Protecting the Environment While Growing in India and China: A Case for an Independent Environmental Agency

Tabitha Thomas [*]

Croft Institute for International Studies
University of Mississippi

Abstract

On the current trajectory, two potential crises will face China and India in the next fifty years: either slowed growth leading to political and social unrest or continued growth leading to severe environmental degradation. To limit the potential environmental and economic crises, China and India should embark on a path toward sustained development, which can be achieved in China and India through the creation of an independent institution. The one-dimensional spatial model and the past successes of the Supreme Court of India serve as the basis for the creation of an independent agency. The powers and organization of the environmental agencies will be determined while accounting for the specific political and economic situations in China and India.

Introduction

Like many developing nations, two potential crises will face China and India in the next fifty years: either slowed growth leading to political and social upheaval or continued growth leading to severe environmental degradation. This thesis attempts to chart a middle path of sustainable development that would help avoid both dangers. The main contribution of the paper is to be found in the specific recommendations that are based on both economic and political theory and the experiences of China and India.

Although China and India would likely wish to strike a balance between long-term economic and environmental goals, political considerations may pose serious roadblocks. Politicians would find it difficult to persuade growth-minded supporters to make sacrifices in the short-term for long-term societal benefits. Fortunately, it is possible to address the problem in a democratic society by applying the model of the Federal Reserve or Bundesbank: create a politically independent institution. The institution would spread information about environmental deterioration, promote innovation in new technology, and propose and implement regulations while taking into account the societal costs of environmental degradation. But will the idea work in the case of China and India?

This thesis is geared to proving that the establishment of a politically independent agency, charged with the management of environmental affairs, would be prudent, and probably necessary, for both China and India. The main task of the thesis is (1) to investigate the political and economic situation in China, a centralized state, and India, a democratic republic, (2) to find the institutions that have worked in the past, (3) to derive on the basis of (1) and (2) the powers and organization of the proposed environmental protection institution, and (4) to suggest ways to make a credible commitment to preserving the independence of the proposed institution; credible

commitment is easier in the case of democratic India and must flow from the self-interest of the leadership in the case of centralized China.

This thesis can be distinguished from previous research concerning sustainable development in several key aspects. First, the thesis focuses on the double-edged nature of the problem: potential political disaster if growth slows and potential environmental disaster if growth continues in the present manner. Second, the study centers on China and India—two of the upcoming industrial nations—instead of the world at large. A forecast of future CO_2 emissions offers the magnitude of the environmental problem that awaits China and India. Finally, the study focuses on discovering a practical method, viz., an independent agency responsible for environmental affairs, to devise and implement environmental policy.

The thesis is organized as follows. The next section presents the potential socio-political crisis due to slowed economic growth and the potential environmental crisis if unsustainable growth continues on the current trajectory. Section 2 describes the data and econometric results. Section 3 presents the available mechanisms for achieving sustainable levels of economic development, while sections 4 and 5 present an institutional solution for achieving sustainable development in India and China.

Chapter 1: The Problem

The Population Reference Bureau estimates that the current world population of 6.3 billion will reach 9.3 billion by 2050.[1] The vast majority of this increase will take place within developing nations, with China and India accounting for approximately twenty-three percent of the total increase.[2] [3]

Increased Industrialization: Necessary to Ensure Political Stability

To keep growing populations in China and India politically satisfied, both nations will have to ensure that the increasing population achieves an increasing standard of living: increased political stability and social prosperity in developing nations have been closely tied to high economic growth rates. Przeworski and Limongi estimate that the "probability that a democracy survives increases monotonically with per capita income."[4] Economic growth will likely have a positive impact on government legitimacy and should limit substantial government change. High levels of economic growth increase the popularity of the government, which decreases the probability that the current government is removed within a constitutional framework or by unconstitutional means.[5] The country's leadership will either be punished or rewarded based on economic performance. The probability of reelection increases with a good economic record; thus, economic growth should decrease the demand for regime change. [6]

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[1] "India Population to be the Biggest." British Broadcasting Corporation News. 18 August 2004.
<http://news.bbc.co.uk/2/hi/in_depth/3575994.stm>.
[2] World Development Report 2003: Sustainable Development in a Dynamic World: Transforming Institutions,
Growth and Quality of Life. The World Bank. New York: Oxford University Press, 2004.
[3] "India Population to be the Biggest."
[4] Przeworski, Adam and Fernando Limongi. "Modernization: Theories and Facts." World Politics Vol. 49, No. 2.
1997. 165.
[5] Feng, Yi. "Democracy, Political Stability and Economic Growth." British Journal of Political Science. Vol. 27,
No. 3. July 1997. 397-398.
[6] Feng, Yi. 397-398.

The negative political impacts of stagnant growth are apparent in certain economic sectors in China. Farmers' discontent over the government seizure of local lands for resale for development led to a two-year string of rural unrest in China. The issue is particularly serious in "Guangdong, where swift urban growth has put increasing pressure on farmland in the Pearl River Delta just north of Hong Kong."[7] Violent protests rose steadily in 2004 and 2005. In response, the government "canceled traditional agricultural taxes and lavished heavy spending on rural areas."[8] Although the violent incidents declined by twenty-two percent in the first nine months of 2006, the Deputy Public Security Minister Liu Jinguo reported 17,900 violent protests in the same period.

India has also experienced social unrest in economic sectors with slowing growth rates. Government subsidies to the agricultural sector have been cut, while "government fixed prices for their produce have remained in force."[9] Because agriculture is the primary source of income for over half of Indian citizens, declining profits in the agricultural sector have serious political implications. As farmers struggle to feed their families, farmers' protests have become increasingly common in India.[10]

Slowed economic growth, which may lead to social unrest, results in political instability: the deterioration of the economy and social unrest should increase the demand for regime change. Thus, the political regimes in China and India will want to maintain a certain level of economic growth.

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[7] Cody, Edward. "Hundreds of Chinese Farmers Hold Officials, Investors Hostage." Washington Post. 9 November 2006.
[8] Cody, Edward. "Hundreds of Chinese Farmers Hold Officials, Investors Hostage."
[9] Lawson, Alastair. "Indian Farming - a Vicious Circle." BBC News. 13 January 1999.
<http://news.bbc.co.uk/2/hi/south_asia/254446.stm>.
[10] Lawson, Alastair.

Economic Growth and the Environment

Although growth is vital to increasing the standards of living in both China and India, growth could exacerbate problems of pollution and *future* growth. As China and India have grown, environmental degradation has grown as well. With increasing environmental deterioration and decreasing availability of natural resources, China and India may soon face an environmental crisis.[11]

Current Situation

The speed with which an environmental crisis may occur depends upon the current levels of the environmental degradation of air, land, and water.

The current level of greenhouse gases in the atmosphere is 430 parts per million (ppm) of carbon dioxide, compared with only 280 ppm before the Industrial Revolution. The increased concentrations of carbon dioxide have already caused the world temperature to rise by half a degree Celsius and "will lead to at least a further half degree warming over the next few decades, because of the inertia in the climate system."[12] If the flow of emissions does not rise above the current rates, the level of greenhouse gases would still reach double pre-industrial levels by 2050; but in reality the emissions flow is accelerating, as economies in the developing world are investing in high-carbon industries.[13] Thus, emissions levels could reach double pre-industrial levels as early as 2035. At this level, economist Sir Nicholas Stern projects with a seventy-seven percent to ninety-nine percent probability a global average temperature rise exceeding 2°C.

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[11] Meadows, Donella, Jorgen Randers, and Dennis Meadows. Limits to Growth: The 30-Year Update. White River Junction, VT: Chelsea Green Publishing Company, 2004.
[12] Stern, Sir Nicholas. Stern Review: The Economics of Climate Change. Executive Summary. BBC News. 30 October 2006. iii. <http://news.bbc.co.uk/2/shared/bsp/hi/pdfs/30_10_06 _exec_sum.pdf>.
[13] Stern, Sir Nicholas. iii.

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

The world's soil and forests are quickly being degraded. Almost "2 million hectares of land worldwide (23 percent of all cropland, pasture, forest, and woodland) have been degraded since the 1950s."[14] Between 1980 and 1995, the developing world has lost nearly 200 million hectares of forests. A 1997 World Resources Institute assessment estimated that only one-fifth of the Earth's original forest remains in "large, relatively natural ecosystems."[15]

As the global population and water pollutants increase, the availability of fresh water in some regions will likely become severely limited. Currently, one-third of the world population inhabits countries that are already experiencing water shortages.[16] The World Bank estimates

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[14] World Development Report 2003. 2.
[15] World Development Report 2003. 3.
[16] World Development Report 2003. 2.

that in the next thirty years the "proportion could (at current forecasts) rise to half or more…unless institutions change to ensure better conservation and allocation of water."[17]

China

China has begun to experience the environmental consequences of unsustainable growth. Although floods and droughts have not been entirely uncommon in China, the 1998 floods were severe. Rainfall between June and August was 38 percent above normal, but further studies revealed that the unusual level of rainfall could only partly explain the floods. In fact, logging of the river's watershed, which eroded the soil, likely contributed to the flooding. Deforestation had been "so great (forest cover had decreased by more than half since the 1950s) that the watershed could no longer stabilize the water flow." [18] The flood resulted in the deaths of tens of thousands and a significant amount of lost production.

The lack of environmental protection in China has also resulted in the degradation of the aquatic environment. China's rivers have some of the highest levels of pollution in the world. Nearly 21,000 chemical factories can be found along China's rivers and coastline – "more than half on the Yellow and Yangtze rivers, which are relied upon by millions of people."[19] The collapse of many shrimp farms, which has led to great economic loss, was a "direct consequence of not recognizing the importance of ensuring good naturally provided water quality in the production process, especially as the volume of shrimp and the capital intensity of farms increased."[20]

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[17] World Development Report 2003. 2.
[18] World Development Report 2003. 20.
[19] "Pollution Turns the Yellow River Red." British Broadcasting Corporation News. 22 November 2006. <http://news.bbc.co.uk/2/hi/asia-pacific/6172360.stm>.

[20] World Development Report 2003. 22.

India

India has also begun to experience repercussions of unrestricted growth. With the population recently surpassing one billion, groundwater scarcity could threaten major regions of India, "drive people off the land and ultimately stunt the country's ability to farm and feed its people…Indians are tapping their groundwater faster than nature can replenish it, so fast that they are hitting deposits formed at the time of the dinosaurs."[21] Approximately one-fifth of India's geographic blocks are considered either overexploited, "meaning more water is drawn on average than is replenished by rain", or critical, meaning they are dangerously close to overexploitation.[22] Water pollution currently threatens India's farms, economic growth, and cities. New Delhi can "neither quench its thirst, nor adequately get rid of the ever bigger heaps of sewage that it produces." [23] In fact, forty-five percent of Indians are not connected to the public sewerage system.

Atmospheric pollution is another result of unrestricted economic growth in India. An environmental group reports that diesel fumes have caused a dangerous increase in air pollution in Indian cities.[24] In New Delhi, one of the top five most polluted cities in the world, one-fifth of residents have severe breathing problems.[25]

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[21] Sengupta, Somini. "India Digs Deeper But Wells Are Drying Up." New York Times. 30 September 2006.
[22] Sengupta, Somini. "India Digs Deeper But Wells Are Drying Up."
[23] Sengupta, Somini. "In Teeming India, Water Crisis Means Dry Pipes and Foul Sludge." New York Times. 29 September 2006.
[24] "Diesel Damage in India." British Broadcasting Corporation News. 1 November 1998. <http://news.bbc.co.uk/2/hi/south_asia/205786.stm>.
[25] "Fresh Air—At a Price." British Broadcasting Corporation News. 28 September 1998. <http://news.bbc.co.uk/2/hi/health/182052.stm>.

Impact of Increased Environmental Degradation

Further deterioration of the environment in China and India will impact economic growth and threaten social and political stability.

