

# Preventing Climate Change: A Proposal for Sharing the Burden between Developing and Developed Economies

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# Introduction

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- ◆ Prevention of climate change requires large reductions in present and future global carbon emissions.
- ◆ It calls for developed and developing countries alike to assume “joint but differentiated responsibilities.”
- ◆ Carbon emissions may be reduced through both the reduction of energy use (conservation as well as improvements in energy efficiency) and the substitution of carbon fuels with alternate, non-carbon forms of energy (e.g., hydro, nuclear, solar, wind, etc.).

# Introduction

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- ◆ For the developed countries, absolute reductions in carbon emissions will be necessary. Given the existing high level of carbon emissions per capita in the developed countries, the hardship caused by the absolute reductions should be relatively small, especially if coupled with non-carbon fuel substitution and phased in over a period of time.
- ◆ For the developing countries, absolute reductions in carbon emissions is not likely to be possible, given their existing low levels of energy use, the expected patterns of growth of personal consumption in the future as their GDP per capita's rise (demands for physical goods rather than services), and the relatively high cost of alternate non-carbon fuels. Absolute reductions, even on a per capita basis, will imply that the standards of living in the developing countries will not rise—an outcome that is not acceptable to developing countries. However, relative reductions, especially in relation to the historical levels of energy consumption of the now developed economies at comparable levels of GDP per capita's, are possible.

# Sharing the Burden

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- ◆ All countries, developed and developing, should collectively develop a formula for a fair sharing of the burden of preventing climate change due to global warming.
- ◆ Simply setting a ceiling based on current usage is considered unfair and unreasonable as far as the developing countries are concerned. So is an equal proportional reduction for all countries.
- ◆ Any goal for controlling carbon emissions must involve both the developed countries reducing their emissions per capita and for the developing countries carefully controlling the growth of their emissions per capita.

