GLOBALIZATION:

WHAT IS IT?

Globalization is the context of our times. Almost nowhere in the world can a viable set of economic, political, or educational goals (policies/initiatives) be developed without taking into consideration our new global context of free markets, New Information and Communication Technologies (NICTs), and the political and cultural consequences those dynamics create.

It is not difficult to find dozens of definitions of globalization. Carnoy (1999) argues that globalization is not merely a matter of trade, investment, or national economy, but a "new way of thinking about social space and time" and that this has occurred primarily because the NICTs have redefined distance and time. One particularly useful definition of globalization that emphasizes our interdependencies is given by Blackmore (2000) who describes globalization as "increased economic, cultural, environmental, and social interdependencies and new transnational financial and political formations arising out of the mobility of capital, labor, and information, with both homogenizing and differentiating tendencies". Another similar definition, which puts more emphasis on the economic, is by Gibson-Graham (1996) who defines globalization similarly as "a set of processes by which the world is rapidly being integrated into one economic space via increased international trade, the internationalization of production and financial markets, the internationalization of a commodity culture promoted by an increasingly networked global telecommunication system". In most cases, globalization is considered to be a relatively new phenomenon, though some critics argue that globalization is not new at all and can be traced back to the emergence of universal religions or the flowering of capitalism in the 16th century (see Robertson, 1997; Wallerstein, 1987). In most cases, globalization is considered to be primarily an economic phenomenon, though some critics examine and define globalization from a variety of social and theoretical perspectives, including discourse theory, gender studies, narratology, and multiculturalism (for overview of theoretical approaches, see Kellner, 2000; McCarthy and Dimitrades, 2000; Hoppers, 2000).
Thomas Friedman (2005) usefully describes globalization as having three great eras. **Globalization**, according to Friedman, occurred between 1492 and 1800--when the Old World was expanding markets and acquiring riches primarily by discovering the New World. **Globalization**, according to Friedman, lasted from about 1800 to the year 2000--the era when the world continued to "shrink," when multinational companies increasingly went global for markets and labor, and when technological innovations continued to reduce transportation, communication, and production costs. In about the year 2,000, says Friedman, globalization began. What is particularly special about this most recent stage is the empowerment of the individual made possible, primarily, by NICTs. As a result of NICT, individuals no longer have to live in or travel to America or Europe to participate in educational, cultural, or business relationships.

Since the point of this paper is to consider possibilities of success or failure for cross-border education, the focus here will be on globalization as a recent economic, technological, political and cultural phenomenon of the late 20th and early 21st centuries. In Friedman's terms, we will examine some of the successes and failures of "late" globalization, and try to understand how, during the era of "early" globalization, cross-border education can contribute to sustainable economic development in Latin America and even, perhaps, contribute to a globalization.

But whatever definition one accepts from whatever approach one might take, globalization is, obviously, a multidimensional process with, at the very least, four primary dimensions. Briefly, they are:

**1. The Economic.** This central dimension of globalization refers primarily to the increase in international trade and the success of the free market economy. What is startlingly new, however, is that these recent economic policies have effectively created a world market where workers, consumers, and companies have the potential (whether they know it or not) to enter into economic relationships with other workers, consumers and companies anywhere in the world. This extraordinary capability for global business, educational, and cultural interrelationships is due primarily to recent innovations in NICTs (but also to increasingly lower transportation costs). And these interrelationships have significant political and cultural implications.
2. The Technological. The technological dimension of globalization refers primarily to the advancements of (a) NICTs which have fueled the communication and information revolution of recent years; and (b) new production technologies, which have produced efficiencies in production and created the so-called "post-Fordist" era of manufacturing. The technological dynamic of globalization includes everything from the **internet and mobile phones**, which have done much to create the "interconnectedness" of the world, to **improved logistics systems**, which have enabled industries worldwide to function more efficiently and profitably, to **modern agronomic practices**, which are restoring infertile lands and opening up new opportunities in agriculture.

3. The Political. The political dimension refers primarily to the decline of the sovereign state, which is due in part to the rise of multinational corporations, but also due to globalization's ties with neoliberalism. Neoliberalism--promoted by the Reagan and Thatcher governments of the 1980s--essentially calls for a less interventionist state in both economic and social arenas, and its adherents, who have been in power at the World Bank and International Monetary fund for over twenty years, have proposed and imposed: (a) deregulation and free markets, with less power for the sovereign state to set economic policies, (b) decentralization of government, shifting power from the sovereign to the more local, and (c) reduction of the role of the state by increasing the role of the private sector in most areas of economic and social life.

4. The Cultural. The cultural dimension of globalization appears at first glance to be a schizophrenic one. On the one hand, our increasing global interconnectedness has helped to produce a kind of homogenous mass culture (mostly American and mostly English language). On the other hand, these same dynamics have led to the mixing of many different cultures and societies, helping to produce a new multiculturalism. Strangely, both dynamics seem to be happening at the same time. The cultural dimension of globalization also deals with gender issues, questions of identity, and the social construction of reality, as well as the production and consumption of media. But while the cultural dimension of globalization is certainly a significant one, the focus here, since we are concerned primarily with sustainable development, will be more on the economic, technological and political.

Transnational Corporation:
A transnational, or multinational, corporation has its headquarters in one country and operates wholly or partially owned subsidiaries in one or more other countries. The subsidiaries report to the central headquarters. The growth in the number and size of transnational corporations since the 1950s

- Company, operating in various countries through subsidiaries that may be legally independent, tends to maximize their profits, or to meet any other objective proposed - under a global perspective of group, and not on each of their isolated legal units.