Economic Effects

The degradation of environmental resources may threaten economic growth in China and India. The World Bank determined that "the long-term neglect of any set of assets—human, social, or environmental—can at some point sharply reduce the productivity of other assets, whether for commodities, sectors, regions or nations."[26] The Stern Review suggests that global warming could diminish the global economy by twenty percent, while taking action now would cost just one percent.[27] A World Bank report indicates that pollution accounts for approximately eighty-billion dollars a year in public health costs.[28]

Political and Social Impact

The Stern Report suggests that the political and social repercussions of environmental degradation could be severe. Increased global temperatures will "increase flood risk and then strongly reduce water supplies, eventually threatening one-sixth of the world's population, predominantly in the Indian sub-continent, parts of China, and the Andes in South America." Increased flooding, rising sea levels, and more intense droughts could lead to the displacement of nearly two hundred million people. Declining crop yields and fishery stocks will also present political problems for leadership in China and India. International and Indian experts warn that

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[26] World Development Report 2003. 22.
[27] "Climate Change Fight 'Can't Wait.'" British Broadcasting Corporation News. 31 October 2006.
<http://news.bbc.co.uk/2/hi/business/6096084.stm>.
[28] "Indian Pollution Report." British Broadcasting Corporation News. 9 October 1998.
<http://news.bbc.co.uk/2/hi/south_asia/189720.stm>.

pollution in India is killing thousands of people annually and could eventually make some cities uninhabitable. According to the United Nations, New Delhi and Calcutta both rank among the five worst polluted metropolises in the world.[29]

In brief, rising standards of living in China and India have accelerated environmental deterioration, which has had severe economic, social and political consequences. In the following section, the relation between population and economic growth rates and levels of environmental degradation will be tested empirically in order to discover the magnitude of the possible environmental crisis and the level of government intervention necessary to avoid the economic and political consequences of environmental deterioration.

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[29] "Indian Pollution Report."

Chapter 2: Data Analysis

To empirically examine the relationship between environmental degradation and population and economic growth, this study uses World Bank Development Report indicators for environmental quality, population, and economic development for China and India between 1960 and 2002.

Population

The main measure of population used in this paper, (POP), is the annual total population for each country, China and India, as reported by the World Bank. Population ranges went up from 660 million in 1960 to 1.28 billion in 2000 in China and from 435 million in 1960 to 1.05 billion in 2000 in India. Figures 1 and 11 in the Appendix show the linear upward trend in population over the period from 1960 to 2002 for both China and India. Although in China "family planning has actually been practiced as a basic policy of the nation for more than 20 years,"[30] the formal implementation of the Population and Family Planning Law on September 1, 2002 may lower population growth in future years. The Population and Family Planning Law will strengthen economic incentives for having a limited number of offspring and will increase surveillance in rural China.

Another measure of population used in this paper is annual population density (PopDen) measured as people per square kilometer. Population density also shows a linear upward trend, ranging from 70.8 to 137.3 for China and from 149.5 to 352.7 for India over the period from 1960 to 2001.

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[30] Huiting, Hu. "Family Planning Law and China's Birth Control Situation." China.org.cn. <http://www.china.org.cn/english/2002/Oct/46138.htm
[32] Annual Energy Review, 2000. Energy Information Administration.

Economic Development

To capture changes in economic growth, the empirical analysis of this thesis uses as the main measure of economic growth the annual gross domestic product, (GDP), measured in constant 1995 U.S. dollars. Figures 2 and 12 in the Appendix show a sharp upward trend in GDP growth from 1960 to 2002. GDP ranges from 43.1 billion 1995 U.S. dollars in 1962 to 1.21 trillion in 2002 for China and from 78.4 billion in 1960 and 517 billion in 2002 for India. In both countries, the gross domestic product is growing at a much faster rate than both population and carbon dioxide emissions, as presented in Figures 4 and 14. India's GDP growth rate of 559% from 1960 to 2002 is significantly lower than China's growth rate of 2,700%, although both easily surpassed the US GDP growth rate of 292% over the same period.[32]

Other measures of economic development used in this paper include annual gross domestic product per capita, (GDPcap), measured in constant 1995 U.S. dollars per person and the annual per capita electricity consumption, (Elec_Cons), measured in kilowatt-hours. In both countries, GDP per capita and per capita electricity consumption show upward trends over the period from 1960 to 2002.

Environmental Quality

The main measure of environmental quality used in this study is annual carbon dioxide emissions, (CO2kt), measured as the amount of carbon dioxide emissions per year in kilotons. Figures 3 and 13 in the Appendix exhibit the upward trend in CO_2 emissions for China and India over the entire period between 1960 and 2000. Carbon dioxide emissions range from 432 thousand to 3.34 million kilotons for China and from 120 thousand to 1.08 million kilotons for India. However, one important note is that China's carbon dioxide emissions begin to fall after

1995. The 1992 World Bank Development Report gives one plausible explanation for this decrease: "As incomes rise, the demand for improvements in environmental quality will increase."[33] This concept is referred to as the Environmental Kuznets Curve:

> "The environmental Kuznets curve is a hypothesized relationship between various indicators of environmental degradation and income per capita. In the early stages of economic growth degradation and pollution increase, but beyond some level of income per capita (which will vary for different indicators) the trend reverses, so that at high-income levels economic growth leads to environmental improvement. This implies that the environmental impact indicator is an inverted U-shaped function of income per capita."[34]

Although the rate of growth of CO_2 emissions for India appears to be diminishing, India's carbon dioxide emission levels are still rising.

Another measure of environmental quality used in this paper is CO_2 emissions per capita (CO2 cap) measured as metric tons per capita. CO_2 emissions per capita also exhibit an upward trend over the period from 1960 to 2000.

Empirical Section

To empirically explore the relationship between environmental degradation and population and economic growth, I use statistical methods and regressions.

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[34] Stern, David. "The Environmental Kuznets Curve." International Society for Ecological Economics. Internet Encyclopaedia of Ecological Economics. June 2003. <http://www.ecoeco.org/publica/encyc_entries/Stern.pdf>.

The Main Empirical Model

To investigate the impact of population growth and economic development on CO_2 emissions for both China and India, the main empirical model considers CO2kt, the measure of carbon dioxide emissions, as dependent variable, and GDP, the country's gross domestic product, and POP, population, as explanatory variables.

$$CO2cap_t = f(POP_t, GDP_t) \qquad (1)$$

Specifically, assuming a linear structural form for $f(\ )$, the baseline empirical model is given by:

$$CO2cap_t = \alpha_0 + \alpha_1 POP_t + \alpha_2 GDP_t + \varepsilon_t \qquad (2)$$

where POP is the measure of population in year t; GDP is the gross domestic product in year t; ε_t is the error term, assumed to be independent and identically distributed as normal.

Empirical Results

Because the model measures carbon dioxide emissions as a function of population and gross domestic product, the natural tendency is to use POP and GDP as separate independent variables; however, multicollinearity exists if explanatory variables are highly correlated. Multicollinearity "may result in highly unstable least-squares estimates of the regression coefficients."[35] To test for multicollinearity, a computation of the pairwise correlation between population and GDP is used. High R-squared values, .7518 for China and .9188 for India,

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[35] Dielman, Terry. <u>Applied Regression Analysis for Business and Economics.</u> 3rd Edition. United States: Duxbury, 2001. 366.

indicate multicollinearity. To verify multicollinearity within the model, a computation of variance inflation factors is used. A variance inflation factor is "a measure of the strength of the relationship between each explanatory variable and all other explanatory variables in the regression…If the average of the VIF is considerably larger than one, a serious problem may exist."[36] The mean VIF values were considerably larger than 1: 12.8 for India and 4.13 for China.

When multicollinearity exists, the "regression coefficient estimates are unstable," and understanding the individual impact of explanatory variables is impossible. [37] In order to avoid the negative consequences associated with multicollinearity, GDP per capita is used as a measure of economic development adjusted for changes in population.

The pooled Ordinary Least Squares (OLS) results for China are shown in Table 3 and for India in Table 5 in the Appendix. The empirical model that best fits the data assumes a non-linear relation between economic development and population growth and environmental degradation, as shown below:

$$CO2cap_t = \alpha_0 + \alpha_1 GDPcap_t + \alpha_2 GDPcap^2_t + \varepsilon_t \qquad (3)$$

The dependent variable $CO2cap_t$, the carbon dioxide emissions per capita, is the amount of annual CO_2 emissions divided by the population in year t. These results show a significant and positive coefficient for the measure of economic development adjusted for population growth, GDPcap; the coefficient for the gross domestic product per capita squared is significant and negative. These coefficients show that there is indeed a positive association between higher

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[36] Dielman, Terry. 368.
[37] Dielman, Terry. 366.

GDP per capita and the CO_2 emissions per capita, and this relation has a quadratic form, that is, the rate of growth of CO_2 emissions per capita slows down as GDP per capita goes up.

Specifically, the rate of change of carbon dioxide emissions, which can be calculated as $\alpha_1+2\alpha_2 GDPcap_t$, is .0119 for India. That is, a thousand dollar increase in GDP per capita will result in an increase of 11.9 metric tons of carbon dioxide emissions per capita. For India, the elasticity[38] calculated at the sample mean is 5.546. For China, the rate of change of carbon dioxide emissions is .0041; thus, a thousand dollar increase in GDP per capita will result in an increase of 4.1 metric tons of carbon dioxide emissions per capita. The elasticity calculated at the sample mean is .7763.

Robustness Checks

To test the robustness of the estimation results from the pooled Ordinary Least Squares (OLS) alternative measures for economic development and population growth are used. Specifically, electrical consumption (Elec_Cons) is used instead of GDPcap:

$$CO2cap_t=\alpha_0 +\alpha_1 Elec\_Cons_t+\alpha_2 Elec\_Cons^2_t +\varepsilon_t \qquad (4)$$

The dependent variable $CO2cap_t$, the carbon dioxide emissions per capita, is the amount of annual CO_2 emissions divided by the population in year *t*. Table 4 reports these results for China, and Table 6 for India. These results show a significant and positive coefficient for the measure of economic development adjusted for population growth, Elec_Cons. The coefficient for electricity consumption per capita squared is significant and negative. The results of the OLS estimations using alternative measures for economic development and population growth are

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[38] $\eta = \delta\, CO2cap\, /\, \delta\, GDPcap * (GDPcap\, /\, CO2cap)\big|_{\bar{x}}$

also significant with positive associations for electricity consumption and of CO_2 emissions per capita and have a quadratic form; thus, the results are robust.

Forecasting

To show the potential environmental issues that China and India might face in the next fifty years if both countries take no action and continue with the current policies, I forecast per capita carbon dioxide emissions in 2050. To forecast carbon dioxide emissions I consider the estimated coefficients from the pooled Ordinary Least Squares (OLS) regression, and I use forecasted values of gross domestic product and population. The forecasting equation is give by:

$$CO2cap^f_t = \alpha^e_0 + \alpha^e_1 GDPcap^f_t + \varepsilon^e_t, \tag{5}$$

where $GDPcap^f$ is the forecasted ratio of GPD and Population in 2050, $\alpha^e_{i,}$ i=0 to 1 are the estimated coefficients from the pooled Ordinary Least Squares (OLS) and ε^e_t, the residuals from the pooled Ordinary Least Squares (OLS).

The U.S. Census Bureau provides estimates of population in 2050 for China, 1.449 billion, and India, 1.601 billion.[39] To estimate GDP from 2007 to 2012, I use the average growth rate over the period from 1980 to 2002 in China and India, eight percent for both countries. I decrease the growth rate by one percent following each five-year period until reaching four percent to obtain the estimate of GDP for 2050. Finally, I divide the estimate of gross domestic

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[39] "Population by Region and Country: 1950-2050." Global Population Profile. Bureau of Census. March 2004. A7.

product by the population estimate to obtain an estimate of gross domestic product per capita: 4,166 1995 US dollars for India and 7,767 1995 US dollars for China.

Given the projected GDP per capita for 2050, my model predicts that CO_2 will rise to 20.93 billion metric tons in India and 31.61 billion metric tons in China. The United States, currently the world's largest emitter of CO_2, emitted only 5.91 billion metric tons in 2004.[40] However, the environmental Kuznets curve projects that in the early stages of economic growth environmental degradation increases, and achieving some level of income per capita raises environmental consciousness so that at high-income levels economic growth leads to environmental improvement. Thus, my CO2 projections may need to adjust downward, since the downward trend appears only for a few years in my data set for China and does not yet appear my data set for India. The effects of the proposed environmental Kuznets curve are positive in the sense that one can expect a rise in environmental consciousness and a decrease in levels of environmental degradation without any external intervention. Despite the downward adjustment from Kuznets proposed relationship between income and pollution levels, my projections show that the situation is grim and requires government intervention. The latter portion of this study focuses on possible methods for securing environmental protection through government intervention.

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[40] "World Carbon Dioxide." Energy Information Administration. 19 July 2006. <http://www.eia.doe.gov/environment.html>.

Chapter 3: Mechanisms for Sustainable Development

"For any given technology, preference structure, and known resource base there are some utilization rates that cannot be sustained."[41] Thus, governments must control the utilization rates of environmental factors such that resource levels may be maintained. The World Commission on Environment and Development in 1987 defined sustainable development as "development [-- that meets the needs of the present without compromising the ability of future generations to meet their own needs. This definition considers that while development may be essential to satisfy human needs and improve quality of life, it should occur in such a way that the capacity of the natural environment to meet present and future needs is not compromised."[42] In order to achieve sustainable development in China and India, their respective governments must overcome the problem of the commons.