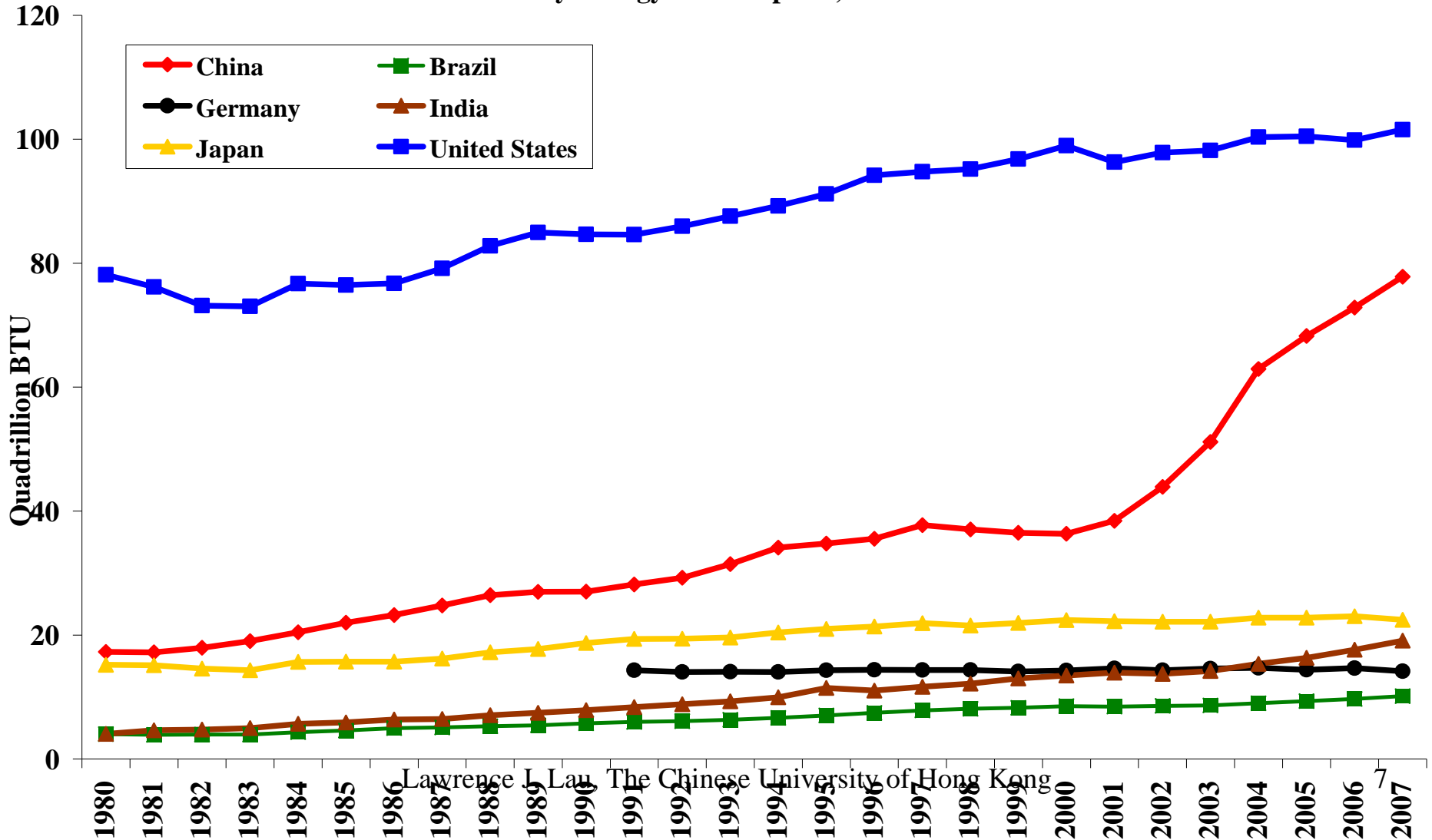
# Large Disparities in Energy Use

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- ◆ There are large disparities in energy use across countries, both on an aggregate and on a per capita basis.
- ◆ These disparities are caused by differences in GDP per capita, energy pricing and taxation policies, climate, size and topology, and historical factors.
- ◆ The United States and China are the two countries with the highest aggregate primary energy consumption.

