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## Why Tropical Countries are Underdeveloped

The strongest link in explaining the wealth and poverty of nations is the relationship between ecological zones and per capita income, according to NBER Research Associate **Jeffrey Sachs**. Yet, most recent cross-country analyses of economic growth have neglected the importance of physical geography.

Despite their varied economic, political, and social histories, almost all of the tropical countries remain underdeveloped at the start of the 21<sup>st</sup> century. Only two tropical-zone countries, Hong Kong and Singapore, rank among the 30 countries classified as high-income by the World Bank. All of the high-income regions — North America, Western Europe, Northeast Asia, the Southern Cone of Latin America, and Oceania — are outside the tropics. When temperate-zone economies are not rich, there is typically a straightforward explanation, such as decades under communism. Sea navigable regions are generally richer than land-locked nations. Those that are both tropical and land-locked — including Bolivia, Chad, Niger, Mali, Burkina Faso, Uganda, Rwanda, Burundi, Central African Republic, Zimbabwe, Zambia, Lesotho and

Laos — are among the very poorest in the world.

In **Tropical Underdevelopment** (NBER Working Paper No. 8119), Sachs uses geographic information system mapping to combine climatic and economic data. He observes that in 1820, GNP per capita in the tropical regions was roughly 70 percent

of GNP in the temperate zone. By 1992, GNP per capita in the tropical regions was 25 percent of that in the temperate zone. Thus, between 1820 and 1992, GNP per capita in the temperate region grew at an average annual rate of 1.4 percent, compared with 0.9 percent a year in the non-temperate region.

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Between 1960 and 1992, both regions grew at about 2.3 percent per year. This reflects fast growth in non-temperate zone Asia of 2.9 percent per year, and continued poor performance in Africa and Latin America.

At the core of this long-term growth was the continued development of technology, a process that has benefitted the temperate-zone

countries much more than the tropics. Production technology in the tropics has lagged behind temperate-zone technology in the two critical areas of agriculture and health. The difficulty of mobilizing energy resources in tropical economies also has contributed to the income gap between climate zones. The problems of applying temperate-zone technological advances to the tropical setting have amplified these factors. Agricultural, health, and some manufacturing-related technologies that could diffuse *within* ecological zones could not diffuse *across* them.

For the major crops (rice, maize, and wheat), productivity is considerably higher in the temperate zone than in the tropical zone: Sachs estimates that in 1995, productivity per hectare of grain produced was approximately 50 percent higher in temperate-zone countries. The explanation lies in soil formation and erosion, pests and parasites, water availability, and the effects of tropical climates on plant respiration. Poor

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nutrition, resulting from poor agricultural productivity, in turn contributes to poor health. Sachs argues that economic development in tropical eco-zones requires a concerted international effort: agricultural technologies must be specific to the needs of tropical economies.

The burden of disease is considerably higher in the tropics than in temperate climates. Even after controlling for GNP per capita, health outcomes are far better in temperate-zone countries: infant mortality in temperate-zone countries is 50 percent lower; life expectancy in temperate countries is 8 percent

higher. Infectious diseases affected all parts of the world in the 19<sup>th</sup> century. Temperate-zone infectious diseases were partially brought under control through a combination of improved nutrition, societal adjustment to diseases, improved public sanitation, and the introduction of immunization. Tropical vector-borne diseases, such as malaria and helminthic infections, have proved much harder to control. Ecology affects the transition of many important diseases, some of which are now confined to tropical countries.

The income gap also has been amplified in the tropics as poor pub-

lic health and weak agricultural technology have combined to slow the demographic transition from high fertility and mortality rates to low fertility and mortality rates. Imbalances in geopolitical power too have played a role, for example the domination of global financial and development institutions by the rich, temperate-zone countries. This in turn might help to explain why the importance of physical geography in the development debate, and in framing development policies, has been neglected.