The Problem of the Commons

The problem of the commons is the absence of incentives to prevent the overuse and depletion of a commonly owned resource, in this instance the environment. The efficient use of a common resource requires marginal cost to equal marginal social benefit. However, individuals will consume the quantity at the point where marginal cost equals marginal private benefit leading to overuse and possible depletion of the commonly owned resource. "Each individual or group can gain from overexploiting it in the short run, but lose in the long run as everyone else

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[41] World Development Report 2003. 14.

[42] "UN Decade for Education for Sustainable Development." United Nations Education, Scientific and Cultural Organization. 2005. < http://portal.unesco.org/education/en/ev.php-URL_ID=23279&URL _DO=DO_TOPIC &URL_SECTION=201.html>.

does the same and the asset falls below its regenerative capacity. Society then ends up worse off."[43]

In order to prevent the overuse of a common resource, self-interested individuals must demand a quantity no higher than the quantity at which the marginal cost equals the marginal social benefit. "The existence of spillovers (externalities) that are not taken into account by individuals gives rise to the need for a 'market for external effects' that can align the marginal costs and benefits to the individual with those of society as a whole—so that individuals take into account their impact on others."[44] Altering the quantity demanded by individuals can be achieved by changing individual incentives.

Education

Education can effectively raise awareness and change the perceived individual benefit from overusing environmental factors. "Information policies, including labeling and the sharing of best practice, can help consumers and businesses make sound decisions, and stimulate competitive markets for low-carbon and high-efficiency goods and services."[45] Information policies can be enforced by government agencies, but they may also be self-enforcing with increased social pressure. As Chinese and Indian citizens become educated about the dangers ahead if reforms are not quickly put into place, religious institutions may be utilized to categorize environmental responsibility as a moral issue, and consumers may even choose to boycott companies who do not comply with environmental regulations.

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[43] World Development Report 2003. 27.
[44] World Development Report 2003. 27.
[45] Stern, Sir Nicholas. xx-xxi.

Technology

New environmental technology can also decrease environmental degradation. However, businesses "may under-invest in projects with a big social payoff if they fear they will be unable to capture the full benefits."[46] Businesses, which have substantial investment in production capital, will prefer to avoid the costs of capital replacement. This tendency becomes stronger when the cost of new technology is high and the future financial benefits are low. However, businesses will not fully take into account the social benefits. Thus, a strong economic case for government facilitation of new technology arises.

Rules

Defining property rights provides another method for preventing overuse of environmental factors. Assigning property rights transforms common property into private property. When a resource is privately owned, "the owner is confronted with the full consequences of his or her actions in using that resource."[47] The marginal social benefit becomes the marginal private benefit. Thus, the owner of the resource will take into account the value of maintaining the resource for the possibility of future benefits.

Placing an efficient price on environmental factors "– explicitly through tax or trading, or implicitly through regulation – means that people are faced with the full social cost of their actions."[48] Command and control government regulations can address environmental deterioration. These techniques include bans on equipment or processes, licenses, permits, quality standards, product standards, and technology requirements. Such methods have the advantage in certain situations of more easily targeting quantity and quality levels of a resource;

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[46] Stern, Sir Nicholas. xix.
[47] Parkin, Michael. <u>Microeconomics</u>. 7th edition. New York: Pearson Addison Wesley, 2006.
[48] Stern, Sir Nicholas. xviii.

however, constant negotiation by large corporations and legal loopholes can make regulations less efficient and effective than market-based methods.

Taxation, a market-based method, can address the problem of overuse; however, the impact of differing tax levels on environmental factors remains unknown until the tax has been imposed. Thus, sustainable levels of asset usage can only be achieved with trial and error. A regulatory agency must be formed to choose tax rates, and any changes in tax rates following trial and error attempts must be negotiated within the agency and approved by legislators.[49]

Trading permits, or individual transferable quotas, are production limits that are "assigned to an individual who is free to transfer the quota to someone else."[50] Using individual transferable quotas creates a market for tradable permits, which is self-regulating and has the advantages of efficiency. "Making permits tradable gives firms an incentive to look for the most cost-effective solutions for pollution abatement, because firms that lower their pollution more effectively or at a lower cost than do other firms can sell their excess credits to those firms. Firms then face an opportunity cost of pollution, which creates incentives to find cheaper abatement methods, encourages less pollution in aggregate, and ensures dynamic efficiency."[51] Using tradable permits places the burden of pollution reduction on the firms that can reduce pollution at the lowest-cost.

Institutions

An institution charged with sustaining the environment would help raise environmental awareness by spreading information, facilitating the production of environmentally sound technologies, and implementing and enforcing changes in rules.

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[49] <u>World Development Report 2003.</u> 32.
[50] Parkin, Michael.
[51] <u>World Development Report 2003.</u> 33.

Creating an institution charged with sustaining environmental factors would inherently form powerful pro-environment interests. Although civil societies, private groups coordinating around environmental issues, can mobilize support, supply information, and provide third party verification, their political influence is small in comparison with that of major business interests.[52] Business interests that have large monetary stakes in maintaining the status quo will provide major contributions to politicians who will oppose strict environmental regulations. Thus, the government must play a role in creating environmental interests whose power rivals that of business interests.

Currently, the government institutions that propose and implement environmental policy and educate the public on environmental issues in China and India, India's Ministry of Environment and Forestry and China's Ministry of Land and Resources, merely serve as an arm of the administration, which controls and appoints the ministers.

In order to implement effective environmental policy, governments should create a more powerful institution, similar to the Federal Reserve Board in the United States or the Indian Supreme Court. The institution would create and implement legislation while taking into account the negative externalities and societal costs from environmental degradation. The powers and organization of such an institution will depend on China and India's respective political environments.

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[52] World Development Report 2003. 33-34.

Chapter 4: Achieving Sustainable Development in India: An Institutional Solution

The powers and organization of a government institution charged with proposing and implementing environmental policy must be determined while taking into account the political framework in which the institution will reside. In other words, taking the political system of India as given, it is necessary to determine the best method for achieving sustainable development as an equilibrium outcome.

Effective Institutions in India's Current Political System

The Indian Supreme Court, an autonomous institution[53], is considered to be effective in bringing about environmental reforms. The Indian Supreme Court displayed its success in solving environmental problems when it effectively "imposed an immediate ban on the discharge of untreated industrial waste into the Yamuna River which passes through Delhi and the neighbouring state of Haryana."[54] In 1998, the Supreme Court once again displayed its success in bringing about environmental reforms: the Indian Supreme Court issued a ruling[55], which required "all the city's buses to be run on compressed natural gas (CNG) by March 31, 2001. Compliance was to be achieved either by converting existing diesel engines or by replacing the buses themselves."[56] Only a small percentage of the buses were converted by the deadline;

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[53] The autonomy of the Indian Supreme Court emanates from the processes of selection and removal of Supreme Court justices. A Judge of the Supreme Court is appointed by the President of India and serves until he or she reaches the age of sixty-five. He or she "cannot be removed from office except by an order of the President passed after an address in each House of Parliament supported by a majority of the total membership of that House and by a majority of not less than two-thirds of members present and voting, and presented to the President in the same Session for such removal on the ground of proved misbehaviour or incapacity. A person who has been a Judge of the Supreme Court is debarred from practising in any court of law or before any other authority in India." ["Law, Courts and the Constitution." Supreme Court of India. < http://supremecourtofindia.nic.in/new_s/constitution.htm>.]

[54] "Pollution Order in India." British Broadcasting Corporation News. 24 January 2000. < http://news.bbc.co.uk/2/hi/south_asia/617107.stm>.

[55] M.C. Mehta v. Union of India, WP 13029/1985 (1998.09.22)

[56] M.C. Mehta v. Union of India, WP 13029/1985 (1998.09.22)

however, the court extended the deadline allowing for the full adherence. Currently, all Delhi buses operate using only compressed natural gas. Although effective, the Supreme Court rules on a plethora of issues mandated by the Indian constitution[57] and is, thus, unable to achieve environmental reform with the speed and efficiency necessary to avoid potential environmental disaster.

In order to determine the attributes of an environmental institution in India, one may utilize the Indian Supreme Court, which has succeeded in achieving environmental reform, as a model.

The Origin of the Effectiveness of the Supreme Court

In order to illustrate the origin of the effectiveness of the Supreme Court, I use the one-dimensional spatial model. The model presents the political spectrum on a [0,1] interval with each policy choice corresponding to a point on the line. In the case of environment reform, I let 0 be pro-environment and 1 be pro-business. Voters have most preferred policies, which correspond to specific points along the line, called ideal points. The further away the actual policy from a voter's ideal point, the worse off he or she is. I assume that voter preferences are symmetric and single peaked. Symmetry implies that a point closer to the ideal point is preferred

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[57] The Indian Supreme Court has original, appellate, and advisory jurisdiction. "Its exclusive original jurisdiction extends to any dispute between the Government of India and one or more States or between the Government of India and any State or States on one side and one or more States on the other or between two or more States, if and insofar as the dispute involves any question (whether of law or of fact) on which the existence or extent of a legal right depends…. The appellate jurisdiction of the Supreme Court can be invoked by a certificate granted by the High Court concerned under Article 132(1), 133(1) or 134 of the Constitution in respect of any judgement, decree or final order of a High Court in both civil and criminal cases, involving substantial questions of law as to the interpretation of the Constitution… The Supreme Court has special advisory jurisdiction in matters which may specifically be referred to it by the President of India under Article 143 of the Constitution. Although the proceedings in the Supreme Court arise out of the judgments or orders made by the Subordinate Courts including the High Courts, but of late the Supreme Court has started entertaining matters in which interest of the public at large is involved and the Court can be moved by any individual or group of persons either by filing a Writ Petition at the Filing Counter of the Court or by addressing a letter to Hon'ble the Chief Justice of India highlighting the question of public importance for invoking this jurisdiction." ["Law, Courts and the Constitution." Supreme Court of India.].

to a point farther away from it. Points equidistant from the ideal point are equally preferred. Single-peakedness implies that "the alternatives under consideration can be represented as points on a line, and each of the utility functions representing preferences over these alternatives has a maximum at some point on the line and slopes away from this maximum on either side."[58]

Policy outcomes are determined by the relative locations of a series of parameters: the status quo policy, individual parties' preferred policies, and the judiciary's preferred policy.

In order to apply the spatial model to the India's political system, I make three additional assumptions. (1) I assume that the judiciary does not like to be overturned and will, therefore, only reinterpret policy outcomes such that the legislature will not be able to overturn the judicial interpretation. (2) Parties within the coalition will not risk the dissolution of the coalition over issues where public opinion lies with judicial rulings. The assumption implies that a ruling party will not seek to overturn a judicial decision with the help of the opposition and at the expense of a coalition partner while going against the popular will. Because the Indian public favors stricter environmental policies[59], I assume that parties will not dissolve the coalition to overturn pro-environment Supreme Court decisions. (3) Each political party has a single ideal point, that is, a most preferred policy.

Assume at the beginning of play, a status quo policy from a previous legislature, X_Q in Figure 1, is in place. The legislature may then select and implement a new policy or let the status quo remain. Next, the Judiciary may either reinterpret the legislature's policy or let it stand. If unhappy with this policy outcome, the legislature may select a new policy.

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[58] Shepsle, Kenneth and Mark Bonchek. Analyzing Politics: Rationality, Behavior, and Institutions. New York: W. W. Norton and Company, 1997. 84.

[59] The Angus Reid Global Monitor reports that 89% of Indians agree with the following statement: "Damage to the environment must be reduced, even if it means slower economic growth." To obtain this statistic, Angus Reid conducted online interviews with 5,800 adults in Australia, Britain, Canada, China, Egypt, France, Germany, India, Israel, Italy, Japan, Lebanon, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Spain, Turkey and the United States, from Sept. 22 to Oct. 6, 2006. ["U.S. Out of Step With World on Environment." Angus Reid Global Monitor. 16 November 2006. <http://www.angus-reid.com/polls/index.cfm/fuseaction /viewItem/itemID/13819>.]