# Total Primary Energy Consumption, Selected Countries, 1980-2007

Primary Energy Consumption, 1980-2007



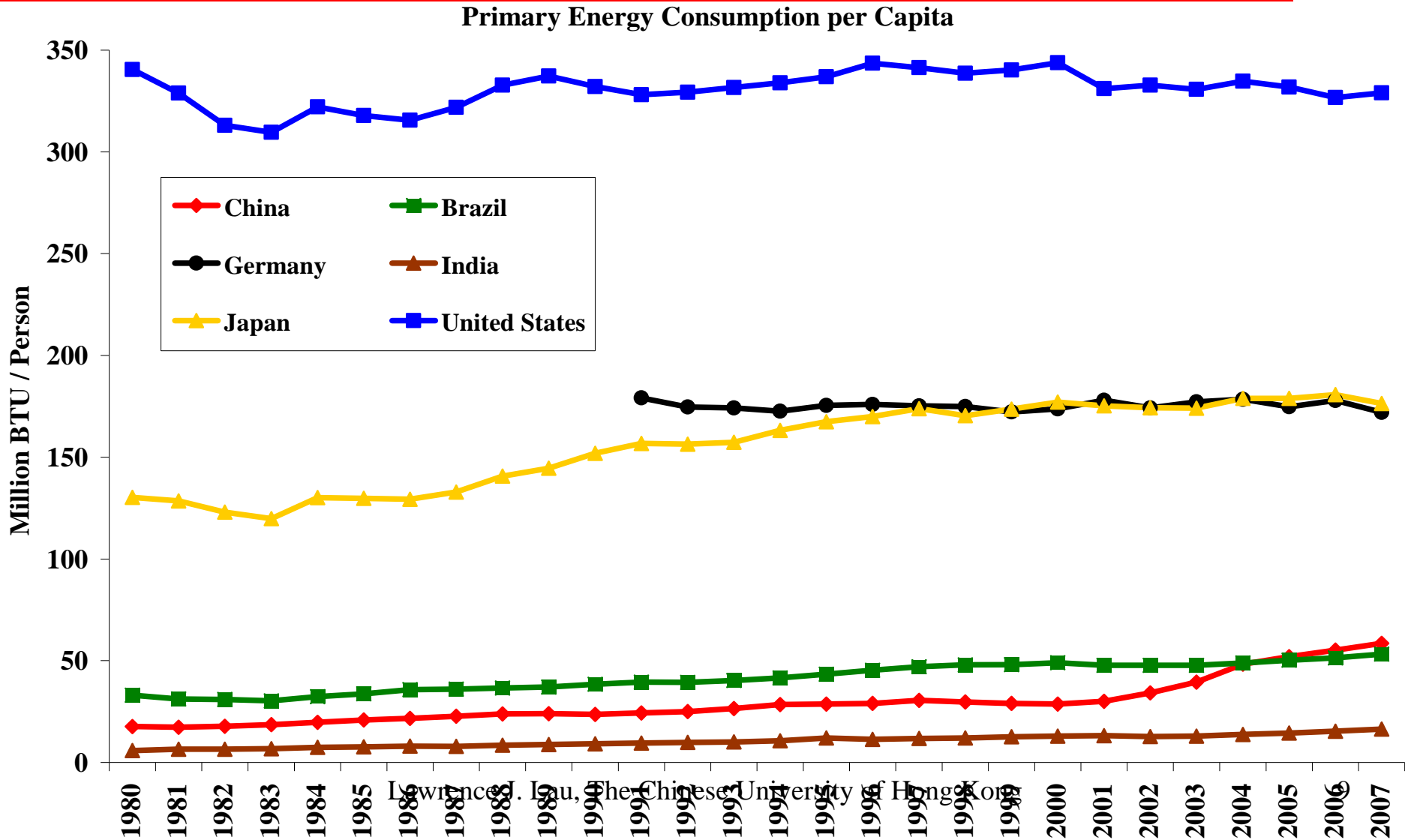
# Large Disparities in Energy Use

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- ◆ However, on a per capita basis, the United States is way ahead, with energy consumption approximately doubled those of Germany and Japan, which are in turn doubled those of China and Brazil. India continues to be a low energy user, consuming less than a third of the quantities consumed by Brazil and China on a per capita basis.
- ◆ GDP per capita is the most important, but not the only, determinant of per capita energy consumption of a country.