- The local neglects to expand in the world with quality and good prices. The borders have no importance.

- Management, finance, pricing, advertising, marketing and strategic brand planning, are made with global sense, in the parent company.

- Manufacturing seeking countries that will provide assurances on manufacturing quality and price.

- Transnational corporations control a very important part of the global technology and transferred to those countries where installed its production plants. They have important departments of research, development and innovation.
**Concept of transnational corporation**

Referred to as transnational corporation to that company of great dimensions, dedicated to the production of goods or services, which owns subsidiaries in other countries other than the originating (parent) and thereby they manage to expand its influence and economic gravitation at the global level, by controlling not only good part of the economy and international trade, but also technology and development gaining enormous importance in the globalized, capitalist world. With 10% of the share capital of the parent company is already set to a foreign subsidiary company is considered multinational or transnational. While subsidiaries comply with the laws of the countries where are established, they do so by direct investment entity mother (who is generally conformed with capitals of different national origins). While each subsidiary cannot be a legally independent entity, and adapt to local standards, it always is in view to achieve common to the entire group benefits, and a basically similar policy as they are secondary or subsidiary entities of the central House, for example Banco Santander. In general, are used as synonyms, multinational and transnational company (some considered to be transnational where capital belongs to people of different nationalities), whereas the supranational, especially dedicated to delivering services, based on common standards, above the local rights, for example, the International Association of air transport (AITA).

Multinational or transnational companies thus become real factors of economic power, accumulating capital, bringing progress to areas where are installed, but often ruin local businesses and industries, and although they provide sources of employment, in general are precarious.
From the Origins to the Second World War

The earliest historical origins of transnational corporations can be traced to the major colonizing and imperialist ventures from Western Europe, notably England and Holland, which began in the 16th century and proceeded for the next several hundred years. During this period, firms such as the British East India Trading Company were formed to promote the trading activities or territorial acquisitions of their home countries in the Far East, Africa, and the Americas.

The transnational corporation as it is known today, however, did not really appear until the 19th century, with the advent of industrial capitalism and its consequences: the development of the factory system; larger, more capital intensive manufacturing processes; better storage techniques; and faster means of transportation.

During the 19th and early 20th centuries, the search for resources including minerals, petroleum, and foodstuffs as well as pressure to protect or increase markets drove transnational expansion by companies almost exclusively from the United States and a handful of Western European nations. Sixty per cent of these corporations' investments went to Latin America, Asia, Africa, and the Middle East. Fuelled by numerous mergers and acquisitions, monopolistic and oligopolistic concentration of large transnationals in major sectors such as petrochemicals and food also had its roots in these years. The US agribusiness giant United Fruit Company, for example, controlled 90 per cent of US banana imports by 1899, while at the start of the First World War, Royal Dutch/Shell accounted for 20 per cent of Russia's total oil production.

Demand for natural resources continued to provide an impetus for European and US corporate ventures between the First and Second World Wars. Although corporate investments from Europe declined somewhat, the activities of US TNCs expanded vigorously. In Japan, this period witnessed the growth of the zaibatsu (or "financial clique") including Mitsui and Mitsubishi. These giant corporations,
which worked in alliance with the Japanese state, had oligopolistic control of the country's industrial, financial, and trade sectors.

1945 to the Present

US TNCs heavily dominated foreign investment activity in the two decades after the Second World War, when European and Japanese corporations began to play ever greater roles. In the 1950s, banks in the US, Europe, and Japan started to invest vast sums of money in industrial stocks, encouraging corporate mergers and furthering capital concentration. Major technological advances in shipping, transport (especially by air), computerisation, and communications accelerated TNCs' increasing internationalisation of investment and trade, while new advertising capabilities helped TNCs expand market shares. All these trends meant that by the 1970s oligopolistic consolidation and TNCs' role in global commerce was of a far different scale than earlier in the century. Whereas in 1906 there were two or three leading firms with assets of US$500 million, in 1971 there were 333 such corporations, one-third of which had assets of US$1 billion or more. Additionally, TNCs had come to control 70-80 per cent of world trade outside the centrally planned economies.8

Over the past quarter century, there has been a virtual proliferation of transnational’s. In 1970, there were some 7,000 parent TNCs, while today that number has jumped to 38,000. 90 percent of them are based in the industrialized world, which control over 207,000 foreign subsidiaries. Since the early 1990s, these subsidiaries' global sales have surpassed worldwide trade exports as the principal vehicle to deliver goods and services to foreign markets.

The large number of TNCs can be somewhat misleading, however, because the wealth of transnational’s is concentrated among the top 100 firms which in 1992 had US$3.4 trillion in global assets, of which approximately US$1.3 trillion was held outside their home countries. The top 100 TNCs also account for about one-third of the combined
outward foreign direct investment (FDI) of their countries of origin. Since the mid-1980s, a large rise of TNC-led foreign direct investment has occurred. Between 1988 and 1993, worldwide FDI stock -- a measure of the productive capacity of TNCs outside their home countries -- grew from US$1.1 to US$2.1 trillion in estimated book value.

