38.0%
Sao Tome & Pr.	99 d/	100	NA	Cocoa	95.5% d/	Copra	1.8%
Yemen PDR	99 d/	NA	94				
Burkina Faso	98 d/	85	95	Cotton	27.3%	Livestock	26.8% d/
Zambia	98 c/	99	100	Copper	93.3%	Zinc	1.8%
Liberia	98 c/	98	97	Iron Ore	60.4%	Rubber	20.4%
						Oilseed	
Sudan	97	99	99	Cotton	30.0%	Cake	1.6%
Niger	97	98	95	Ores/Metals	67.0%e/	Food	29.0%e/
Uganda	97	100	100	Coffee	95.8%	Cotton	1.6%
Mauritania	97 d/	99	99	Fisheries	41.9%	Iron Ore	37.0%
Algeria	96	99	96	Petroleum	34.9%	Phosphate	0.2%
Benin	96	96	95	Cotton	26.0%	Cocoa	16.0%
Malawi	95	93	99	Tobacco	53.5%	Tea	15.4%
Libya	95	99	100	Petroleum	90.5%		
Iraq	95 c/	NA	99	Petroleum	94.4%	Tobacco	0.1%
Somalia	95 d/	99	86	Bananas	18.6%	Fisheries	3.5%
Ecuador	94	93	98	Petroleum	43.6%	Fisheries	15.8%
						Groundnut	
Gambia, The	94	NA	NA	Groundnuts	17.2%	Oil	12.0%
Guyana	94 c/	NA	NA	Bauxite	39.5%	Sugar	35.7%
Congo, Dem. Rep. (Zaire)	93 d/	94	92	Copper	35.9%	Coffee	14.3%
Nicaragua	92	92	94	Coffee	40.9%	Cotton	21.2%
Comoros	92 d/	86	NA	Cloves	41.7% d/	Vanilla	33.3% d/
Cameroon	91	97	94	Petroleum	48.1%	Coffee	13.1%
Congo, Rep.	91 c/	94	37	Petroleum	83.2%	Timber	5.7%
Saudi Arabia	90	99	99	Petroleum	88.5%e/	Food	1.0%e/
Papua N.G.	90	100	90	Copper	31.0%	Coffee	15.2%
Lao PDR	90 d/	100	94	Timber	51.7% d/	Electricity	19.0%

Export Concentration in Primary Commodities for Low and Middle Income Developing Economies (cont.)

	Export Share 1990/99 a/	Export Share 1980/81 b/	Export Share 1965 b/	Main Export Commodities c/			
				1		2	
80%-89%							
Burundi	89 c/	96	95	Coffee	83.5%	Tea	4.2%
Venezuela	89	NA	98	Petroleum	55.7%	Aluminum	3.7%
Myanmar	89	81	99	Timber	40.3%	Rice	28.1%
Chad	89 d/	96	97	Cotton	33.2%	Oilseed	0.2%
Oman	88	96	NA	Petroleum	90.0%	Fisheries	0.7%
Cote d'Ivoire	88 d/	90	95	Cocoa	30.5%	Coffee	18.5%
Paraguay	87	NA	92	Cotton	16.4%	Soybeans	14.9%
Gabon	87 c/	NA	NA	Petroleum	70.5%	Manganese	8.1%
Guinea-Bissau	87 d/	71	NA	Fisheries	13.9%	Groundnuts	10.4%
Togo	86	85	97	Phosphate	31.7%	Cotton	11.8%
Ghana	86	98	98	Cocoa	49.2%	Aluminum	11.3%
Chile	85	90	96	Copper	42.9%	Fisheries	11.6%
Tanzania	84	86	87	Coffee	44.1%	Cotton	11.3%
Panama	81	91	98	Fisheries	31.3%	Bananas	22.5%
Honduras	80	89	96	Bananas	35.4%	Coffee	28.0%
Peru	80	83	99	Copper	17.3%	Zinc	12.3%
Guinea	80	NA	NA	Bauxite	72.8%	Aluminum	19.4%
Cuba	80 c/	NA	NA	Sugar	74.9%	Fisheries	2.3%
70%-79%							
Mozambique	79 c/	NA	NA	Fisheries	55.7%	Sugar	7.1%
Bolivia	78	100	95	Tin	18.6%	Zinc	3.4%
Syrian Arab Republic	77	NA	90	Petroleum	40.1%	Cotton	7.9%
Maldives	77 d/	70	NA	Fish	57.1% d/		
Kenya	74	88	94	Coffee	31.7%	Tea	22.2%
Colombia	72	72	93	Coffee	46.7%	Bananas	4.1%
Zimbabwe	71	63	85	Tobacco	19.7%	Cotton	6.7%
Guatemala	71	71	86	Coffee	39.2%	Bananas	6.5%
60%-69%							
Argentina	69	84	94	Oilseed	9.5%	Wheat	8.7%
Trinidad and Tobago	68	86	93	Petroleum	41.7%	Sugar	1.3%
Madagascar	67	92	94	Coffee	36.8%	Fisheries	8.8%
Uruguay	61	70	95	Beef	12.0%	Wool	8.5%
Senegal	60	81	97	Fisheries	39.9%	Phosphate	8.5%