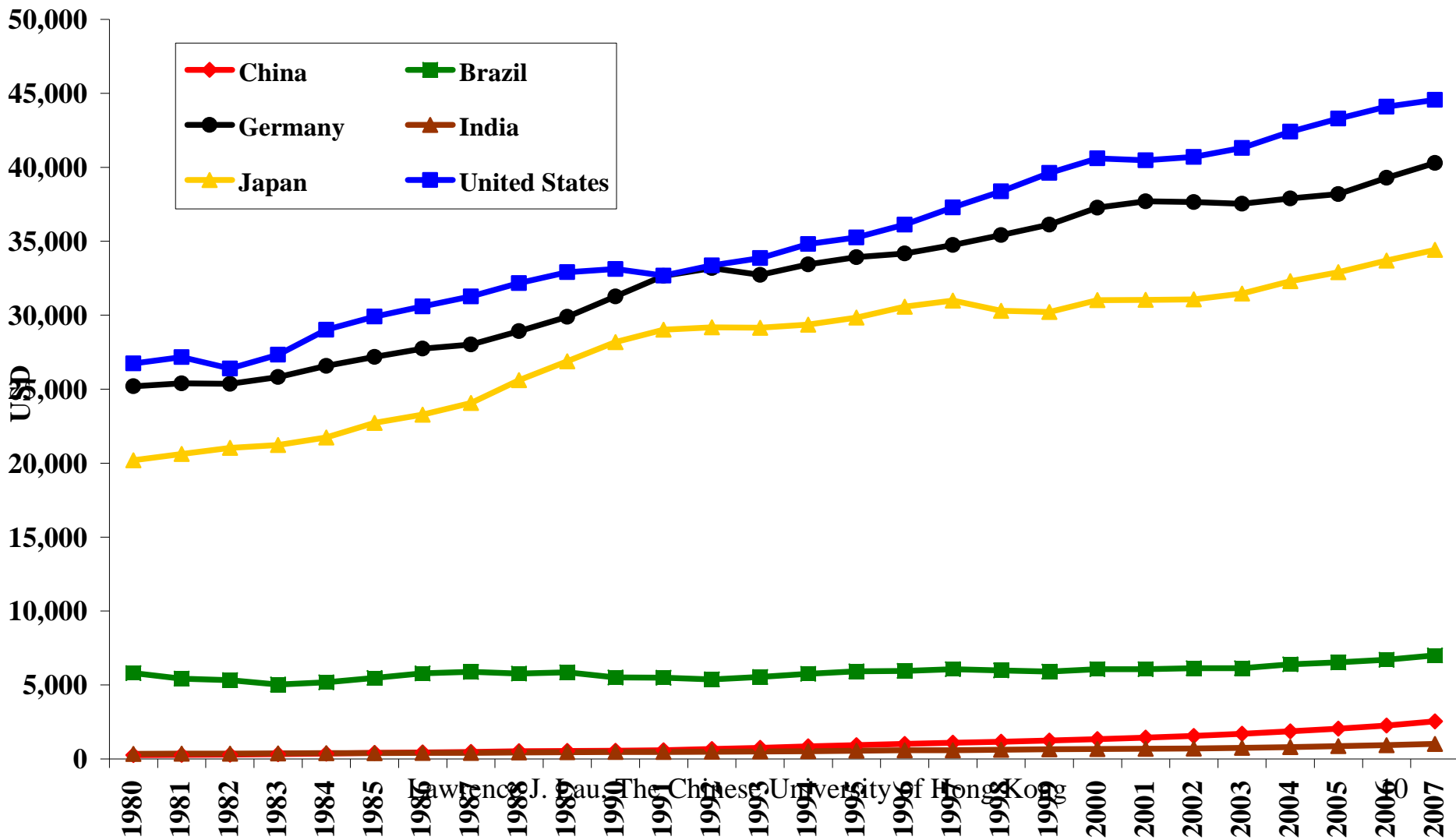


# Primary Energy Consumption per Capita, Selected Countries, 1980-2007



# Real GDP per Capita, Selected Countries, 1980-2007 (2007 Prices)

Real GDP per Capita, in 2007 prices



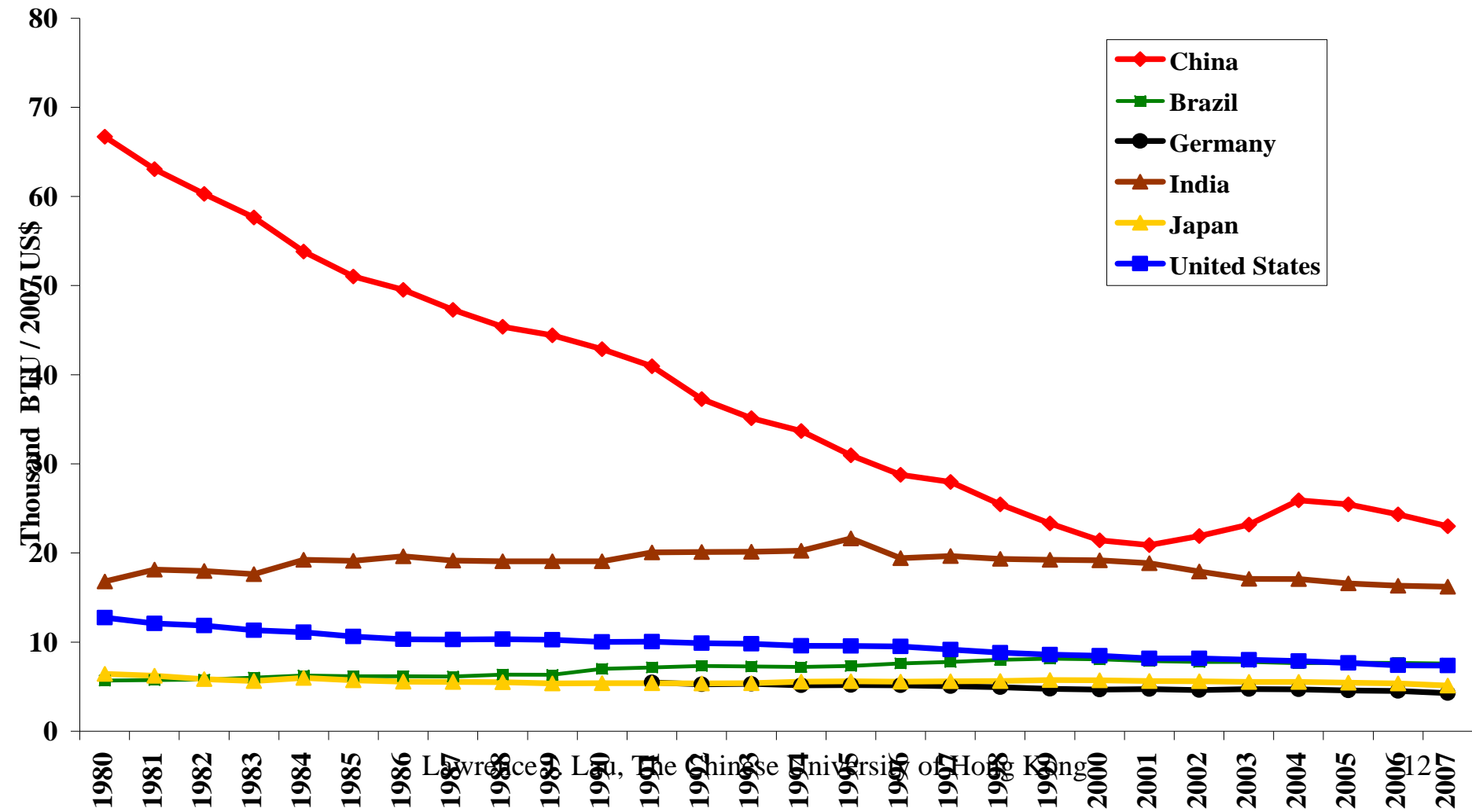
# Large Differences in Energy Efficiency