In a parliamentary system one must consider two situations: when one party has an absolute majority in the legislature or when the majority is made up of a coalition of parties. If one party has an absolute majority in the legislature, the legislature's chosen outcome and the largest party's preferred outcome are one and the same X_M, the ideal point of the median voter in the legislature. In this situation, the judiciary rarely influences policy outcomes. If the judiciary interpreted the policy at its ideal point, X_J, the legislature would overturn the judicial decision. Because the legislature's median outcome and the largest party's preferred outcome are exactly the same, the equilibrium outcome will always be X_M as explained below.

The legislature will propose and implement its most preferred outcome X_M. If the judiciary reinterprets the legislation, the legislature will overturn the judicial ruling proposing X_M again. Because the judiciary does not like to be overturned, the judiciary will simply let X_M stand.

Figure 1

0 X_J X_Q X_M 1

Pro Business

Pro Environment
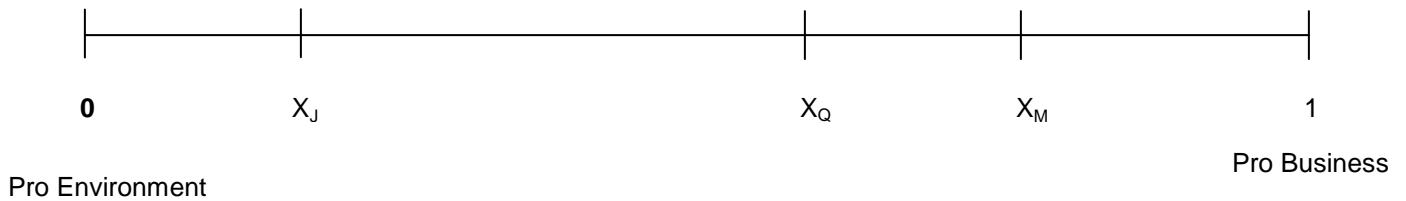
If one party does not gain an absolute majority, as is recently the case in India, the median voter in the legislature and the largest party will no longer have the same ideal point. Thus, new parameters must be introduced into the model: the ideal points of each party within the majority coalition.

Assume that the majority coalition is made up of two parties: one of which makes up 45% of seats in the legislature, the Big Party, and the other which makes up only 15% of seats within the legislature, the Little Party. The Opposition Party also makes up 40% of seats within the legislature. Assume that the Big Party's most preferred policy outcome, X_B, lies between the Little Party's ideal point, X_L, and the Opposition Party's ideal point, X_O, shown in Figure 2. The Big Party and the Little Party form a coalition and the leader of the largest party within the coalition presides over the administration.

The legislature will choose a policy between X_L and X_B. Bargaining on the position of the policy proposal in the legislature between coalition members takes place prior to proposal. If the judiciary prefers a policy that is more pro-business than X_B, its ideal point lies to the right of X_B. However, if the judiciary moves the policy to the right of X_B, both the Big and Little Party, the majority coalition, can achieve a more preferred policy outcome by overturning the judiciary or administrative decision and selecting X_B. If the judiciary prefers a policy that is more pro-environment than X_L, its ideal point lies to the left of X_L. Because members of the judiciary do not depend on business donations to maintain their positions, as is often the case with legislators, in Figure 2 I have placed the judiciary's ideal point, X_J, to the left of X_L. If the judiciary moves the policy to the left of X_L, both the Big and Little Party, the majority coalition, can achieve a more preferred policy outcome by overturning the judiciary's decision and selecting X_L. However, the judiciary may choose its most preferred policy between X_B and X_L, what I have called the approvable range. Thus, in Figure 2 the judiciary will reinterpret the legislature's proposed policy at X_L. Although both the Opposition Party and the Big Party could be made better off by overturning the judiciary decision and choosing X_B, the assumption that parties do not want to dissolve the coalition over issues where public opinion lies with the judicial ruling

will prevent the Big Party from allying with the Opposition party in order to overturn stricter environmental regulations. *The power of the judiciary flows from the division of power.*

Figure 2

| 0 | X_J | | X_L | X_B | X_Q | X_O | 1 |

Pro Environment   Pro Business

Approvable Range
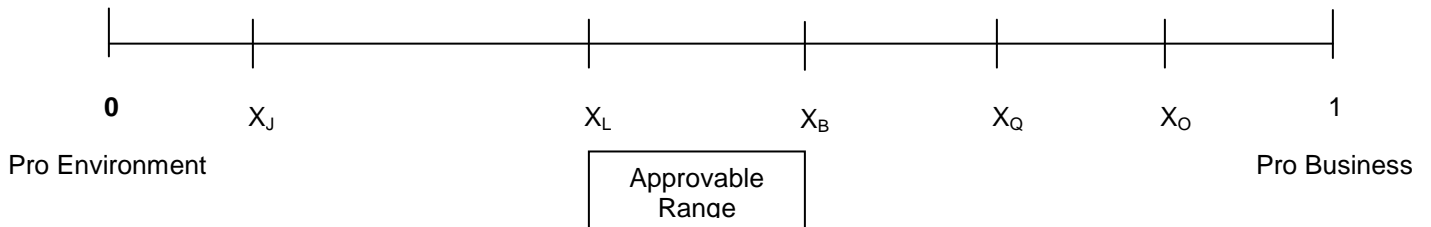
Thus, given the assumptions that the judiciary does not want to be overturned, political parties will not dissolve the coalition to overturn pro-environment Supreme Court decisions and that each party has a single ideal point, the Supreme Court can successfully implement environmental reform as an equilibrium outcome by reinterpreting legislative policy at the ideal point of the most pro-environment member of the majority coalition.

Further Support for the Effectiveness of the Indian Supreme Court

Several scholars have recognized the role of the Indian Supreme Court in India's institutional framework. Gerald E. Beller argues that a growing belief has emerged that "the Court represents the only real protection against incipient tyranny."[60] Furthermore, he states that the Supreme Court "is often referred to as the only major guarantor of constitutional rights…Many groups use litigation as a means of invoking Court decisions on those in power."

George Gadbois claims that the "Supreme Court of India has been an enormously important factor in Indian politics."[61] He cites the Court's declaration of hundreds of national

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[60] Beller, Gerald E. "Benevolent Illusions in a Developing Society: The Assertion of Supreme Court Authority in Democratic India." The Western Political Quarterly, Vol. 36, No. 4. Dec. 1983. 514.
[61] Gadbois, George. "Review: The Indian Supreme Court and Politics by Upendra Baxi." The American Political Science Review. Vol. 75, No. 2. June 1981. 523-524.

and state laws as unconstitutional and the successful invalidation of constitutional amendments meant to limit the power of the Supreme Court as evidence of the power of the Indian Supreme Court. He argues that the Indian Supreme Court is "probably the nearest analogue (not just the nearest non-Western analogue) to the United States Supreme Court."[62]

Indians and the Supreme Court itself view the role of the Court to include the protection of "the public interest at large."[63] The Indian Supreme Court is "a unique adjudicative body that considers a wide range of social issues under the rubric of protection of constitutional fundamental rights…Eventually, the Court extended fundamental rights to include the right to a clean environment. The doctrine of Court-protected fundamental rights advanced in a way that gave the Court the last say on the basic structure of the constitution."[64]

Whether using the theoretical political model or simply looking at the past successes of the court as the basis for its creation, an autonomous institution such as the judiciary can lead to environmentally sound equilibrium outcomes. Thus, if India's government decides to promote sustained development in order to strike a balance between long-term economic and environmental goals, an autonomous institution specifically focused on environmental sustainability should be created.

Attributes of an Environmental Institution in India

The powers and organization of an environmental institution in India may be determined by looking to the Indian Supreme Court as a model for successful institutions. However, one

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[62] Gadbois, George. 523.
[63] "Law, Courts and the Constitution." Supreme Court of India
[64] "The Role of India's Supreme Court in Public Life." Environment. Vol. 46 No. 3. April 2004, 2.

must specifically address four major concerns when considering the establishment of an environmental institution: (1) autonomy, (2) budgetary concerns, (3) the extend to which the government and Indian citizens have oversight over the institution, (4) the prevention of extremism within the institution itself.

Autonomy is defined as "having the right or power of self government… undertaken or carried on without outside control."[65] Huntington describes autonomy as one of the primary criteria for successful institutionalization. Political institutions may only be considered valuable if they have "interests and values distinguishable from those of other institutions and social forces."[66] In order to achieve political independence within an institution charged with environmental protection, I propose that a number of measures be taken: Firstly, a nomination committee made up of the existing Environmental Council members would nominate new council members to the institution. Secondly, individual councilors would serve until they have reached the official retirement age and will receive a salary and benefits, which are fixed "independent of effort, quality of work, or any other performance based standard. They [would be] salaried managers of a non-profit system."[67] This condition removes the profit-motive from environmental regulators. Thirdly, a two-thirds majority within a disciplinary committee made up only of councilors and previous councilors would be necessary for disciplinary actions or the untimely removal of councilors.[68]

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[65] "Autonomy." Merriam Webster's Online Dictionary. 10 January 2007.

[66] Huntington, Samuel P. Political Order in Changing Societies. New Haven: Yale University Press, 1968. 20.

[67] Shepsle, Kenneth and Mark Boncheck. 414.

[68] Chief Justice of India K G Balakrishnan explains the importance of internal control over disciplinary measures in autonomous institution: When asked, "Should non-judges be involved in disciplining judges?", Chief Justice Balakrishnan responded, "It's a question of independence of the judiciary. If any other person conducts such enquiry about any judge, it will cause serious inroads into the independence of the judiciary." [Balakrishnan , K. G. Interview with Karan Thapar. "Devil's Advocate: K G Balakrishnan." CNN-IBN News. 4 February 2007. <http://www.ibnlive.com/news/devils-advocate-k-g-balakrishnan/32742-3.htm>.]

In order to maintain political autonomy, the budget of the environmental protection institution must be dissociated from other institutions. In order to minimize political control over the budget of the institution, I propose that the institutional funding be determined by transparent formula, specified by the original legislation, beyond current political control.

Although political autonomy is vital to the success of an environmental institution in India, political leaders, who are chosen by Indian citizens and charged with representing their interests, may hold some minimal level of oversight over the institution such that the interests of the Environmental Council are aligned with the interests of the people. In order to maintain a basic level of political oversight, I propose that the approval of a majority within the legislature would be required for the confirmation of institutional appointments. The right to appointment approval gives politicians, and indirectly Indian citizens, the ability to influence the attributes of environmental policy-makers.

While minimal political intervention is vital to effectively achieve environmental reform with the speed necessary to avoid potential environmental crises, how can extremism within the institution be prevented? Although it is conceivable for one extremist appointee to deceive both the nomination committee and a majority of the legislature, the likelihood of repeated deception by multiple appointees over a short period of time is extremely small. Thus, by creating an Environmental Council of fifteen members and requiring majority approval for the implementation of environmental regulations, a majority vote of the Environmental Council will defeat extremist measures.[69] A Council of policy makers will lead to more preferred outcomes than a Chairman alone.[70]

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[69]   Buchanan and Tullock suggest that the optimal voting mechanism varies from dictatorship to unanimity depending on the collective choice issue in question. "A positive argument for democratic decision-making institutions, beyond the election of rulers periodically, must rest on the assumptions of individualist rather than idealist democracy. *Individual interests must be assumed to differ, and individuals must be assumed to try to further*

In conclusion, the proposed institution would be charged with environmental protection and would have the power to implement and enforce legislation. The institutional budget would be determined by a transparent formula, beyond political control. A council of fifteen members, nominated by a committee made up of previous council members and confirmed by the Indian legislature, would propose and implement environmental regulations. Councilors would serve until retirement age and receive a fixed salary and benefits. They could only be removed by a two-thirds majority vote within a disciplinary committee made up of current and previous councilors.

Creation of an Autonomous Institution in Democratic India

The creation of an autonomous institution in India would require the support of the Indian legislature. Although legislators have a variety of political objectives, their primary concern is re-election. Without maintaining their position, legislators will not be able to achieve any other political objectives. Thus, politicians must be aware of the groups that they must please in order to hold their position. Because of the high costs of running campaigns, politicians must satisfy those who supply funds for their campaigns: "financial 'fat cats,' political action committees, important endorsers, small contributors, party officials, [and] volunteer activists."[71] A legislator must also please the categories of voters who secured his or her election, voters who "may be

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these by means of political as well as private activity. Only on these assumptions can the costs of decision-making be accepted as an inherent part of the process that will provide protection against the external costs that may be imposed by collective action." (Italics not original) [Buchanan, James M. and Gordon Tullock, The Calculus of Consent: Logical Foundations of Constitutional Democracy. Liberty Fund, Inc. 1999. Library of Economics and Liberty. 26 March 2007. <http://www.econlib.org/Library/Buchanan/buchCv3c1.html>.]