Export Concentration in Primary Commodities for Low and Middle Income Developing Economies (cont.)

	Export Share 1990/99 a/	Export Share 1980/81 b/	Export Share 1965 b/	Main Export Commodities c/			
				1		2	
50%-59%							
Egypt	58	92	80	Petroleum	39.3%	Cotton	7.4%
Sierra Leone	58 c/	57	39	Bauxite	18.0%	Cocoa	16.3%
El Salvador	57	63	83	Coffee	63.6%	Sugar	3.0%
Central African Republic	57 c/	74	46	Coffee	26.0%	Timber	18.0%
Indonesia	54	96	96	Petroleum	31.1%	Rubber	4.7%
Morocco	50	72	95	Phosphate	16.9%	Fisheries	11.9%
40%-49%							
Costa Rica	49	68	84	Coffee	31.4%	Bananas	20.0%
Jordan	47	57	81	Phosphate	22.1%	Wheat	0.3%
Brazil	46	59	92	Coffee	8.5%	Iron Ore	6.6%
Malaysia	33	80	94	Petroleum	12.5%e/	Food	10.0%e/
Sri Lanka	33	79	99	Tea	28.7%	Rubber	7.3%
30%-39%							
South Africa	37	26	68	Ores/metals	16.0%e/	Petroleum	8.5%
Mexico	36	73	84	Petroleum	49.6%	Coffee	3.3%
Thailand	30	68	95	Fisheries	10.7%	Rice	9.0%
Jamaica	30	40	69	Aluminum	34.5%	Bauxite	16.5%
20%-29%							
Mauritius	29	69	100	Sugar	38.7%	Fisheries	1.5%
Tunisia	26	56	82	Petroleum	32.5%	Fisheries	3.1%
India	25	47	51	Tea	4.6%	Iron Ore	4.2%
Vietnam	24 c/	NA	NA	Fisheries	10.3%	Rubber	4.0%
Dominican Rep.	21	81	98	Sugar	20.6%	Nickel	15.4%
Philippines	20	49	95	Coconut Oil	7.0%	Copper	5.1%
10%-19%							
China	19	43	NA	Petroleum	12.5%	Cotton	1.7%
Pakistan	18	36	64	Cotton	12.1%	Rice	8.4%
Bangladesh	16	39	NA	Fisheries	12.5%	Jute	12.5%
Haiti	15	NA	NA	Coffee	15.5%	Cocoa	1.8%
Nepal	11	48	NA	Rice	3.6%	Oilseed	1.6%

Export Concentration in Primary Commodities for Low and Middle Income Developing Economies (cont.)

	Export Share	Export Share	Export Share	Main Export Commodities c/			
	1990/99 a/	1980/81 b/	1965 b/	1	2		
	0%-9%						
Korea, Rep.	7	9	40	Fisheries	3.1%	Sugar	0.2%
Lesotho	5 c/	NA	NA	Wool	4.8%		
Lebanon	2 c/	NA	66	Tobacco	1.3%	Wool	0.2%

Total No. of Countries 95

Avg Export Share of All Countries 71

Median Export Share of All Countries 84

Countries with Export Share > 90% 35

Countries with Export Share > 50% 71

Notes: Low and middle-income countries in Africa, Latin America, Asia and Oceania, based on World Bank definition (countries with GDP per capita in 1994 at 1987 constant purchase power parity \$ of less than \$10,500 and an average of \$2,691).

a/ Based on United Nations Conference Trade and Development (UNCTAD), *Handbook of International Trade and Development Statistics, 2001* unless otherwise stated.