There has also been a great increase in TNC investment in the less-industrialized world since the mid-1980s; such investment, along with private bank loans, has grown far more dramatically than national development aid or multilateral bank lending. Burdened by debt, low commodity prices, structural adjustment, and unemployment, governments throughout the less-industrialised world today view TNCs, in the words of the British magazine The Economist, as "the embodiment of modernity and the prospect of wealth: full of technology, rich in capital, replete with skilled jobs." As a result, The Economist notes further, these governments have been "queuing up to attract multinationals" and liberalising investment restrictions as well as privatising public sector industries. For TNCs, less-industrialised countries offer not just the potential for market expansion but also lower wages and fewer health and environmental regulations than in the North.

Thus, in 1992 foreign investment into less-industrialised nations was over US$50 billion; the figure had jumped to US$71 billion in 1993 and US$80 billion in 1994. In 1992-93, less-industrialised countries accounted for between one-third and two-fifths of global FDI inflows -- more than at any time since 1970. These flows have not been evenly distributed, however, with just ten host recipients_the majority in Asia_accounting for up to 80 percent of all FDI to the less-industrialised world.

Transnational Corporation in India
A transnational corporation differs from a traditional multinational corporation in that it does not identify itself with one national home. While traditional multinational corporations are national companies with foreign subsidiaries, transnational corporations spread out their operations in many countries to sustain high levels of local responsiveness.

An example of a transnational corporation is Nestlé who employ senior executives from many countries and tries to make decisions from a global perspective rather than from one centralized headquarters.

Another example is Royal Dutch Shell, whose headquarters are in The Hague, Netherlands, but whose registered office and main executive body are headquartered in London, United Kingdom.

Problems Arising from TNCs

Intra-Company Trade and Manipulative Price Transfers

The post-Second World War period witnessed not merely a rise in TNCs' control of world trade, but also growth of trade within related enterprises of a given corporation, or "intra-company" trade. While intra-company trade in natural resource products has been a feature of TNCs since before 1914, such trade in intermediate products and services is mainly a phenomenon of recent decades. By the 1960s, an estimated one-third of world trade was intra-company in nature, a proportion which has remained steady to the present day. The absolute level and value of intra-company trade has increased considerably since that time, however. Moreover, 80 per cent of international payments for technology royalties and fees are made on an intra-company basis.

Problems stemming from intra-company trade concern TNCs' ability to maximise profits by avoiding both market mechanisms and national laws with an instrument of internal costing and accounting known as "transfer pricing." This is a widespread technique whereby TNCs set prices for transfers of goods, services, technology, and loans
between their worldwide affiliates which differ considerably from the prices which unrelated firms would have had to pay.

There are many benefits TNCs derive from transfer pricing. By lowering prices in countries where tax rates are high and raising them in countries with a lower tax rate, for example, TNCs can reduce their overall tax burden, thus boosting their overall profits. Virtually all intra-company relations including advisory services, insurance, and general management can be categorised as transactions and given a price; charges can as well be made for brand names, head office overheads, and research and development. Through their accounting systems TNCs can transfer these prices among their affiliates, shifting funds around the world to avoid taxation. Governments, which have no way to control TNCs' transfer pricing, are therefore under pressure to lower taxes as a means of attracting investment or keeping a company's operation in their country. Tax revenue which might be used for social programs or other domestic needs is thus lost.

Moreover, in countries where there are government controls preventing companies from setting product retail prices above a certain percentage of prices of imported goods or the cost of production, the firms can inflate import costs from their subsidiaries and then impose higher retail prices. Additionally, TNCs can use overpriced imports or underpriced exports to circumvent governmental ceilings on profit repatriation, causing nation-states to suffer large foreign exchange losses. For instance, if a parent company has a profitable subsidiary in a country where the parent does not wish to re-invest the profits, it can remit them by overpricing imports into that country. During the 1970s, investigations found that average overpricing by parent firms on imports by their Latin American subsidiaries in the pharmaceutical industry was 155 per cent, while imports of dyestuffs raw materials by Indian TNC affiliates were being overpriced between 124 and 147 percent.
Influence in Nations' Political Affairs

TNCs' influence over countries, particularly those in the less-industrialised world, has not been manifest solely in sheer economic power or manipulative price transfers. Such influence has also been reflected in corporations' willingness and ability to exert leverage directly by employing government officials, participating on important national economic policy making committees, making financial contributions to political parties, and bribery. Furthermore, TNCs actively enlist the help of Northern governments to further or protect their interests in less-industrialised nations, assistance which has sometimes has involved military force. In 1954, for instance, the US launched an invasion of Guatemala to prevent the Guatemalan government from taking (with compensation plus interest) unused land of United Fruit Company for redistribution to peasants.

Perhaps the most notorious example of TNCs' meddling in the political affairs of a sovereign state, however, occurred in the early 1970s, when International Telephone and Telegraph (ITT) offered the US Central Intelligence Agency US$1 million to finance a campaign to defeat the candidacy of Salvador Allende in Chilean national elections. Though this offer was refused, and Allende democratically elected, ITT continued to lobby the US government and other US corporations to promote opposition to Allende through economic pressure including the cutoff of credit and aid and support of Allende's political rivals. After copper mines in Chile owned by the firms Kennecott and Anaconda were nationalised, the US government took a series of steps based largely on the recommendations of ITT to subvert Allende.