[70] The Condorcet Jury Theorem establishes that when individuals vote independently and share a common goal "a majority of a group, with limited information about a pair of alternatives, is more likely to choose the 'better' alternative than any one member of the group." [Ladha, Krishna. "The Condorcet Jury Theorem, Free Speech, and Correlated Votes." American Journal of Political Science. Vol 36, No. 3. (Aug. 1992). 617.]

[71] Shepsle, Kenneth A. and Mark S. Bonchek. 313.

prepared to support her again if performance is adequate."[72] Finally, legislators have their own agendas. Whether for private gain or the public good, most politicians take office with personal policy goals.

Once in place, an autonomous institution charged with environmental protection would be stable and probably good for politicians, as they can take the credit and pass the blame; they would be able to "do the right thing" by protecting India's environment, and thus India's future well-being, while placing the blame on the institution to opponents of stricter environmental regulations, which may include major campaign contributors. Much as the Indian Supreme Court, the environmental institution would often serve "the covert desires of elected leaders."[73] Thus, politicians in democratic India can credibly commit to maintain the institution.

Although a large number of Indian citizens support environmental protections, environmental supporters are a classic example of a latent group: supporters are large in numbers; members are anonymous; no one individual feels that his action will make a difference; and enforcing compliance is virtually impossible.[74] Thus, supporters often fail to overcome the collective action problem needed to influence Indian environmental policy.

As major campaign donors, businesses that would bear the costs of adherence to stricter environmental regulations pressure politicians to avoid stricter regulations. Business owners, a privileged group, being a highly-organized, comparatively small group with substantial resources, would be able to generate a considerable amount of effective political action.

Because the benefits from supporting measures to increase environmental protections are widely dispersed and the benefits from opposing are highly concentrated, a political entrepreneur is essential to provoke political action. A political entrepreneur "is someone who sees a

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[72] Shepsle, Kenneth A. and Mark S. Bonchek. 313.
[73] Beller, Gerald E. 522.
[74] Shepsle, Kenneth A. and Mark S. Bonchek. 238.

prospective cooperation dividend that is currently not being exploited…[and] for a price, whether in votes…, or a percentage of the dividend, or the nonmaterial glory and other perks enjoyed by leaders, the entrepreneur bears the cost of organizing, expends effort to monitor individuals for slacker behavior, and sometimes even imposes punishment on slackers."[75]   If an "alternative is to be adopted over status quo, a political entrepreneur is needed to mobilize or represent those with dispersed benefits."[76]   A crisis situation could provoke a political entrepreneur to propose the creation of an environmental protection institution[77], or a politician may simply recognize the potential benefit in popular support for improved environmental conditions.

Following the formation of an autonomous environmental institution, new interests will be created. A unified and organized pro-environment group would then match the influence of the well-funded and highly organized business sector. In fact, much of the opposition from the business sector may no longer exist once the initial costs of adhering to stricter environmental legislation has been born. Often times, adhering to environmental regulation entails large fixed costs, but very small marginal costs.

Conclusion

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[75] Shepsle, Kenneth A. and Mark S. Bonchek. 245.

[76] Baron, David P. Business and Its Environment. 3rd ed. Upper Saddle River, New Jersey: Prentice Hall, 2000. 175.

[77] It is common for a crisis situation to provoke political pressure on opponents of stricter policy. Following the attacks in New York City on September 11, 2001, political pressure in the legislature led to the increase in military power within the United States executive branch. Senate Joint Resolution 23 was passed on September 14, 200l, authorizing "the President to use all necessary and appropriate force against those nations, organizations, or persons he determines planned, authorized, committed, or aided the terrorist attacks that occurred on September 11, 2001, or harbored such organizations or persons, in order to prevent any future acts of international terrorism against the United States by such nations, organizations, or persons." ["A Joint Resolution to Authorize the Use of United States Armed Forces Against Those Responsible for the Recent Attacks Launched Against the United States."." S.J.RES.23. 14 September 2001. <http://thomas.loc.gov/cgi-bin/bdquery/z?d107:SJ00023:@@@L&summ2=m&>].

Taking the democratic political superstructure of India as given, an autonomous institution charged with environmental protection would be a move towards achieving sustainable development as an equilibrium outcome. Using the Supreme Court, which has succeeded in successfully implementing environmental reforms, as a model, I propose the creation of an autonomous government institution charged with environmental protection. Although legislative support would be necessary for its creation, and business interests would likely disapprove of its formation, a crisis situation or the perceived political benefits could induce a political entrepreneur to pursue the creation of an environmental agency.

Chapter 5: Achieving Sustainable Development in China: An Institutional Solution

The attributes of an institution charged with proposing and implementing environmental policy must be determined while taking into account the political framework in which the

institution will reside. Taking the political system of China as given, what will be the best method for achieving sustainable development as an equilibrium outcome?

China's Political Framework

The constitution of the People's Republic of China stipulates that the Communist Party of China will be the country's sole political party in power and the socialist system is its fundamental political system. The fundamental goals of the government are "to concentrate on the socialist modernization drive along the road of building socialism with Chinese characteristics; to adhere to the socialist road, persist in the reform and opening up program, improve the socialist system in all aspects, develop the market economy, expand democracy, and improve the rule of law; to be self-reliant and work hard to gradually realize the modernization of the industry, agriculture, national defense, science and technology so as to build China into a strong and democratic socialist country with a high degree of cultural development."[78]

The Communist Party of China's basic principle of control is "democratic centralism," which "makes each member subordinate to the Party organization. It has a pyramid structure resting on millions of local-level Party organizations across the country and reaching all the way up to the highest decision-making bodies in Beijing."[79] The highest echelon of the political pyramid is the National Party Congress, which assembles once every five years. Thousands of representatives from local Party organizations gather together to elect a Central Committee, "though in fact almost all of these people are approved in advance."[80] The Central Committee is

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[78] "China's Political System." China Internet Information Center. 24 February 2007. <http://www.china.org.cn/english/Political/26143.htm>.
[79] "How China is Ruled." British Broadcasting Corporation News. 23 March 2007. <http://news.bbc.co.uk/2/shared/spl/hi/in_depth/china_politics/government/html/1.stm>.
[80] "How China is Ruled."

responsible for the selection of the twenty-four member Politburo and its nine member Standing Committee, where the majority of policy formation occurs.

To become a member of the Politburo or its Standing Committee, "people need a strong record of achievement working for the Party, to have the right patrons, to have dodged controversy, and to have avoided making powerful enemies."[81] Committee members are chosen following a thorough investigation of their careers and personal lives. The Standing Committee operates in secret; however, experts believe that meetings are regular and frequent. Although Standing Committee members may engage in policy struggles in the privacy of committee meetings, final decisions made by the Standing Committee are binding. Members rarely display displeasure with Committee decisions publicly. Public disagreement signifies a major power struggle within the Standing Committee.

After the Standing Committee drafts new legislation, the committee sends the legislation to the National People's Congress for "consideration." The Congress, the highest organ of state power, has over three thousand members and convenes for one yearly session. The NPC exercises the following functions and powers:

(1) "to amend the Constitution;"

(2) "to supervise the enforcement of the Constitution;"

(3) "to enact and amend basic laws;"

(4) "to elect the President and the Vice President of the People's Republic of China;"

(5) "to elect the Chairman of the Central Military commission;"

(6) "to elect the President of the Supreme People's Court;"

(7) "to elect the Procurator-General of the Supreme People's Procuratorate:"[82]

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[81] "How China is Ruled."
[82] "China's Political System."

Due to the sporadic nature of congressional sessions, the Standing Committee of the Congress, which holds monthly meetings, has the real influence within the institution. The Standing Committee of the National People's Congress is "the permanent organ of the NPC."[83] When Congress is not in session, the Standing Committee performs the functions of the Congress. Although the Congress and the Standing Committee of the NPC appear to hold significant political power, the Congress is intrinsically linked to the Communist Party of China: approximately "70% of its delegates - and almost all its senior figures - are also Party members. Their loyalty is to the party first, the NPC second."[84] Thus, the National People's Congress quickly approves virtually any legislation proposed by the Standing Committee of the Politburo.[85]

Much as the National People's Congress, the Chinese judiciary is not independent of the Communist Party. As previously mentioned, the NPC elects both the President of the Supreme People's Court, the highest People's Court, and the Procurator-General of the Supreme People's Procuratorate, "the highest legal supervisory body, charged with safeguarding the constitution, laws and people's rights."[86] The judiciary uses the law to serve the interests of the Communist Party and not for the protection of individual rights.

Currently, the Ministry of Land and Resources is "responsible for the planning, administration, protection, and rational utilization of such natural resources as land, mineral, and marine resources in the People's Republic of China."[87] However, the ministry falls under the direct authority of the State Council, the highest executive organ of State power. Because the

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[83] "China's Political System."
[84] "How China is Ruled."
[85] Although still dominated by the leadership of the Communist Party of China, in recent years the NPC has become increasingly more independent: "In a notable incident in 1999, it delayed passing a law bringing in an unpopular fuel tax. It has also been given greater leeway drafting laws in areas like human rights." ["How China is Ruled."]
[86] "How China is Ruled."
[87] "Ministry of Land and Resources P.R.C." Government of the People's Republic of China. 3 March 2007. <http://www.mlr.gov.cn/pub/gtzyb/mlrenglish/mission/index.htm>.

Ministry of the Land and Resources serves as an arm of the administration, ministry officials in disagreement with Party leadership hold little influence in environmental policy making.

Creation of an Environmental Institution in Centrally Planned China

Due to the centralized control of the Communist Party within China's political system, the creation of a more powerful environmental institution must come solely from the political will of Party and government leadership. Thus, if environmental protection is a priority for Communist Party leaders, specifically a majority of the members of the Politburo Standing Committee, creation of an institution charged with environmental protection will be unproblematic.

Recent statements and actions by President Hu Jinato and Party leadership indicate that environmental protection may indeed be a Party priority. On October 11, 2006, the Communist Party's Central Committee formally adopted President Hu's proposal to build a "harmonious socialist society." The leadership stated that "a range of social concerns, including the surging wealth gap, corruption, pollution and access to education and medical care, must be placed on a par with economic growth in party theory and government policy."[88]

Though China's one-party system "concentrates authority in the hands of Mr. Hu, he must also navigate personal, regional and institutional allegiances that can make it difficult to implement decisions made in Zhongnanhai, the leadership compound."[89] Continuing anti-corruption probes indicate President Hu's commitment to the removal of corrupt government officials. Experts speculate that future targets for the corruption investigation will be Mr. Jia,

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[88] Kahn, Joseph. "China Makes a Commitment to Achieving Social Harmony." New York Times. 12 October 2006.
[89] Kahn, Joseph. "China's Corruption Inquiry Targets Beijing." New York Times. 26 October 2006.

member of the Politburo Standing Committee, and Mr. Lui, a regular member of the Politburo.[90]

Even if the President does not force Mr. Jia and Mr. Lui into resignation, the investigation, or threat of investigation, will likely serve to stifle their political agendas, which favor fast economic growth.

Although it is difficult to distinguish between corruption and political purges, and although most of the 67,505 government officials who have been punished for corruption since 2003[91] are supporters of former President Zemin[92], it is possible that these purges serve current President Hu's agenda of social reform centered on the environment and redistribution of wealth.

Attributes of an Environmental Institution in China

Although the formation of an environmental institution in China would be uncomplicated due to the centralized political structure, constructing institutions that will not be destroyed under the leadership of someone for whom environmental policy may not be a policy focus presents difficulties. The necessary powers and organization of an environmental protection institution in China may be determined while taking into account the political framework in which the institution will reside. I will address four major concerns when considering the establishment of an environmental institution in centralized China: (1) the level of political independence, (2) the level of centralization, (3) the prevention of extremism within the institution itself, and (4) the prevention of the diminution of institutional power in the future.

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[90] Kahn, Joseph. "China's Corruption Inquiry Targets Beijing."
[91] "China Cracks Down on Corruption." British Broadcasting Corporation News. 24 October 2006.
<http://news.bbc.co.uk/2/hi/asia-pacific/6079400.stm>.
[92] Mr. Jiang's old loyalists, often referred to as the Shanghai faction, tended "to favor fast economic growth, a relatively high degree of provincial autonomy in economic affairs, loose controls on investment and bank lending and close ties between the party and the country's rising class of private businessmen." [Kahn, Joseph. "In Graft Inquiry, Chinese See a Shake-Up Coming." New York Times. 3 October 2006.]