— Andrew Balls

## Child Care Regulations Yield Mixed Results

**G**overnment regulation of child care facilities creates both winners and losers in terms of childhood accidents, according to a study by NBER Research Associate **Janet Currie** and her co-author **V. Joseph Hotz**. Working parents who can afford to put their children into regulated child care settings benefit from a lower rate of accidental injury or death for their offspring. Parents who find that regulated child care with its higher costs is unaffordable and place their children with unregulated caregivers may subject their children to higher rates of unintentional injury, they find.

In **Accidents Will Happen? Unintentional Injury, Maternal Employment, and Child Care Policy** (NBER Working Paper No. 8090), Currie and Hotz note that day care has become important in most western countries because of the dramatic increase in recent years in the labor force participation of mothers with young children. In the United States, the proportion of mothers who are working for pay

and have children under age six has risen from 47 percent in 1980 to 62 percent in 1996. Despite the magnitude of this change, little is known about the way that the effects of maternal employment may be mediated by child care policy.

Currie and Hotz look at one impact on children, the incidence of

school and unsupervised. Childhood death rates from causes such as burns, drowning, and falls are systematically lower in Europe than in the United States. If supervision matters, they argue, then there may be scope for child care regulation to reduce accident rates.

Currie and Hotz examine this issue

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unintentional injuries. Epidemiological evidence clearly indicates that the risks of childhood injury vary across socioeconomic groups, race, and time. For example, black children are 1.7 times more likely than white children to die from unintentional injuries. Furthermore, there is evidence that suggests that the quality of supervision matters. For example, most childhood accidents occur between May and August, and most unintentional-injury-related deaths among older children happen in the evening when they are likely to be out of

using individual data from the National Longitudinal Survey of Youth about accidents requiring medical attention, and state-level data from Vital Statistics records about fatal accidents. The regulations they focus on include child-staff ratios in day care facilities and family homes, whether insurance is required, whether more than one annual inspection is required, and whether caregivers are required to have any training beyond high school.

The authors find “strong and consistent evidence” that requiring caregivers to have education beyond

high school reduces both fatal and non-fatal accident rates. Regulations setting child-staff ratios have only small effects on accident rates, the authors find. Requiring more than one inspection per year has statistically significant but mixed effects: It reduces fatal accidents (among children in regulated care), but also

crowds black children out of the regulated sector, presumably by raising its price. When insurance is required, the incidence of fatal injuries is lowered among whites, but not among blacks. Both whites and blacks tend to be crowded out of regulated care, however.

On the whole, it appears that

African-American children are more likely to leave the regulated sector in response to child care regulation that increases costs, suggesting that they are more likely to be “losers” while white children are more likely to be “winners.”

— David R. Francis

## Productivity Growth and the New Economy

The information and communications industries are widely acknowledged as having fueled productivity in the United States in recent years. But by applying a new approach to measurement, NBER Research Associate **William Nordhaus** reports that the same period has also seen a substantial upturn in labor productivity outside of the new economy.

In **Productivity Growth and the New Economy** (NBER Working Paper No. 8096) Nordhaus relies on traditional data from the Bureau of Economic Analysis and the Bureau of Labor Statistics. In addition, though, he employs a new measure called “well-measured output,” which involves only sectors (farming, mining, manufacturing, transportation, utilities, wholesale and retail trade) for which output is measured relatively well. He then considers these factors segregated from new economy growth.

The last three years for which statistics are available (1996–8) were a period of dramatic growth and accordingly provide fertile ground for study. In order to distinguish changes in labor productivity growth as seen in GDP, in the business sector, and in well-measured output, Nordhaus devises a new technique that identifies a pure productivity effect (a fixed weight average of the productivity growth rates of different industries).

His results indicate that the pure productivity effect in the three-year period has been considerably higher than total production growth. The business sector for example saw total labor productivity expansion of 3.2 percent per year, while pure productivity growth was 3.6 percent.

Nordhaus further applies a productivity measurement based on the “welfare-theoretic” point of view,

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“... while new economy industries have demonstrated acceleration of productivity growth in recent years, there has also been a substantial concurrent upturn in such growth in much of the traditional economy.”

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which gauges growth in average living standards. This “ideal” measure is higher than more conventional measures of labor productivity growth — 0.21 percent per year higher over the period 1978–98, but only slightly higher in the most recent period.