Disclosure of ITT's efforts to overthrow Allende helped prompt initiatives in the United Nations to draft a TNC Code of Conduct to establish some guidelines for corporate behaviour. This move was part of more general concern about the extent of corporations' economic and political influence which emerged in the 1960s and 1970s, and which led some less-industrialised countries to demand that TNCs divest from certain sectors or to require changes in the terms of a company's investment. Yet such developments have been minor and temporary obstacles to the augmentation of TNCs'
economic power, and overall the past three decades have been characterised by increased regional economic integration, the liberalisation of many international markets, and the opening up of new areas such as Central and Eastern Europe.

TNCs and International Politics

Especially since the 1980s, TNCs' involvement at international political negotiations and fora has accompanied and encouraged the rise of global corporate economic power. In an effort to reduce barriers to trade and investment capital flows in the last decade, TNCs have lobbied vigorously to shape to their liking Europe's Single Market agreement, the North American Free Trade Agreement (NAFTA), and the Uruguay Round of the General Agreement on Tariffs and Trade (GATT). For TNCs, so-called free trade lessens governmental restrictions on their movement and ability to maximise returns. "The deregulation of trade aims to erase national boundaries insofar as these affect economic life," economists Herman Daly and Robert Goodland have noted. "The policy-making strength of the nation is thereby weakened, and the relative power of TNCs is increased."

For example, rules established in the GATT's recently concluded Uruguay Round regarding trade-related intellectual property rights (TRIPs) and trade-related investment measures (TRIMs) will be of particular benefit to TNCs. The first gives corporations greater capacity to privatise and patent life forms, including plant and other genetic resources of less-industrialised nations and peoples. TRIMs render illegal certain measures which countries_ notably Southern nations_ have employed to encourage TNCs to establish linkages with domestic firms. TRIPs, TRIMs, and other GATT rules fall under the authority of the World Trade Organisation (WTO), a new supranational body which works with the World Bank and other financial institutions to manage global economic policy to serve transnational corporate interests.

In another demonstration of transnationals' growing political might, and perhaps the most striking example to date of organised
corporate lobbying on the world stage, TNCs' efforts at the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro undermined sections of the Summit's key documents. And well before the Summit took place, TNC pressure had led to the removal from UNCED materials proposals to regulate the practices of global corporations.

This success in Rio underscores a broader issue: although TNCs are collectively the world's most powerful economic force, no intergovernmental organisation is charged with regulating their behaviour. United Nations efforts to monitor and to some extent address TNCs' impacts, notably through the UN's Centre on Transnational Corporations (CTC), have recently been decimated. Under a 1992 restructuring, the CTC lost its independent status, and in 1993 it was dismantled and a 17-year attempt to negotiate the aforementioned Code of Conduct on TNCs was abandoned. A new Division on Transnational Corporations and Investment emerged with the aim of promoting foreign direct investment.

**TNCs, Human Health, and the Environment**

The unwillingness or inability of national governments to control TNCs in a period of deregulated global trade and investment does not bode well for people's health or the environment. TNC operations routinely expose workers and communities to an array of health and safety and ecological dangers. All too often these operations erupt into disasters such as the gas release at the Indian subsidiary of the US-based corporation Union Carbide in Bhopal.

To regard such tragedies only as "accidents," however, distracts attention from the larger, inherent harm to the planet and its inhabitants TNCs' industrial development strategies cause. For example, TNC activities generate more than half of the greenhouse gases emitted by the industrial sectors with the greatest impact on global warming. TNCs control 50 percent of all oil extraction and refining, and a similar proportion of the extraction, refining, and marketing of gas and coal. Additionally, TNCs have virtually exclusive
control of the production and use of ozone-destroying chlorofluorocarbons (CFCs) and related compounds.

In destructive minerals extraction, TNCs still dominate key industries. In aluminum, for example, just six companies account for 63 per cent of the mine capacity, 66 per cent of the refining capacity, and 54 per cent of the smelting capacity. Four TNCs account for half the world's tin smelting capacity. With respect to their influence on global agriculture, TNCs control 80 per cent of land worldwide which is cultivated for export-oriented crops, often displacing local food crop production. Twenty TNCs account for about 90 per cent of the sales of hazardous pesticides. Additionally, because TNCs control much of the world's genetic seed stocks as well as finance the bulk of biotechnology research worldwide, they are poised to reap large financial rewards from patenting life forms.

TNCs also manufacture most of the world's chlorine—the basis for some of the most toxic, persistent, and bioaccumulative synthetic chemicals known such as PCBs, DDT, dioxins and furans, chlorinated solvents, and thousands of other organ chlorine compounds. These chemicals' impacts on health include: immune suppression; birth defects; cancer; reproductive, developmental, and neurological harm; and damage to the liver and other organs. As a group, TNCs lead in the export and import of products and technologies that have been controlled or banned in some countries for health and safety reasons. For instance, 25 per cent of total pesticide exports by TNCs from the US in the late 1980s were chemicals that were banned, unregistered, canceled, or withdrawn in the US itself. And a handful of Northern companies are responsible for the nuclear technology now found at plants in South America and Asia.

TNCs and their business associations claim that deregulated trade and investment will produce enough growth to end poverty and generate resources for environmental protection. The unrestricted free trade and investment-based growth beloved by TNCs, however, is the same kind of development which has led to overexploitation of land and natural resources, air, water, and soil pollution, ozone depletion, global warming, and toxic waste generation. As
economists Herman Daly and Robert Goodland observe: "The dream that growth will raise world wages to the current rich country level, and that all can consume resources at the U.S. per capita rate, is in total conflict with ecological limits that are already stressed beyond sustainability."