True political independence is impossible in a centrally planned state. However, in order to achieve the highest level of political independence possible, I propose that a number of measures be taken: Firstly, institutional leaders would serve until he or she reaches retirement age or resigns. Secondly, just as the proposed institution in democratic India, leaders would receive salaries and benefits, which are fixed "independent of effort, quality of work, or any other performance based standard. They [would be] salaried managers of a non-profit system."[93] This condition removes the profit-motive from environmental regulators. Thirdly, the leadership of the institution could remain independent in its daily functions. Although the Party would maintain control of hiring institutional leadership and constructing environmental policy goals, the implementation and enforcement of specific environmental regulations would be the responsibility of the leaders in the institution. The environmental agency would be inherently less independent than an institution within a democratic country, but it could remain independent in its day-to-day functions.

In order to aggregate information pertaining to environmental protection in a country of 1.3 billion people spread over 9,326,410 square kilometers[94], the institution would need a significant level of decentralization. The objective of an institution charged with environmental protection is to create incentives such that the actions of informed actors taken in private interest are also in the collective, public interest. Thus, I propose that the institution have a central office where leadership actually proposes environmental regulations and punishment for those who defy regulations. However, regional offices would be responsible for enforcement and submitting reports suggesting future measures or changes in current regulations based on regionally specific information.

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[93] Shepsle, Kenneth and Mark Bonchek. 414.
[94] "The World Factbook: China." U.S. Central Intelligence Agency. 15 March 2007.
<https://www.cia.gov/cia/publications/factbook/geos/ch.html>.

The level of extremism within the institution would be determined by attributes of the Party appointees to the institution. Although one extremist appointee could deceive Party leadership, the likelihood of repeated deception by multiple appointees over a short period of time is extremely small. By creating an Environmental Council of fifteen members and requiring majority approval for the implementation of environmental regulations, extremist proposals made by an appointee who has deceived Party leadership will fail. Extremists may purposely be appointed if the Party leadership exhibits extremism; however, eight councilors must retire or reach retirement age in order to achieve a majority within the Council.

Although a centralized state cannot credibly commit to maintaining the power of an institution charged with protecting the environment, the increased awareness about environmental issues following the creation of an institution will make sustainable development a public priority, diminishing the credible commitment problem. As the institution spreads information more people will become aware of the problems facing popular interests. Because no substantial political opposition groups exist, the public priorities lead to Party priorities. The creation of an institution also creates a new interest group: the institution would be an organized group who can lobby Party leadership just as corporate interests do. In reality, business interests oppose stricter environmental regulation because high fixed costs are associated with adherence to stricter regulations. Once firms make the initial investments, often their profits increase or stay the same. These firms would not wish to revert back to old regulations once they had made the initial investment.

Conclusion

Taking the political superstructure of China as given, an institution charged with environmental protection would be a move towards achieving sustainable development. The support of the Communist Party of China would be vital to its formation, and the Party would maintain control over institutional appointments and budgets; however, the institution would maintain independent in daily functions. Increased environmental awareness following the creation of an institution will make sustainable development a public and Party priority, which will make removal difficult.

Conclusion

According to this thesis, the problem China and India face is not the usual economy-environment trade-off. China and India must grow to maintain political stability, yet, must

preserve their environment to support their rising populations. Thus, China and India must have increased output and increased environmental quality simultaneously and speedily.

The need for speedy action in the area of environmental protection may be understood with reference to the data analysis presented in this thesis as well as various reports widely publicized during 2006 and 2007. The need for simultaneous betterment of the economy and environment is the point of departure of this thesis.

It is well known that the socio-political stability in developing nations, with rising populations, is tied to high economic growth rates. Considering that China and India will account for a large fraction of the rise in the world population from 6.3 to 9.3 billion by 2050 (as projected by the Population Reference Bureau), economic growth is a must; and so is sustenance of the environment because, beyond a critical point of decay, environmental deterioration can arrest economic growth. The data analysis carried out in this thesis, although limited to CO_2 emissions in China and India, project a similar grim picture of the environment and its potential effect on economic activity.

It is evident that China and India must pursue long-term economic growth while meeting considerably stricter environmental standards.

Methods for addressing the problem of environmental decay are plentiful: from education to social norms, from technological improvements to tradable permits and taxes, and from voluntary mechanisms to governmental impositions. This thesis has focused on institutional solutions at the national level.

On the basis of the one-dimensional spatial model and the successes of the Indian Supreme Court in the area of the environment, the thesis argues for the creation of a politically independent agency with jurisdiction over environmental issues. A council of fifteen members

would require majority approval for implementation of regulations, preventing extremism within the institution. Individual councilors (1) would serve until retirement age, (2) would be removed only by a council of their peers, (3) would be nominated by existing leadership, and (4) would receive fixed salaries independent of performance based standards.

The centralized power of the Communist Party in China requires that the creation of a environmental institution must come solely from the political will of the Party. Recent actions by President Hu Jinato indicate that environmental protection, as a major part of President Hu's proposed "harmonious socialist society," may currently be a political priority.

Assuming President Hu's commitment to environmental issues is sincere, the construction of the institution would be unproblematic; however, maintaining effectiveness under leadership not committed to environmental protection presents concerns. By (1) allowing leaders to serve until retirement age, (2) fixing salaries and benefits independent of performance, and (3) giving the institution independence in daily functions, the government would allow the institution to have a significant level of political autonomy and would make destruction difficult.

A politically independent agency, charged with the management of environmental affairs, would be prudent for both China and India in order to achieve long-term economic growth while preserving environmental quality.

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Appendices

Table 1: Variable Definitions

Variable Definition	Variables
CO2 emissions (thousands of kilotons)	CO2kt
CO2 emissions (metric tons per capita)	CO2cap
GDP (billions of constant 1995 US$)	GDP
GDP per capita (constant 1995 US$)	GDPcap
Electric power consumption (kwh per capita)	Elec Cons
Population, total (millions)	Pop
Population density (people per sq km)	PopDen

CHINA

Table 2: Summary Statistics for China

Summary Statistics					
Variable	**Obs.**	**Mean**	**Std.Dev.**	**Min**	**Max**
year	43	1981	12.557	1960	2002
Co2kt	41	1635066	951884	432881.1	3342733
Co2cap	41	1.558336	0.677	0.573694	2.745459
gdp	43	336	335	43.1	1,210
gdpcap	43	297.2026	253.821	64.68492	944.1224
elec_cons	31	401.3992	224.926	135.75	893.4033
pop	43	986	196	660	1,280
popden	42	106.578	20.539	70.794	137.273

Data Source: Annual data, World Bank Development Report indicators, 2003.

Figure 1: Increasing Trend in China's Population over Time
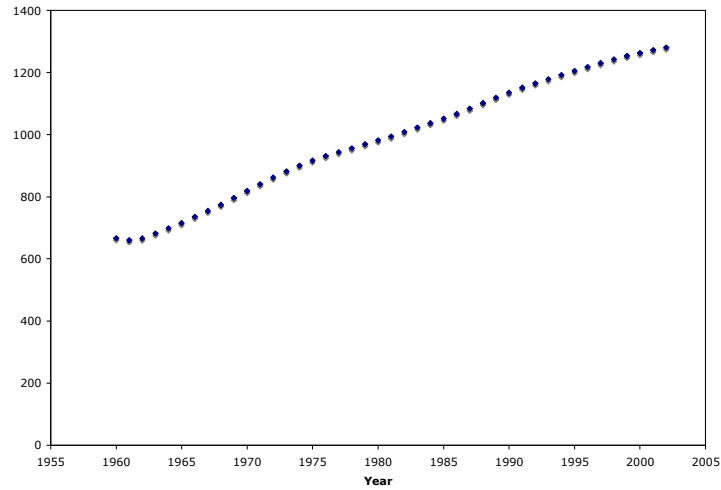
Figure 2: Increasing Trend in China's GDP over Time
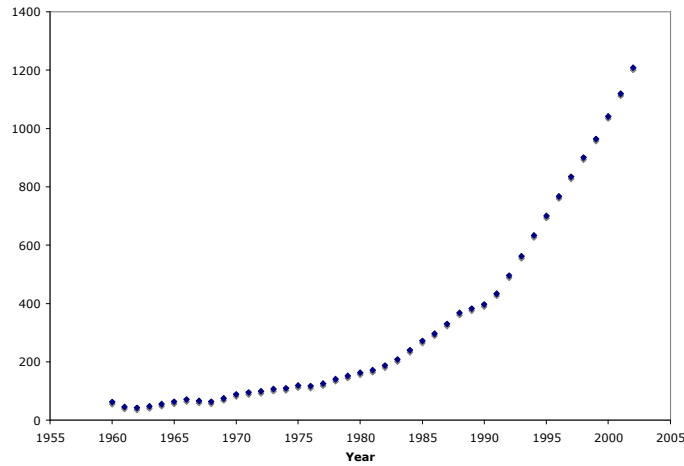
Figure 3: Increasing Trends in China's CO_2 emissions over Time
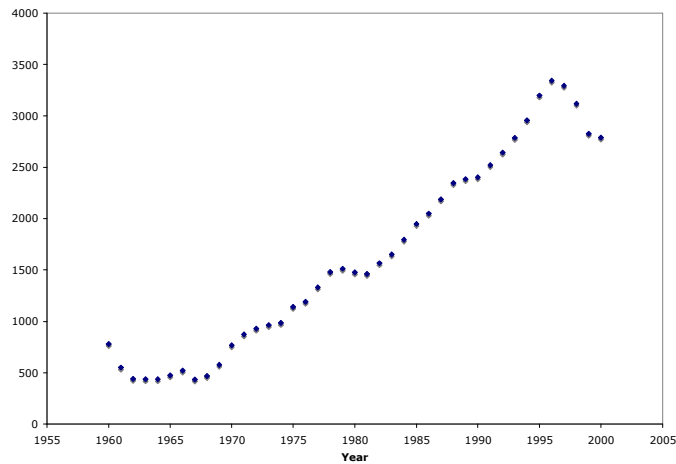
Figure 4: Comparative Trends in China's CO_2 emissions, Population, and GDP over Time
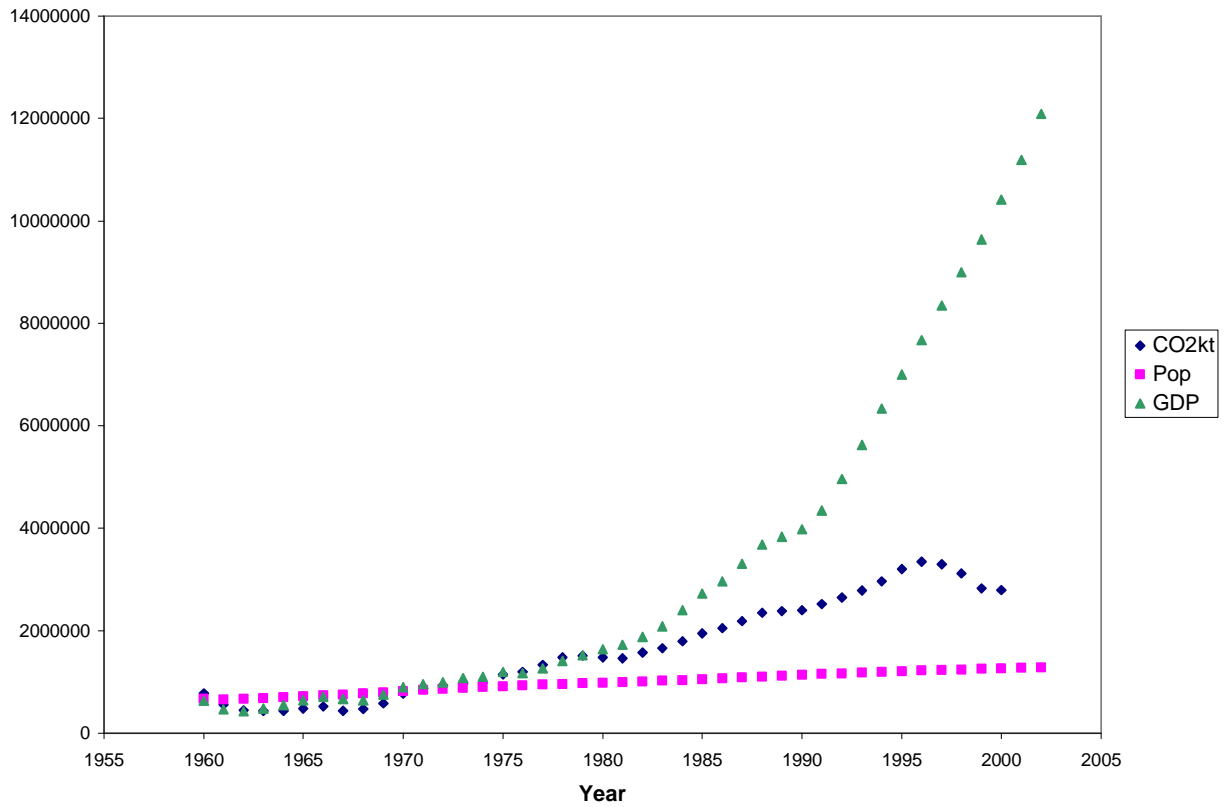
* Population measured in thousands of people
** GDP measured in hundred thousands of dollars
*** CO2kt measured in kilotons