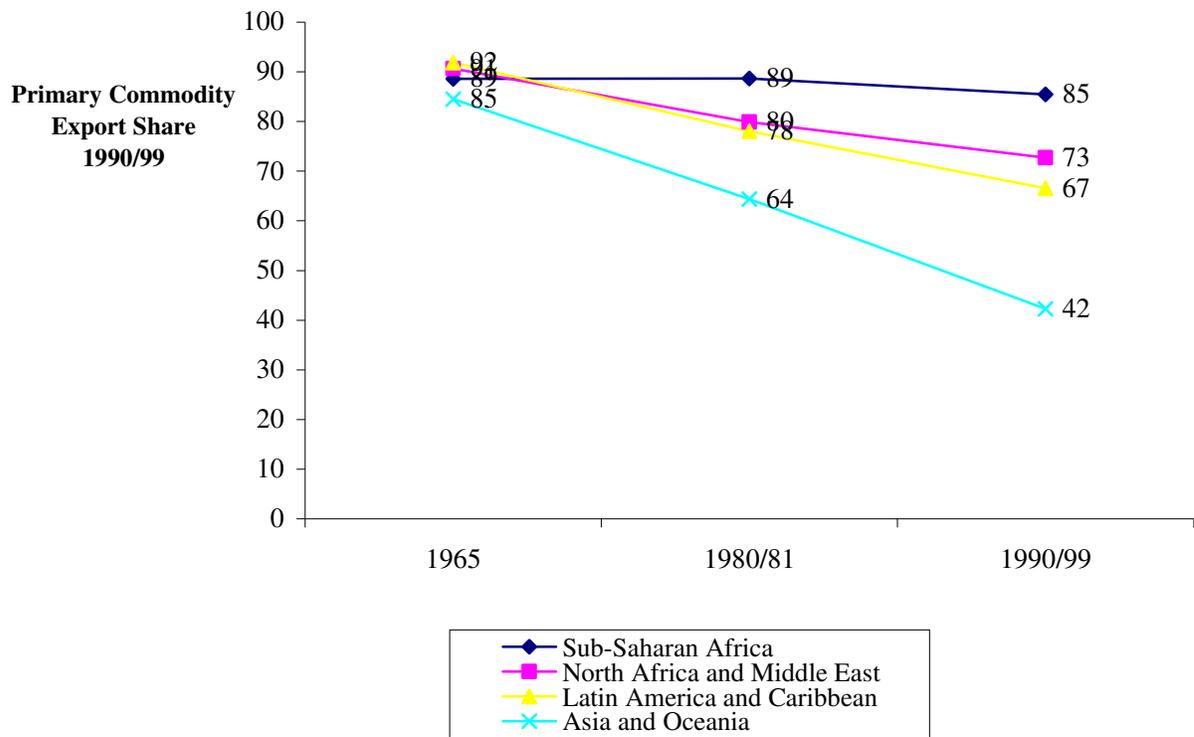
b/ Based on various editions of the following World Bank documents: *World Development Report, Trends in Developing Economies, Commodity Trade and Price Trends* and *African Economic and Financial Data*.

c/ Based on World Bank, *Commodity Trade and Price Trends, 1989-91 Edition*.

d/ Based on World Bank, *Commodity Trade and Price Trends, 1989-91 Edition*

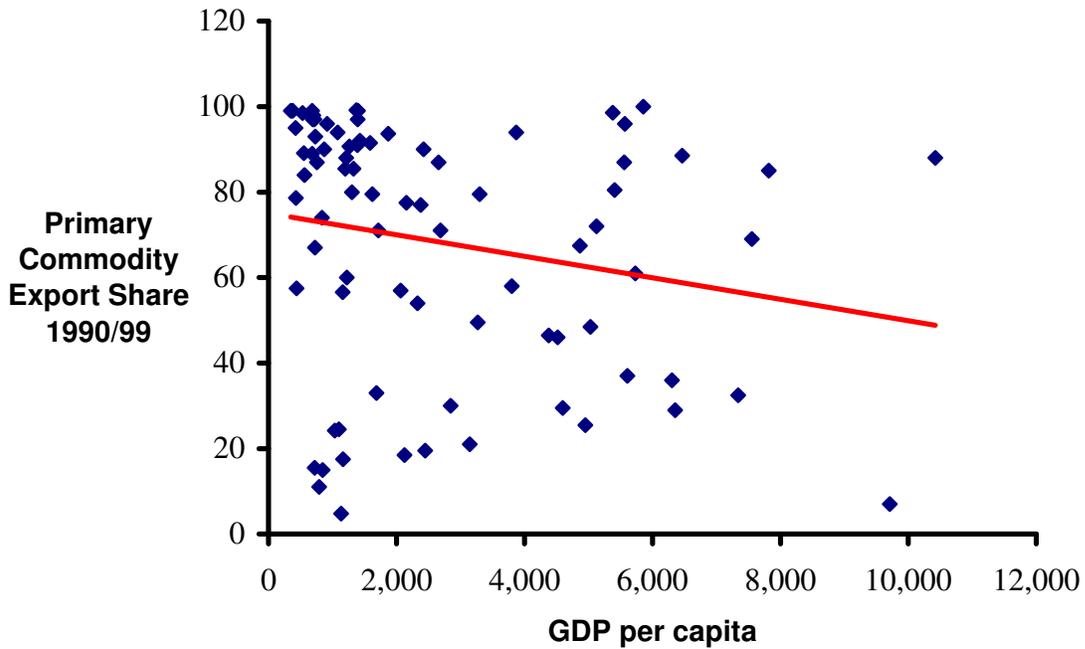
e/ Based on World Bank Development Indicators.