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- ◆ There are also large differences in energy efficiency across countries. Energy efficiency, in terms of primary energy consumption per unit GDP, is generally better in developed countries, in the sense that less energy is required to produce a unit of GDP.
- ◆ Energy efficiency in China has actually improved significantly since 1980, even though it has gotten worse in the last couple of years. It is, however, still considerably worse than those of the United States, Japan, and other developed countries. This is due, in part, to the lower price of energy to the end users; but also, in part, to the different sectoral composition of GDP originating—which in turn also depends on the domestic consumption patterns (e.g., the distribution between goods and services).

# Primary Energy Consumption-GDP Ratios, Selected Countries, 1980-2007

The Ratio of Primary Energy Consumption to Real GDP



# Large Differences in Energy Efficiency

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- ◆ Energy efficiency is also affected by differences in climate and life-styles: in locational patterns, including residential patterns, densities, types of housing, types of transportation, temperature preferences, etc.
- ◆ It is also affected by the differences in the energy efficiency of the existing capital stocks of both the enterprises and the households—structure and equipment, housing, automobiles—which are legacies of the historical actual and expected prices of energy.
- ◆ But all of this also suggests that there is considerable room for further improvements in energy efficiency in China and the developing countries.

# Large Differences in Energy Efficiency

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- ◆ Among the developed countries, Germany and Japan have consistently the best energy efficiency.
- ◆ If the United States can bring its energy efficiency to a level close to those of Germany and Japan, its energy consumption can be reduced by approximately 50 percent, with a corresponding reduction in carbon emissions!