Figure 5: Increasing Trends in China's CO2 emissions given the trends in Population
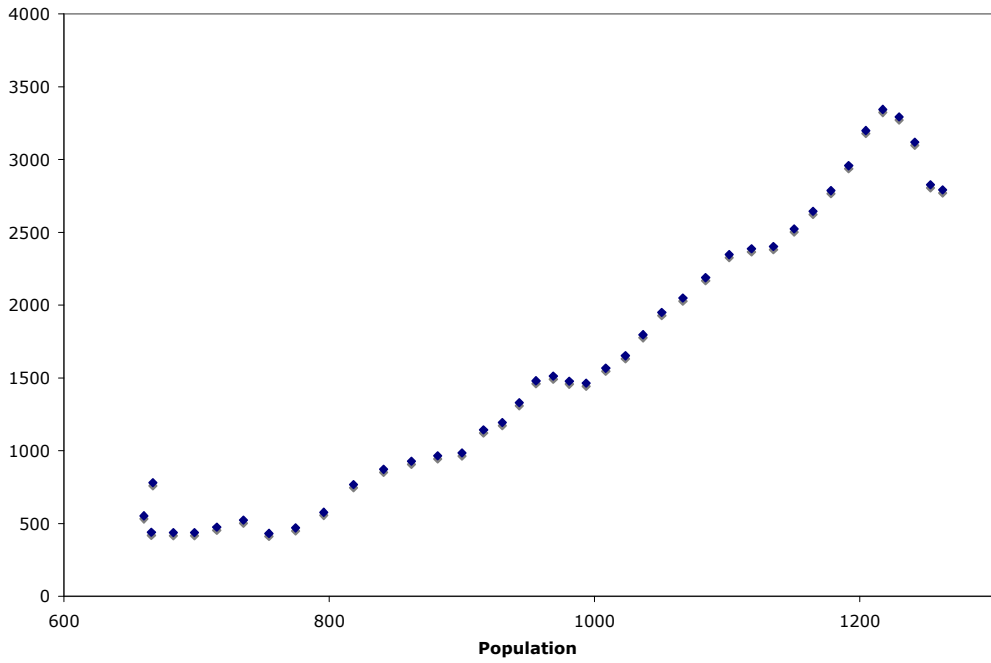
Figure 6: Increasing Trends in China's CO2 emissions given the trends in GDP
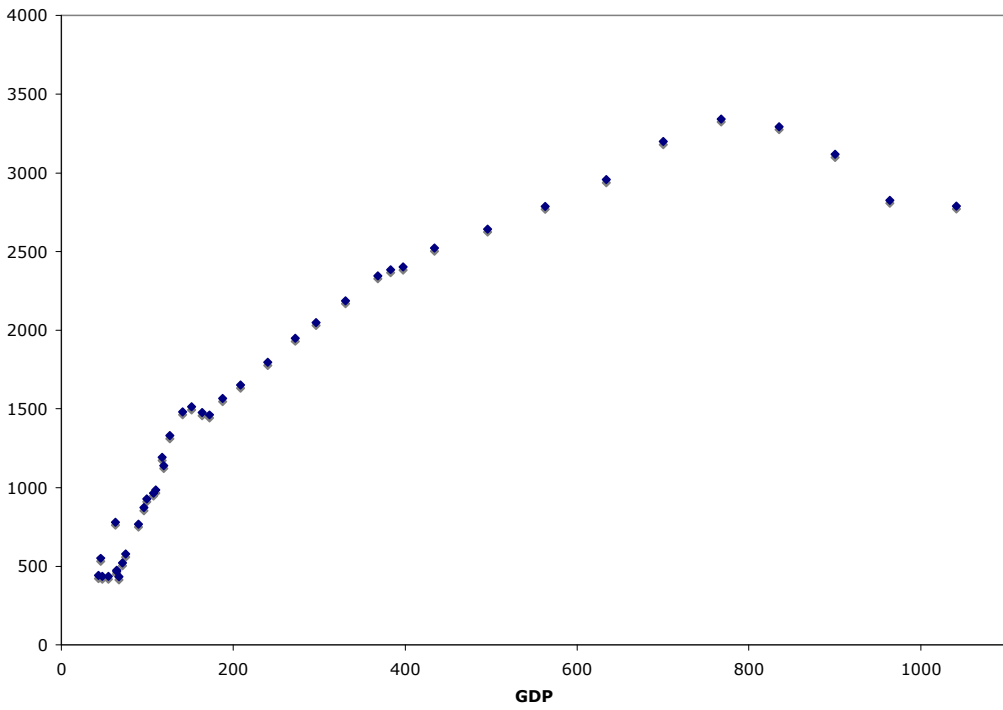
Regression Results

Table 3: OLS Estimation Results for China's CO2 emissions

Dependent Variable: CO2cap		
Independent Variables	Coefficient (1)	Coefficient (2)
Constant	0.836*	0.184*
	(0.083)	(0.062)
GDPcap	0.0027*	0.0083*
	(0.0002)	(0.0004)
GDPcap2		-0.000007
		(0.0000005)
Number of Observations	41	41
R-squared	0.763	0.957
F statistic	125.34	417.33
p-value for F statistic	0	0

Note: Standard deviation in parentheses.

*Coefficient significant at the 1% level

Figure 7: CO2 emissions per capita for China based on the OLS estimates from panel 2, Table 3
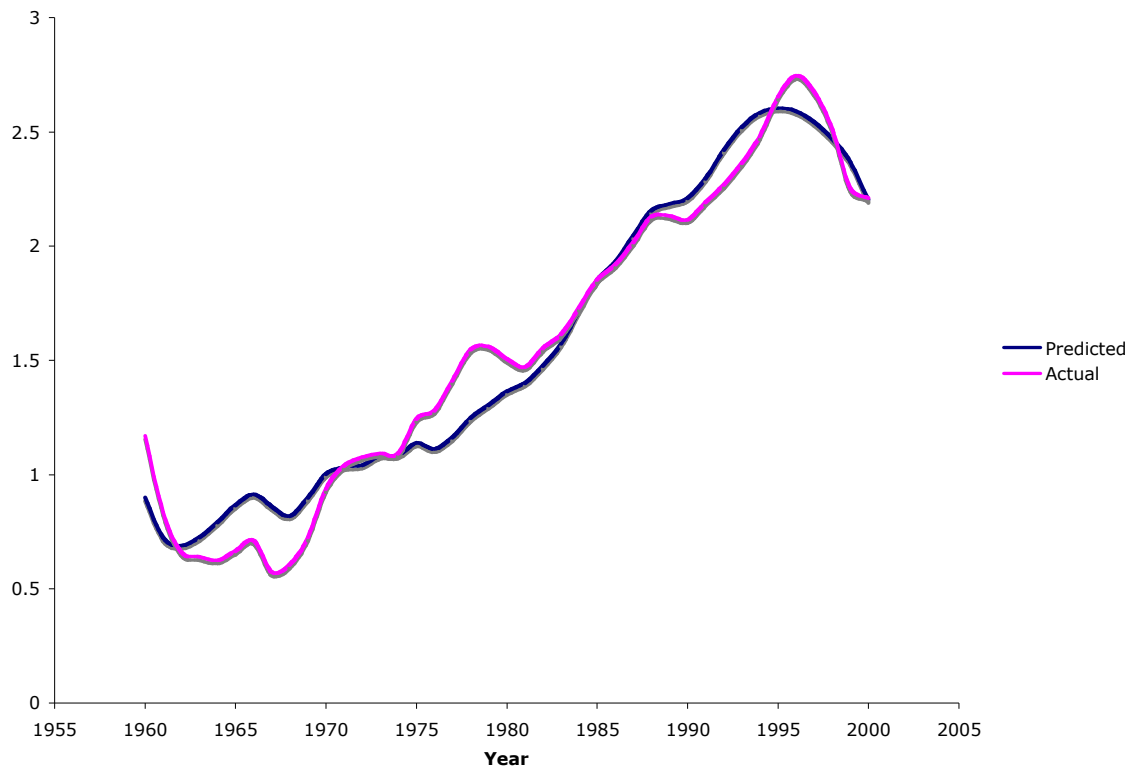
Robustness Checks

Table 4: Alternative OLS Estimation Results for China's CO2 emissions

Dependent Variable: CO2cap		
Independent Variables	Coefficient (1)	Coefficient (2)
Constant	0.987*	0.113
	(0.089)	(0.096)
Elec_cons	0.0023*	0.0073*
	(0.0002)	(0.0005)
Elec_cons2		-0.000005*
		(0.0000005)
Number of Observations	30	30
R-squared	0.816	0.961
F statistic	124.18	335.39
p-value for F statistic	0	0

Note: Standard deviation in parentheses.
      *Coefficient significant at the 1% level

INDIA

Table 5: Summary Statistics for India

Summary Statistics					
Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
year	43	1981	12.55654	1960	2002
co2kt	41	461.556	311.362	120.483	1076.989
co2cap	41	0.594	0.265	0.277	1.079
gdp	43	2.15E+11	1.27E+11	7.84E+10	5.17E+11
gdpcap	43	277.504	92.206	180.385	493.270
elec_cons	31	212.169	97.270	92.306	364.694
pop	43	7.17E+08	1.88E+08	4.35E+08	1.05E+09
popden	42	243.435	62.162	149.493	352.699

Data Source: Annual data, World Bank Development Report indicators, 2003.