**TNCs and Occupational Safety**

There have been many instances of TNCs failing to control industrial hazards at their facilities in less-industrialised nations as thoroughly as in their home countries. The situation in Bhopal, where comparison of operations of Union Carbide's Indian subsidiary and a similar plant in the US has revealed many double standards, is only the most infamous example of what the Industrial Labour Organisation acknowledges is a prevailing trend: "In comparing the health and safety performance of home-based [TNCs] with that of the subsidiaries, it could generally be said that the home country operations were better than those of subsidiaries in the developing countries."

The case of the German TNC Bayer's chromate production factory in South Africa is illustrative. Chromate is a corrosive compound which can cause respiratory illness including lung cancer. Bayer has owned the facility, Chrome Chemicals, since 1968. In 1976, a South African government report noted health problems in nearly half the plant's employees which were related to their work and which, it said, "are extremely disturbing and would appear to indicate a lack of concern regarding the physical welfare of the workers."

In 1990, a trade union learned that several workers had developed lung cancer, although none had been informed that the disease might be related to their employment. Chrome Chemicals management refused the union's request to review the plant's industrial hygiene records, and in 1991 the firm shut down much of its operation and laid off most of its workers. In South Africa, lung cancer was not added to the list of compensable occupational diseases until 1994, and Bayer has so far refused to provide compensation to a growing number of former employees at Chrome Chemicals who have developed lung cancer. Bayer could not get
away with this in Germany, where as early as 1936 lung cancer was considered a compensable occupational disease for chromate workers. Indeed, German compensation authorities consider any labourer with more than three months of chromate work eligible for compensation if lung cancer develops subsequently.

**TNCs and Employment**

In an era of declining constraints on their mobility and the attraction of cheaper wages in less-industrialised nations eager to draw foreign investment, TNCs are eliminating jobs in their home countries and shifting production abroad. Although overall TNCs’ employment in their home countries has changed little in the last decade, among the 300 largest corporations employment in 1989 was lower than it had been in 1980. US-based TNCs have eliminated jobs especially vigorously. Between 1982 and 1993, for example, US TNCs cut over three-quarters of a million jobs at home but added 345,000 jobs outside the United States. For workers in the US and other industrialised countries, TNCs' increased willingness to move operations to lower wage areas along with their greater use of automation, subcontractors, and part-time labour have rendered the strike relatively ineffective and undermined trade unions' collective bargaining power. In the US, there were one-tenth the number of strikes in 1993 as in 1970, and only 12 per cent of the US workforce is currently unionized, a lower proportion than in 1936.

In less-industrialised regions, the lure for TNCs of fewer costs and regulations offers little promise to workers of decent working conditions, sufficient pay, or job security. Tax breaks and subsidies governments use as incentives are no guarantee that the TNCs will not move on after the benefits have expired, and as cost advantages now found in Singapore appear in, say, Bangladesh, the countries currently experiencing an influx of investment may eventually find themselves in the same position as that of the US and other industrialised nations today.

More fundamentally, as Richard Barnet has emphasised, the transnational corporate order cannot begin to solve the chronically
severe unemployment problems in Asia, Latin America, and Africa, where an estimated 38 million new job seekers enter the labor market annually. A comparison of the growth in TNCs' outward foreign investment stock worldwide and their estimated global direct employment in recent decades lays this fact bare. Between 1975 and 1992, outward FDI stock increased almost seven times, whereas TNCs' employment did not even double. In less-industrialised countries, TNCs added only five million employees between 1985 and 1992.

**Future population and human capital in heterogeneous India**

Abstract
Within the next decade India is expected to surpass China as the world’s most populous country due to still higher fertility and a younger population. Around 2025 each country will be home to around 1.5 billion people. India is demographically very heterogeneous with some rural illiterate populations still having more than four children on average while educated urban women have fewer than 1.5 children and with great differences between states. We show that the population outlook greatly depends on the degree to which this heterogeneity is explicitly incorporated into the population projection model used. The conventional projection model, considering only the age and sex structures of the population at the national level, results in a lower projected population than the same model applied at the level of states because over time the high-fertility states gain more weight, thus applying the higher rates to more people. The opposite outcome results from an explicit consideration of education differentials because over time the proportion of more educated women with lower fertility increases, thus leading to lower predicted growth than in the conventional model. To comprehensively address this issue, we develop a five-dimensional model of India’s population by state, rural/urban place of residence, age, sex, and level of education and show the impacts of different degrees of aggregation. We also provide human capital scenarios for all Indian states that suggest that India will rapidly catch up with other more developed countries in
Asia if the recent pace of education expansion is maintained. Link: https://doi.org/10.1073/pnas.1722359115 (CC BY-NC-ND 4.0)

India's total population 1970-2070 by level of education (23).