Figure 1. Regional Trends in Resource Dependency



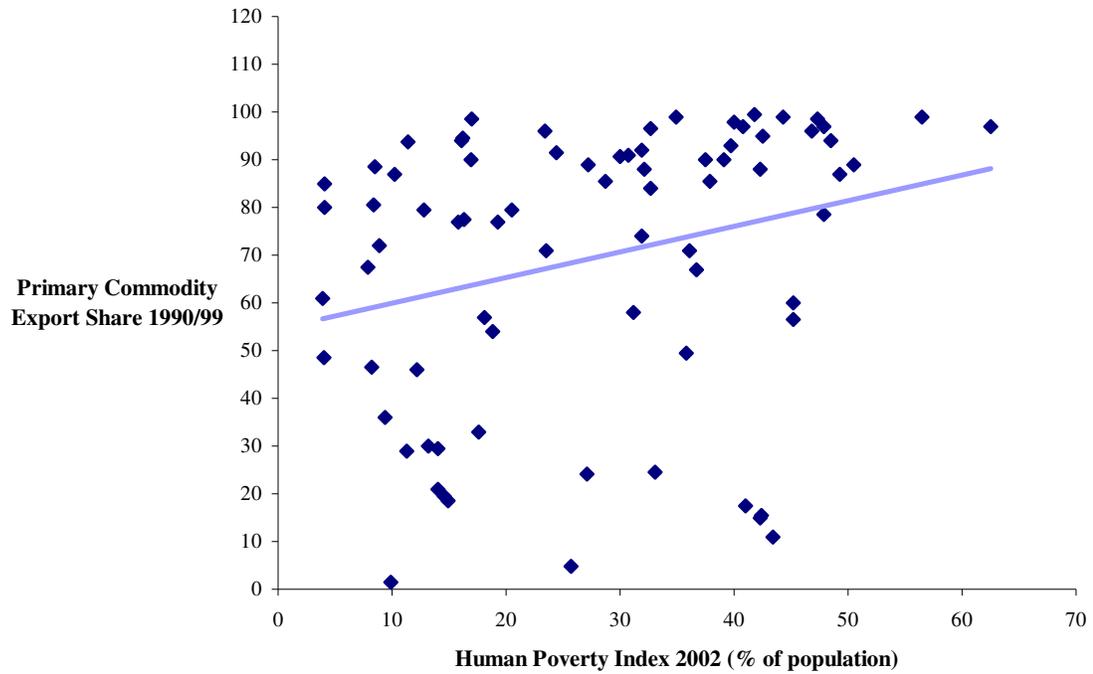
Source: See Appendix 1.

Figure 2. Resource Dependency and GDP per Capita in Low and Middle-Income Economies



Notes: Primary commodity export share is the average export share 1990/99 for low and middle-income countries in Appendix 1.
GDP per capita in 1994 at 1987 constant purchase power parity \$, from World Bank Development Indicators.
Correlation coefficient, $r = -0.205$. Number of observations = 82.