Figure 8: Increasing Trend in India's Population over Time
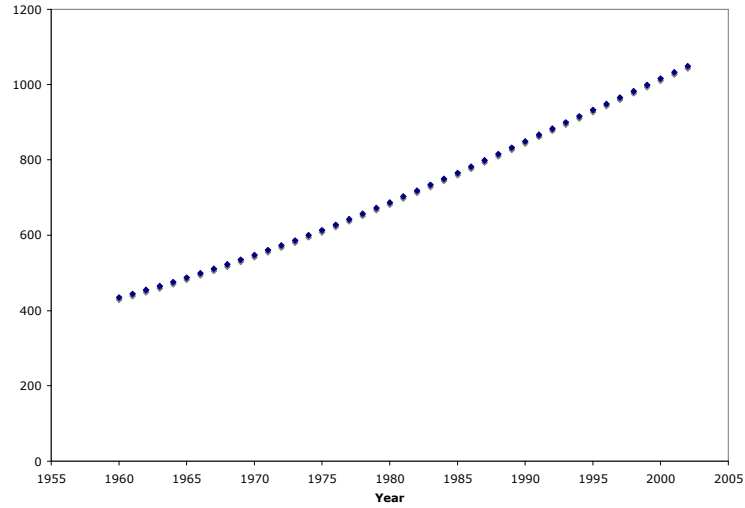
Figure 9: Increasing Trend in India's GDP over Time
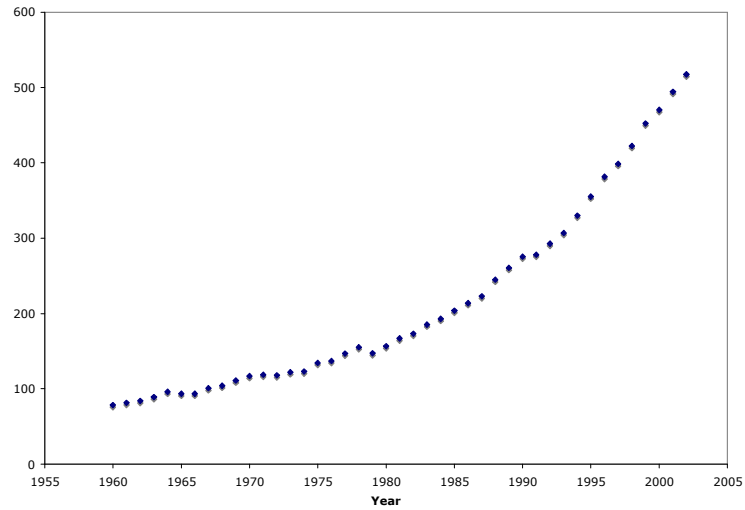
Figure 10: Increasing Trends in India's CO2 emissions over Time
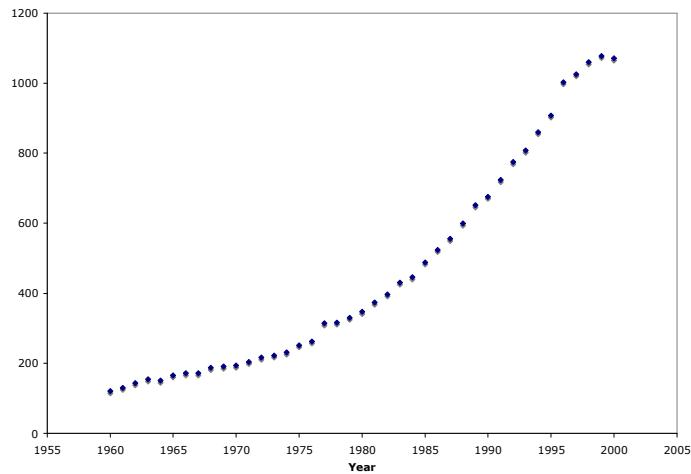
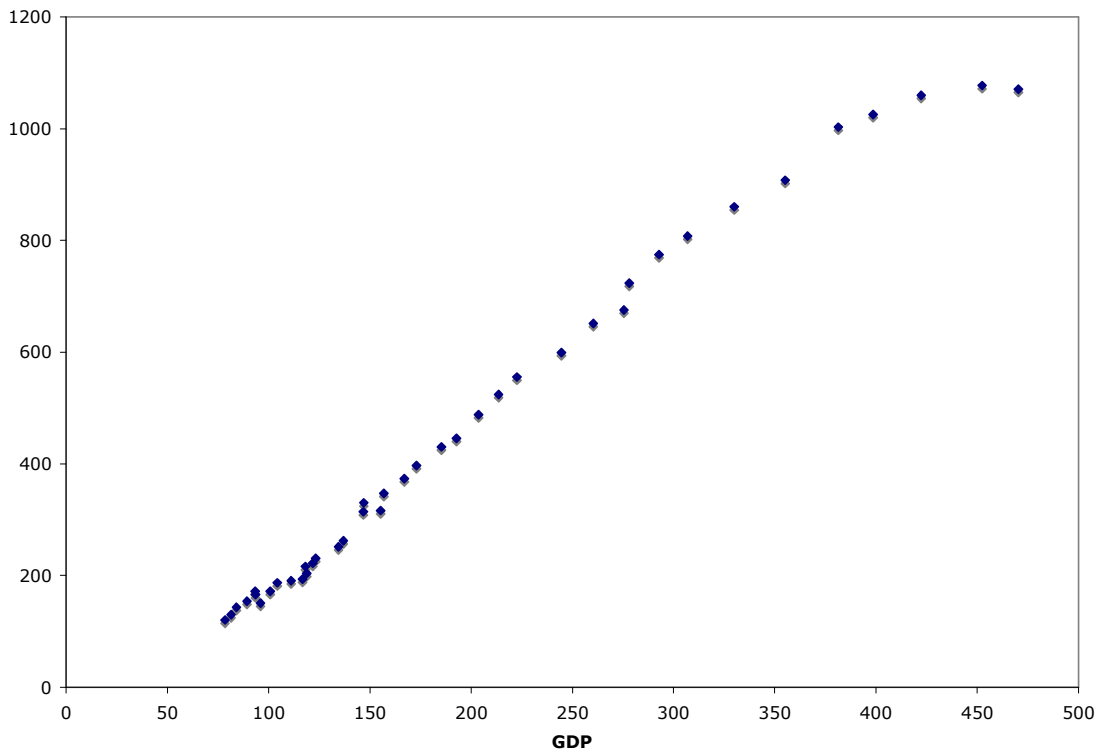**Figure 11: Comparative Trends in India's Population, GDP, and CO2 emissions over Time**
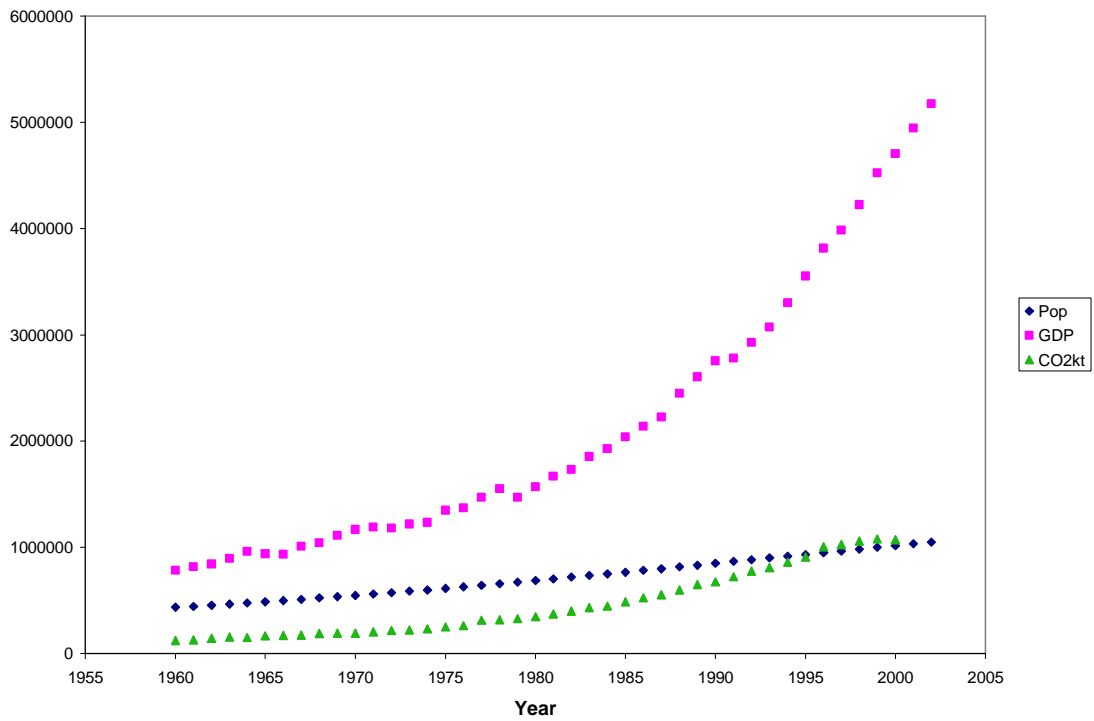
* Population measured in thousands
** GDP measured in hundred thousands of 1995 dollars
*** CO2kt measured in kilotons

Figure 12: Increasing Trend in India's CO2 emissions Given the Trends in Population
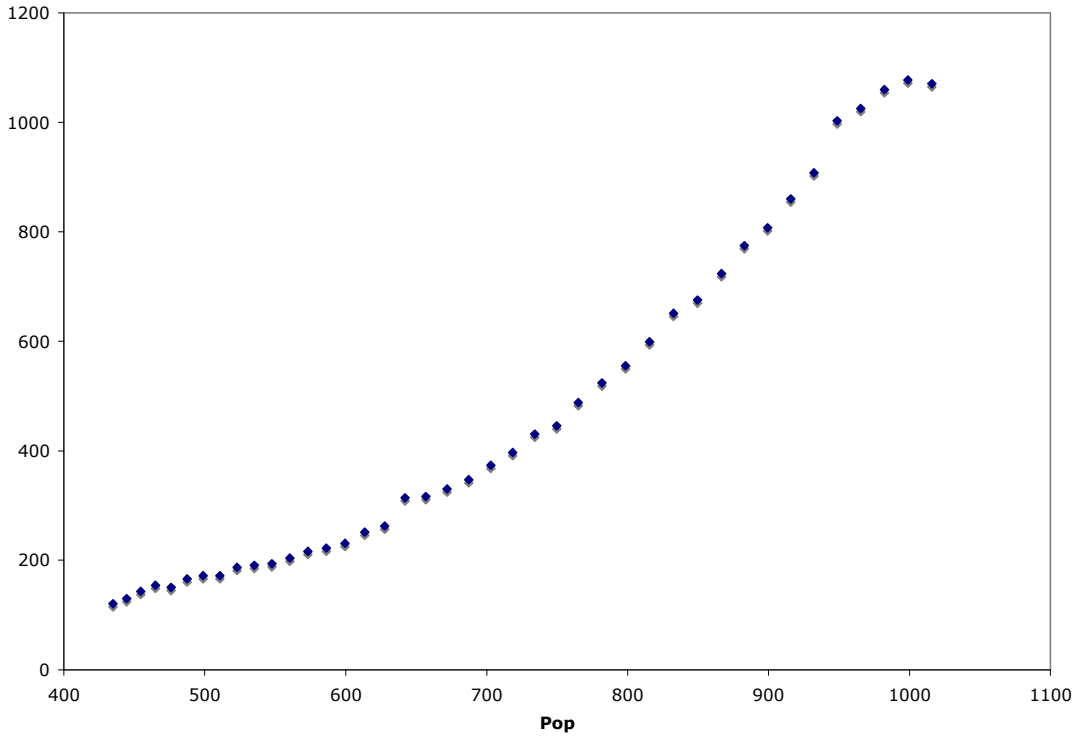
Figure 13: Increasing Trends in India's CO2 emissions and GDP

Regression Results

Table 6: OLS Estimation Results for India's CO2 emissions

Dependent Variable: CO2cap		
Independent Variables	Coefficient (1)	Coefficient (2)
Constant	-0.258*	-0.881*
	(0.028)	(0.065)
GDPcap	0.0032*	0.0076*
	(0.0001)	(0.0005)
GDPcap2		-0.000007*
		(0.0000007)
Number of Observations	41	41
R-squared	0.963	0.990
F statistic	1008.91	1784.89
p-value for F statistic	0	0

Note: Standard deviation in parentheses.

      *Coefficient significant at the 1% level

Figure 14: CO2 emissions per capita estimations for India based on the OLS estimates from panel 2 Table 3
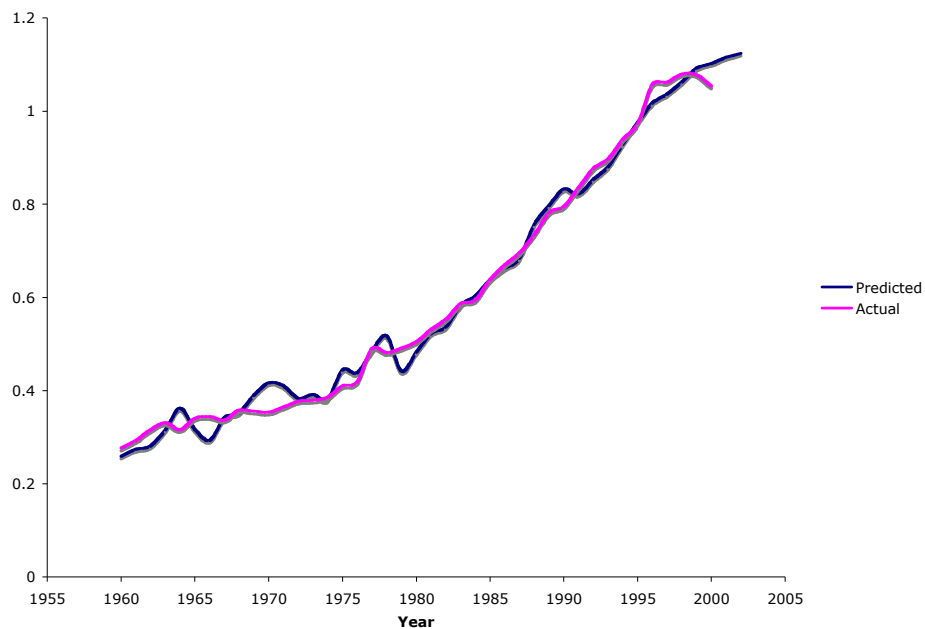
Robustness Checks

Table 6: Alternative OLS Estimation Results for India's CO2 emissions

Dependent Variable: CO2cap		
Independent Variables	Coefficient (1)	Coefficient (2)
Constant	0.1577*	0.0828*
	(0.011)	(0.0289)
Elec_cons	0.0026*	0.0034*
	(0.00005)	(0.0003)
Elec_cons2		-0.000002*
		(0.0000007)
Number of Observations	30	30
R-squared	0.9905	0.9926
F statistic	2915.81	1806.28
p-value for F statistic	0	0

Note: Standard deviation in parentheses.
      *Coefficient significant at the 1% level