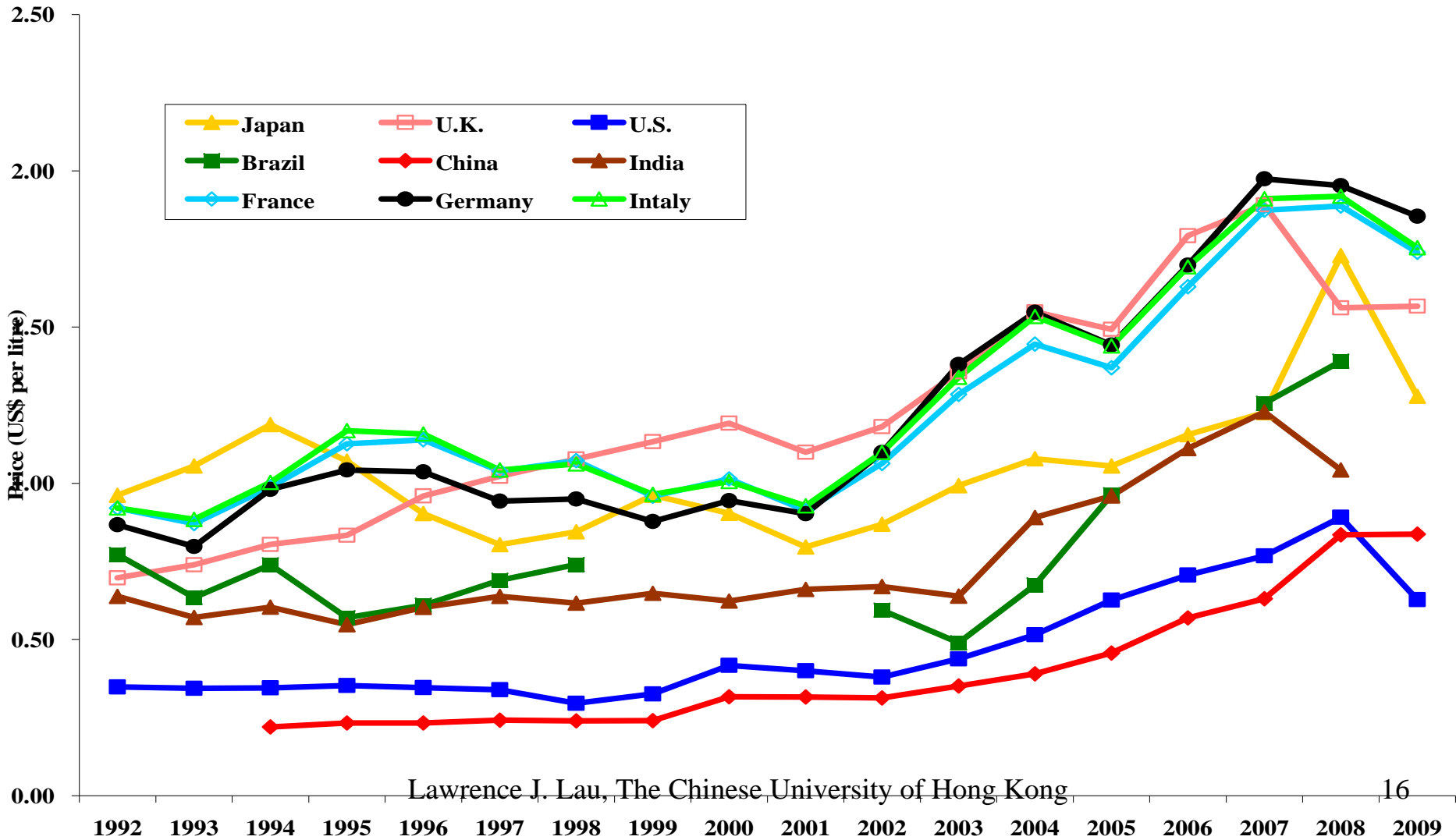
# Large Differences in the User Costs of Energy

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- ◆ There are also large differences in the user costs of energy across countries.
- ◆ For example, the retail prices of gasoline in the United States and China are among the lowest in the world (China has raised its retail price of gasoline in the last couple of years). Chinese gasoline prices are lower than those in Brazil and India. China can impose a tax on gasoline that is similar in order of magnitude to those in Western Europe and Japan to bring its gasoline prices more in line with the rest of the world.
- ◆ The U.S. gasoline prices are the lowest in the world and also the lowest among all developed countries.
- ◆ In any case, the price of gasoline, if left solely to the market, may not reflect the (social) costs of congestion, air pollution and global warming. Thus, a gasoline tax can be easily justified.