Age and education pyramids for India (national level) for 1970 and 2015 (23).
was around 370 million and Indian women on average had six children. The age structure was very young, and over 80% of the population was illiterate (1). As a consequence, the population grew very rapidly, raising early concerns about the sufficiency of food supply and development prospects in general. Given these fears, in the late 1960s the Ford Foundation commissioned the “Second India” study to understand how India would fare under an expected doubling of its population (hence the name of the study) (2). In 1965 India’s population was 500 million, and shortly before 2000 it reached the 1 billion mark. Revisiting the Second India around that time, Cassen found a rather mixed record. Some issues such as food production turned out to be better than feared, while others such as lack of education and poverty were worse than hoped (2). Both authors pointed at the great heterogeneity of the subcontinent, illustrated by the fertility rates in the early 1990s, which had already declined to 1.8 children per woman in Kerala but still stood at 5.1
in Uttar Pradesh (3).
The great heterogeneity of the Indian population is also the main focus of this paper. We will show how different ways of explicitly addressing heterogeneity in our demographic models will produce different outlooks for India’s future population, human capital, and thus development. Fig. 1 shows the evolution of one century of India’s population by level of education as observed since 1970 and forecast under a model described in this paper. It shows that in the 1970s still far more than half of the entire adult population had never received any formal education and that this unfavorable situation has changed only very slowly. Still, by 1990, half of the adult population had never been to school. Educational attainment of women has been much worse than that of men. Fig. 2 shows the age and education pyramids for 1970 and 2015. It shows that in 1970 about three quarters of Indian adult women had never been to school. Only a very tiny elite had the privilege of education. Among the younger cohorts, the proportion with at least primary education starts to slowly increase. For males, education levels are remarkably higher with only fewer than half of all adult men never having been to school. Because of higher fertility levels—during the 1960s Indian women had on average almost six children—the population age structure in 1970 was still extremely young. This very young age structure, together with only slow declines in birth rates, resulted in an increase of India’s population from 554 million in 1970 to 1.3 billion in 2015. Today the younger cohorts are significantly better educated, but the legacy of low levels of female education is still visible in the low educational attainment of older cohorts, particularly of women. In association with the improving education of younger women, national-level fertility rates have also declined to 2.2, which is just around a third of their levels in the 1960s. In this paper we will address the likely future population trends of India while systematically accounting for India’s great population heterogeneity. Earlier projections of India that tried to go beyond conventional aggregate projections by age and sex |
revealed an interesting phenomenon, namely that projections turn out to be significantly higher or lower depending on what additional sources of heterogeneity are taken into account. One study (4) showed that, if the projection is carried out at the level of India’s 35 states, then the sum of state projections turns out to be significantly higher due to the fact that the high-fertility states over time receive more weight, and thus the higher fertility rates are applied to relatively more women. In contrast, projections that differentiated by level of educational attainment (at the national level) (5) resulted in lower forecasts because over time the younger, more educated cohorts of women entered the main reproductive ages, and since higher education is associated with lower fertility, this led to lower overall fertility. These seemingly contradictory results, which depend on which source of evident population heterogeneity is included in the model, lead to the more general methodological debate in population forecasting and even more broadly for all social and economic forecasting models. What is the most appropriate way to account for the observable heterogeneity of agents in forecasts? While unobservable population heterogeneity also matters (6), the options to account for it are limited, a fact that suggests caution when interpreting results. Observed population heterogeneity, on the other hand, could readily be incorporated into multidimensional models, but there has been an interesting debate about whether this should always be done, most prominently in a set of papers in 1995 on the question of whether simple models outperform complex ones (7). This discussion focused primarily on the question of whether forecasting total population size directly by applying assumed growth rates has given more accurate projections than the more complex cohort-component methods projecting individual age cohorts. In this context, Long (8) stresses that one needs to distinguish between two different questions: (i) whether one is only interested in the
difference it makes for total population size forecasts and (ii) whether the additional dimension considered is of interest in its own right. We will add to this methodological discussion through an ex ante analysis of the sensitivity of Indian population forecasts to different sources of heterogeneity in the context of a multidimensional model, which, in addition to the conventional age and sex structure, also explicitly differentiates by level of educational attainment, urban/rural place of residence, and state of residence with differential fertility and mortality rates.

India is a subcontinent that includes many population groups differing by language, ethnicity, religion, and caste (3). While some of this heterogeneity is stratified spatially and can be captured by differentiating between states and urban and rural areas, other factors (such as caste) exist in almost every location. Since statistical information tends to be collected along administrative boundaries, regional differentiation can be captured more easily from official aggregate statistical sources. Some of the other sources of heterogeneity can be derived only from individual-level data or more detailed cross-tabulations of census data. As has been argued earlier (9) and recently by Lutz and KC (10), the level of educational attainment and urban/rural place of residence are the two most important demographic dimensions of population heterogeneity after age and sex that cover relevant sociodemographic differentiations and should be used when measuring and modeling population dynamics. Following this approach, this study uses data that differentiate the populations of each of the 35 Indian states by all four dimensions (age, sex, level of education, and urban/rural place of residence).

The data used in this study come from detailed tabulations of the two most recent Indian censuses that were conducted in 2001 and 2011. These census tabulations were complemented with respect to vital rates by tabulations from the Sample Registration Survey (SRS) with annual information for the years 1999–2013. This allows us not only to study cross-sectional information, but also to analyze the trends over time since 1999. A more detailed specification of the data sources is given in SI Appendix.

Since fertility levels are the most important source of differ-
ential population growth, we studied the regional demographic

heterogeneity first through the lens of fertility. The map of India’s 35 states and union territories according to their fertility levels in 2010–2013 (Fig. 3) shows a distinct pattern of North–South differences with some interesting exceptions. Fertility is highest in the big states of the northwestern India—above three children per woman in Bihar, Uttar Pradesh, and Madhya Pradesh, with Rajasthan and Jharkhand being very close to that level. On the other end of the spectrum are eight small states and union territories with fertility levels of less than 1.6. But even the big southern states of Andhra Pradesh, Kerala, and Tamil Nadu are well below 2.0. As will be discussed below, these differences to a large extent can be explained by different levels of social and economic development, but there remain some relevant cultural differences as well. Odisha is an example where, despite a low level in terms of social and economic development, fertility level has been relatively low due to extensive family planning drives in some parts of India (3, 11).