Figure 3. Resource Dependency and Poverty in Low and Middle-Income Economies

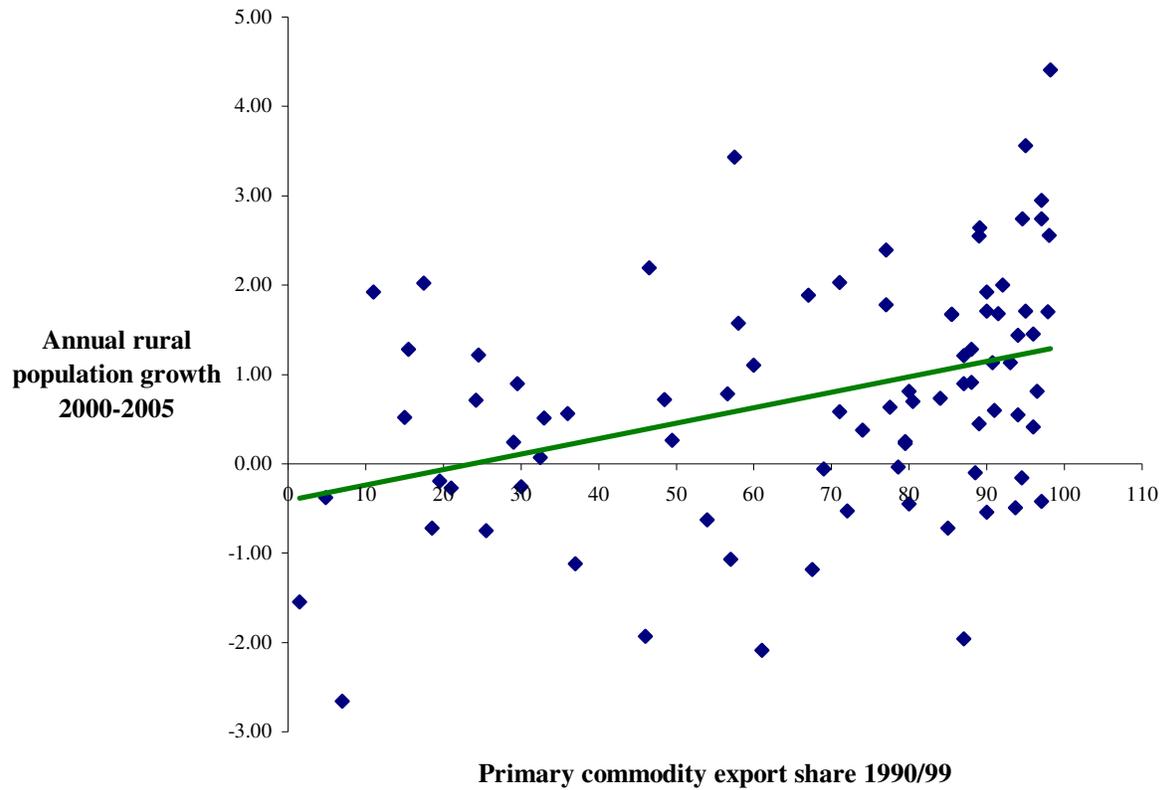


Notes: Primary commodity export share is the average export share 1990/99 for low and middle-income countries in Appendix 1.

Human Poverty Index 2002 from the United Nations Development Program, *Human Development Report 2002*.

Correlation coefficient, $r = 0.275$. Number of observations = 77.

Figure 4. Resource Dependency and Rural Population Growth in Low and Middle-Income Economies