# Retail Prices of Gasoline in Selected Countries

Retail Price of Gasoline in Selected Countries





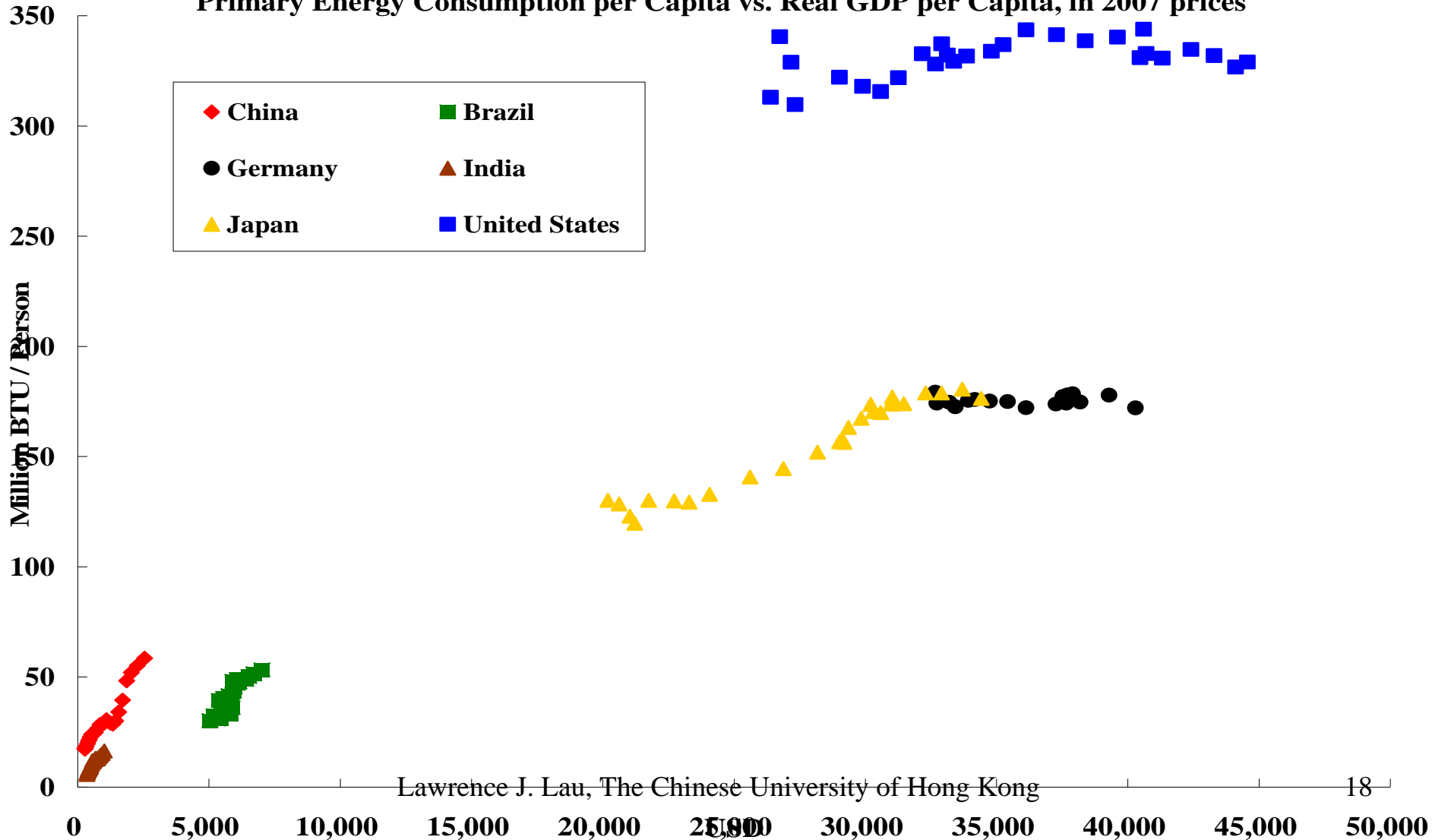
# Adoption of a Common Energy-Consumption Norm

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- ◆ Energy consumption per capita of a country will rise with GDP per capita of a country until it reaches a certain steady-state level. Energy consumption in developed countries such as the United States, Germany and Japan have already reached such levels (i.e., their energy consumption per capita no longer rises with increases in GDP per capita). Energy consumption in developing countries still has a long way to go.
- ◆ Developed and developing countries should agree on a common norm for energy consumption at each level of GDP per capita. The underlying concept is that when a currently developing country reaches the level of GDP per capita of a developed country, it should only be consuming a level of energy per capita no higher than the agreed norm for a country at that level of GDP per capita.

# Primary Energy Consumption per Capita versus GDP per Capita

Primary Energy Consumption per Capita vs. Real GDP per Capita, in 2007 prices



# Adoption of a Common Energy-Consumption Norm

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- ◆ The norm will be set not only with reference to the historical experience of developed countries but also with reference to the latest technology available. For example, suppose Japan's annual energy consumption per capita was 120 million BTU when its GDP per capita was US\$20,000. But with the latest technology, only 100 million BTU would have been required. The norm would be set at 100 rather than 120.
- ◆ Developed countries will attempt to meet the norm set for and by themselves.

# Adoption of a Common Energy-Consumption Norm

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- ◆ For example, if China can emulate Brazil, China's per capita energy consumption can be significantly reduced.
- ◆ The norm can be revised from time to time. So the more the developed countries can lower their consumption of energy per capita, the less the developing countries will consume in terms of energy per capita in the future even if their GDP per capita's rise in the meantime.
- ◆ There is thus a fair sharing of the burden of prevention of climate change by both the developed and the developing countries.