Next, we look at the further stratification of fertility levels by maternal education and urban/rural place of residence (Fig. 4). Here we see a very consistent, almost linear, decline of fertility by levels of education with only a slight reversal for the very highest group. For rural fertility at the national level, total fertility rate (TFR) is 3.2 for illiterate women, declines to 2.6 for those with completed primary education, and bottoms at 1.7 for those with completed secondary education. For urban women, the slope of the gradient is about the same, but the level of the line is about half a child lower, starting at 2.6 for illiterate women to 1.3 for women with completed secondary education. While the line gives the national average, there clearly is some variation around these averages at the state level. The variation can be explained in terms of social, economic, and cultural differences as well as varying levels of success in family-planning drives among the poor and less ed-
ucated population at the state level (3, 11). In addition, the education distribution within each education category could also be a reason for the variation.

For analytically comparing the effect of different forms of aggregation on project results, one must compare projections with equivalent fertility, mortality, migration, and education assumptions. This raises problems for any kind of more realistic projection that assumes continued changes of these rates in the future because the assumptions about these changes must be made for some specific level of aggregation. If we want to make “identical” assumptions at different levels of aggregation, then the easiest way of doing so is to simply hold constant all of the currently observed rates at all levels of aggregation. This freezing of transition rates at their current level will result in differences that can be entirely attributed to the effects of different levels of aggregation. The resulting differences will be the consequence of projection “errors” that result from assuming population homogeneity where actually there is measurable heterogeneity. The result will also allow us to understand which sources of heterogeneity, of the ones considered here, are more relevant in influencing results. The findings of this systematic comparison have important general implications for the way in which population projections should be done in the future.

Fig. 5 shows the aggregate national TFR for India, resulting from assuming constant fertility rates at different levels of aggregation. Starting from the baseline TFR of slightly above 2.4, the straight red horizontal line gives the national level TFR, which is invariant when it is assumed to be constant at the national level without considering heterogeneity. If fertility rates are held constant at the level of the 35 states and union territories of India, then TFR will increase almost linearly to close to 3.0 by the end of the century because over time the high fertility states will see higher population growth and thus their higher fertility level will gradually carry more weight in determining the national fertility level. However, when fertility rates are kept constant at the level of the six different education groups without considering the state of residence, then the national-level fertility declines sharply over the coming two decades before leveling off. This is due to the education momentum that is already embedded in the population.
structure with the young cohorts of women being significantly better educated than the average woman in reproductive age today. These better-educated young cohorts will gradually move up the age pyramid and hence lower the average fertility of reproductive age women. But this effect will be happening only over the next two decades because in this scenario school enrollment rates are also kept constant and the new cohorts entering school age will not see any further improvements in education, which translates into no further decline in fertility under this constant scenario. These results show numerically the above-described issue, which in part motivated this study. The two projections accounting for different sources of heterogeneity (one by states, the other by education) yielded deviations from the aggregate-level projection that go in different directions. Fig. 5 also shows that disaggregation by urban/rural place of residence goes in the same direction as states, and thus considering both together, yields the highest aggregate fertility. When combining education and urban/rural place of residence that have effects in opposing directions, then the education effect clearly dominates. The most interesting case is to see what happens when state, place of residence, and education effects (two working upward and one working downward) are combined. Here, first the education effect dominates and leads to lower fertility until around 2050, after which point the state and place of residence effects dominate.

Fig. 6 shows the results of these different fertility levels together with all other demographic rates held constant at the indicated levels. The resulting population sizes by the end of the century span a huge range from 1.6 billion in the case of stratifying only by level of education to 3.1 billion in the case of stratifying only by state and place of residence. Considering that these results ( differing by 1.5 billion people) come from identical assumptions that keep all demographic rates constant and vary only the source of heterogeneity explicitly included in the model suggests the critical importance of the question of which heterogeneity to include in the model (discussed further in the concluding section).
To come up with a realistic population scenario that incorporates what is seen from today’s perspective as the most likely future trajectories of fertility, mortality, migration, and education, we conducted a very detailed analysis of education-specific trends in 70 territorial units of India (urban and rural for each of the 35 states and union territories). Since full documentation of these specific analyses is given elsewhere (12), here we summarize only the basic findings and choices that went into defining the medium scenario.

To make the study comparable across demographic components, similar methods were used to define the models generating the assumptions for all 70 territorial units. Hence, we developed a fertility model, a mortality model, a migration model, and an education model that will be briefly outlined in the following sections.