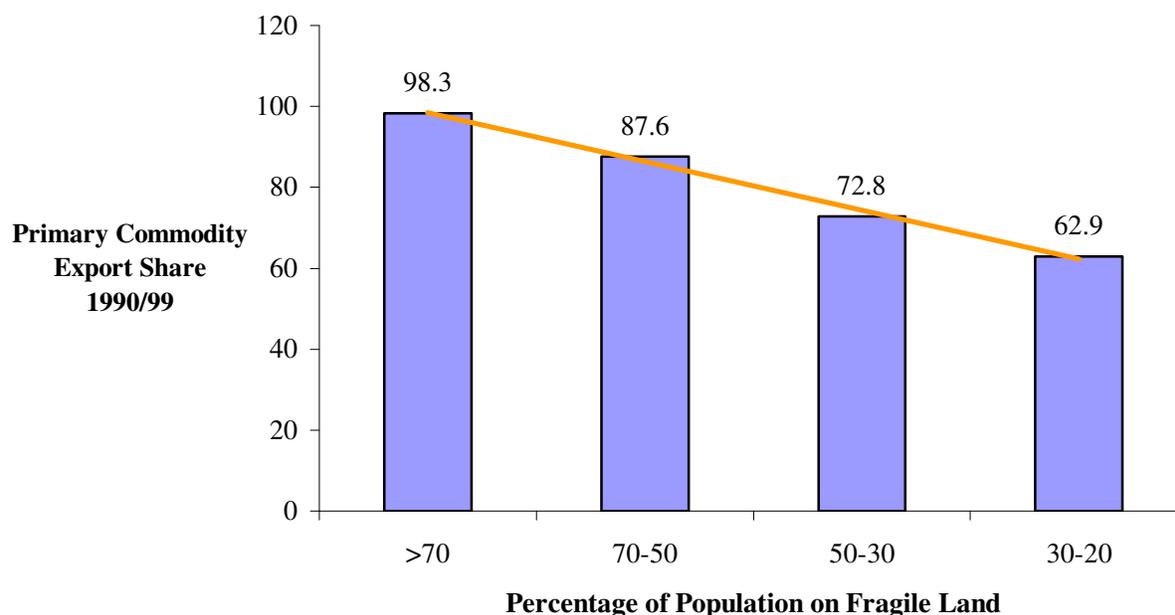


Notes: Primary commodity export share is the average export share 1990/99 for low and middle-income countries in Appendix 1.

Annual rural population growth 2000-2005 from Population Division of the United Nations Secretariat, World Urbanization Prospects: The 2001 Revision.

Correlation coefficient, $r = 0.465$. Number of observations = 94.

Figure 5. Resource Dependency and Share of Population on Fragile Lands in Low and Middle Income Economies



Notes: Primary commodity export share is the average export share 1990/99 for low and middle-income countries in Appendix 1.

Share of population on fragile land is from World Bank, *World Development Report 2003*, Table 4.3. Fragile land is defined in the report as "areas that present significant constraints for intensive agriculture and where the people's links to the land are critical for the sustainability of communities, pastures, forests, and other natural resources" (p. 59).

Number of observations = 72, of which 2 (> 70%), 8 (70-50%), 33 (30-50%) and 29 (20-30%).

Table 1. Selective Countries Displaying "Dualism within Dualism" Characteristics

	Share of Population on Fragile Land $\geq 50\%$	Share of Population on Fragile Land 30-50%	Share of Population on Fragile Land 20-30%
Primary Product Export Share $\geq 90\%$	Burkina Faso (61.2) Chad (67.0) Congo Dem. Rep. (NA) Laos (53.0) Mali (72.8) Niger (66.0) Papua New Guinea (NA) Somalia (NA) Sudan (NA) Yemen A.R. (19.2)	Algeria (30.3) Angola (NA) Benin (33.0) Botswana (NA) Cameroon (32.4) Comoros (NA) Eq. Guinea (NA) Ethiopia (31.3) Gambia (64.0) Guyana (NA) Iran (NA) Mauritania (57.0) Nigeria (36.4) Rwanda (51.2) Uganda (55.0)	Ecuador (47.0) Congo, Rep. (NA) Liberia (NA) Zambia (88.0)
Primary Product Export Share 50-90%	Egypt (23.3) Zimbabwe (31.0)	Central Af. Rep. (66.6) Chad (67.0) Guatemala (71.9) Guinea (40.0) Kenya (46.4) Morocco (27.2) Senegal (40.4) Sierra Leone (76.0) Syria (NA) Tanzania (51.1)	Bolivia (79.1) Burundi (36.2) Côte d'Ivoire (32.3) El Salvador (55.7) Ghana (34.3) Guinea-Bissau (48.7) Honduras (51.0) Indonesia (15.7) Madagascar (77.0) Mozambique (37.9) Myanmar (NA) Panama (64.9) Peru (64.7) Togo (32.3) Trinidad & Tobago (20.0)
Primary Product Export Share $< 50\%$		Costa Rica (25.5) Haiti (66.0) Lesotho (53.9) Nepal (44.0) Pakistan (36.9) South Africa (11.5) Tunisia (21.6)	China (4.6) Dominican Rep. (29.8) India (36.7) Jamaica (33.9) Jordan (15.0) Malaysia (15.5) Mexico (10.1) Sri Lanka (20.0) Vietnam (57.2)

Notes: Primary commodity export share is the average export share 1990/99 for low and middle-income countries in Appendix 1.

Share of population on fragile land is from World Bank, *World Development Report 2003*, Table 4.3.

Figure in parenthesis is the percentage of the rural population below the national poverty line, from World Bank, 2002 World Development Indicators.