# Adoption of a Common Energy-Consumption Norm

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- ◆ Without a global post-Kyoto Accord agreement, it is unlikely that one can achieve the goal of reducing carbon emissions and preventing climate change. A global agreement requires sacrifices from all: the developed economies must be willing to reduce their consumption per capita and the developing economies must be willing to consume much less energy than the developed countries at the latter's comparable stage of development. Thus, both sets of countries will have to make some sacrifices.

# Prevention of Climate Change

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- ◆ However, these sacrifices must take into account the status quo—that the developed countries have vastly higher energy consumption per capita than the developing countries. Moreover, they have been largely responsible for the accumulation of carbon dioxide in the atmosphere over the past two centuries. It is not really equitable to ask both set of countries to make equal proportional reductions. Nor is it likely to be accepted by developing countries.
- ◆ China can provide leadership by setting achievable targets and implementing policies (including pricing) for national energy conservation and environmental protection, which are in China's own national interests.

# Prevention of Climate Change

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- ◆ A reasonable way to proceed on trying to achieve an implementable version of a global agreement to reduce carbon emissions and avoid climate change is the following:
- ◆ All countries will subscribe to a global norm of primary energy consumption per capita ceiling standards calibrated, to a first approximation, to the real GDP per capita so that when the GDP per capita of a specific country or region reaches a certain level, it should have adopted and implemented policies so as to stay below or equal to the corresponding target standard energy consumption per capita. That is, there is a global “life-style” energy consumption standard linked to real GDP per capita.

# Prevention of Climate Change

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- ◆ This will imply that for some developed countries, they will need to be willing to reduce the energy consumption per capita; and for some developing countries, they will need to adopt policies that will prevent them from exceeding the standard as their real GDPs per capita grow.
- ◆ In long-run steady-state, all countries will become developed and their energy consumption patterns should become largely similar. For example, when China achieves the same real GDP per capita as, say, the European Union, its energy consumption per capita should be at or below the energy consumption per capita of the European Union at the time (assuming that such a global agreement is already in place).



# Prevention of Climate Change

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- ◆ It is possible to introduce modifications of these standards to reflect possible differences across countries based on climate, location, size, the proportion of primary energy consumption that is non-carbon dioxide producing, and the carbon dioxide emission quota owned (assuming that trading in such quotas continues). For example, those living in cold climates arguably may need to consume more energy for heating purposes. Countries with large territories and widely dispersed population may need to consume more energy for transportation. These possible modifications to the basic norm will have to be part of the overall agreement.

# Some Possible Common Instruments

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- ◆ It is envisaged that each country will do its own part independently and separately to meet the norm appropriate to itself. However, there are a number of possible common instruments that can be considered.

# Some Possible Common Instruments: A Global Oil and Gas Import Tax

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- ◆ A global import tax on oil and gas will encourage conservation, lower their demand, and raise government revenue for all net-oil-and-gas importing countries. The incidence of the global oil and gas import tax will be borne by the oil and gas exporters and the oil and gas consumers, with the latter possibly compensated in part by the additional government revenue generated.
- ◆ China and the United States can also agree to impose an oil and gas import tax even in the absence of an agreement by all oil and gas importing countries on a global oil and gas import tax.
- ◆ The implementation of the oil and gas import tax can be scheduled for three years into the future to allow all the consumers the time to make the necessary adjustments.
- ◆ Part of the revenues from such a tax can be used to help developing countries with low GDP per capita to meet the norm and to fund R&D projects (see below) designed to prevent, directly or indirectly, climate change.
- ◆ Such a tax will also greatly reduce, if not eliminate, the so-called “global imbalances” in flows of funds in the world.

# Some Possible Instruments: Sharing of Technology and Joint R&D

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- ◆ Energy efficiency can be greatly enhanced through technology. New technology on the exploitation of coal and renewable sources of energy should be made widely available to all countries in the global community. Funding should be provided to developing countries with low GDP per capita's.
- ◆ R&D on new technologies, including clean coal technology, the technology for carbon sequestration, and the technologies for alternative sources of energy, etc. can be jointly conducted (for example, R&D on the breeder-reactor should perhaps be resumed.)

# Concluding Remarks

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- ◆ A global agreement is necessary in order to prevent climate change.
- ◆ Such an agreement requires that the burden be shared equitably between the developed and developing countries.
- ◆ China, as a large developing country committed to the prevention of global climate change, can play a leading role in forging a consensus that is agreeable to both the developed and the developing countries.