From here, Nordhaus finds evidence that runs counter to earlier studies that suggested the computer industries were unique in productivity growth in recent years. For all three output concepts (total GDP, the business sector, and well-measured output), labor productivity without the new economy demonstrated a marked rise during 1996–8 as compared to 1978–98. The acceleration in traditional economic productivity was 0.64 percent for overall GDP, 0.91 percent for business output, and 1.16 percent for well-measured out-

put. The new economy contributed roughly one-half of the total acceleration in labor productivity growth. This is surely a considerable impact, but Nordhaus maintains that even after correcting for capital deepening, productivity has accelerated in all three of the sectors in his study.

Finally, Nordhaus considers how much each industry contributes to the total of productivity growth in

the overall economy. Not surprisingly, durable manufacturing is the most important contributor in this respect. But retail and wholesale trade accelerated at a greater rate in 1996–8 than durable manufacturing did. Nordhaus cautions however that the data in this area are not entirely established or understood. Similarly, evidence suggesting the service and construction sectors performed poorly in the same period may well result from their questionable price indexes, which is why he excluded them from his well-measured output index. In any case, Nordhaus concludes that while new economy industries have demonstrated acceleration of productivity growth in recent years, there has also been a substantial concurrent upturn in such growth in much of the traditional economy. — Matt Nesvisky

## Foreign Direct Investors in Three Financial Crises

**I**n **Foreign Direct Investors in Three Financial Crises** (NBER Working Paper No. 8084), Research Associate **Robert Lipsey** finds that direct investors, chiefly those who operate manufacturing facilities in foreign countries, are much more likely to ride out economic squalls

“... much of the direct investment is bound up in enterprises that, in times of instability, can redirect sales from a country’s local markets to export markets.”

than those involved in foreign bonds, equities, bank loans, and other forms of investment. This was true, Lipsey reports, in the Latin America crisis of 1982, the Mexico crisis of 1994, and most recently the East Asia meltdown of 1998.

In Latin America, for example, while dropping at one time to 40 percent of 1982 levels, flows of direct investment remained positive even as flows of other forms of investment turned negative (that is more money rushing out than coming in). Similarly, in the aftermath of the 1994 Mexico crisis, direct investment dipped by about 15 percent in two years, but by 1997 and 1998,

was at or above its 1994 peak. Contrast that to other investment flows, which quickly plummeted into negative territory. While they eventually came back into positive territory, they remained a pale shadow of their former selves through 1998. The story appears to have been the same during the Asian crisis of 1998 — although those data are still com-

ing in — with direct investment dipping only slightly and then coming back to previous levels by 1999. Meanwhile, other types of investment, in contrast, quickly beat a rapid retreat to net outflows.

The key reason for these circumstances appears to be that much of the direct investment is bound up in enterprises that, in times of instability, can redirect sales from a country’s local markets to export markets. Lipsey finds this to be particularly true for U.S. firms operating abroad. “The most consistent feature of the responses to the crises by U.S. manufacturing affiliates was the rapid growth in their export sales,” Lipsey

states. “The shifts were in response to both the host country devaluations and the stagnation in host country markets.” The crises dampened local consumption of the U.S. firms’ products, but the drop in currency values made those same products much cheaper for foreign buyers and, hence, much easier to export.

Lipsey notes that direct investors, unlike other investors, may not have the luxury of simply pulling up stakes in the face of a crisis. It’s much harder to dispose of a manufacturing plant than to sell off stocks and bonds. So in that sense it could be argued that it isn’t so much grit and tenacity as it is a lack of better options that prompts direct investors to stay put.

But Lipsey also credits the direct investors with being more willing to hang tough in the midst of seeming chaos. For instance, Lipsey finds foreign direct investors operating in the developing countries of Asia “to be much less skittish than other investors in responding to the crisis.” Similarly, he notes that during Mexico’s turmoil, U.S. direct investors “seemed able to look past the crisis, without waiting for it to end.”

— Matthew Davis

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