Extend into the future the empirically given trends of age- and education-specific fertility rates (by state and urban/rural) from the period 1999–2013. General trends show that fertility has been declining rapidly among women with no education or some primary education, while rates among women with completed primary and lower secondary education declined more slowly with a tendency to level off. Fertility among women with the highest education seems to have largely leveled off at rates well below replacement fertility. Since these trends showed slightly different patterns for urban and rural women, two separate models were developed. Both models are based on fitting a spline through the data points that aligns the trends over time for each education group with the cross-sectional pattern of lower fertility by level of education, which tends to show a rather clear general trend from high to low fertility levels. Since, for the highest education group (university), both the cross-sectional pattern as well as the trend over time show a minor increase after reaching very low levels (a TFR of 1.73 for rural and 1.40 for urban, which are floor values), this light upswing is also reflected in the fertility model that will eventually converge to a level of 2.08 in urban and 1.75 in rural areas (see SI Appendix for details). This is also in line with what the United Nations (UN) assumes for long-term fertility assumptions of low-fertility countries (UN 2017 assessment) and can also be explained in terms of a to-be-expected end of the tempo effect that depresses period fer-
tility due to postponement of childbearing (13). At the national level these assumptions imply that fertility across all education groups would reach a bottom of around 1.4 in 60 y for urban areas and of around 1.73 in 80 y for rural areas. With different starting values, all states will follow the rural- and urban-specific trajectories into the future (see SI Appendix for details).

were taken separately for rural and urban areas from the SRS website (14). These life tables were estimated based on registered deaths during 2009–2013. Unfortunately, no education-specific life tables were available, not even at the national level. The only source of information for differential mortality is child mortality by mother’s education as recorded in demographic surveys. Therefore, using the Indian Demographic and Health Survey (15), we calculated differential mortality by mother’s education and used this to estimate adult mortality differentials using model life tables. While this may result in a slight overestimation of mortality differentials if child mortality is more sensitive to education than adult mortality, it is still preferable to disregarding educational differentials, which implicitly assumes a certainly incorrect zero difference.

The SRS estimates for life expectancy at birth at the national level were 69.3 y for women and 65.8 y for men for the period around 2011. This sex difference in mortality in India is somewhat lower than in most other countries, and only since the 1980s has the original pattern of higher female mortality been reversed. Before then, India was one of the few countries where men lived longer than women, presumably due to differential treatment. In the coming decades we assume India will move toward the standard international sex differentials in mortality. For projecting life expectancy into the future, we generated an average pathway for future gain by regressing gains in life expectancy between two observed points in time using time-series data for several periods spanning 1970–2013 (SRS) separately.
for males and females. This takes into account the fact that at high levels of life expectancy potential gains tend to diminish. We fit a simple linear regression and extrapolated life expectancy into the future using the regression results to generate the general predicted average gain. For men and women in each territory, we started with the recently observed average rate of change and then let it converge to the general predicted average gain by 2030. On average, this gain starts out to be somewhat above 2 y per decade and carries on until the end of the century at somewhat below 2 y per decade.

within and between the states is one of the main determinants of regional population dynamics in India. The data for bilateral flows between all of the rural and urban areas in all states were not readily available and had to be estimated from different tables from the Census 2001 as the relevant data from the 2011 census has not yet published. A detailed account of this estimation procedure and its results is given in SI Appendix.

tional attainment ranging from illiterate to university. The given educational attainment distributions for women and men in 2011 in each of the 70 urban and rural territories was used to reconstruct the distributions in earlier years by going back along cohort lines. This utilizes the fact that educational attainment is typically acquired at a younger age and then stays invariant over the rest of life. Hence, if we know how many 60-y-old women are high school graduates, we also know how many 30 y olds were high school graduates 30 y ago. From this information, detailed analysis of trends in educational attainment progression rates by sex were produced for all urban and rural areas. The Indian Education Trend scenario then assumes that these trends will continue in the future, where only for tertiary education a ceiling of 50% for rural and 70% for urban men and women is assumed. Since recent progress in education in India has been very impressive, the continuation will result in further rapid education expansion. As a contrast, below we will also discuss the Constant Enrollment Rates Scenario, which shows the implications of the hypothetical case of no further education expansion.

A comparison of the different scenarios based on medium-
level assumptions for all of the components confirms the differences between the models including alternative sources of heterogeneity that had been identified for the constant scenario above. But the differences in population size turn out to be smaller than under the constant rates scenario due to smaller differences in future fertility and mortality levels resulting from assumptions of convergence. Over the next two to three decades the results hardly differ because of the common effect of population momentum and the only gradually increasing differences in rates, all hitting the 1.6 billion mark between 2036 and 2046 (Fig. 7). However, in terms of births the differences in the trajectories start earlier with 2.3% in 2011–2016 between the age-and-sex-only model and the age-sex-education model, increasing to around 7% for the next 25 y.

After 2040 the paths in total population size diverge, with India’s population peaking at quite different levels and at different points in time. The red line in Fig. 7 gives the conventional national-level projection in which only the age and sex structures are considered. Here the population will peak at 1.71 billion in 2056–2066 and then enter a slow decline. Fig. 7 also gives the medium variant of the UN projections for India (thick broken line), which is based on an age- and sex-only model but assumes slightly lower fertility than our age- and sex-only model. This is why it results in somewhat lower projections that after 2070 are almost identical with our Indian education trend scenario. This also reminds us of the fact that the heterogeneity effect discussed in this paper is only one dimension of uncertainty while different assumptions on future fertility levels may even have bigger impacts on the outcomes.

As expected, the lowest projection comes from the model that considers only age, sex, and level of education, showing that the population will peak at 1.66 billion. If only the states are being considered and education is disregarded, the results peak at almost 1.8. The full model—considering all five dimensions—first (dark blue line) produces a lower trajectory than the conven-
tional age-and-sex-only model (red line) due to a dominating education effect, but at 2061 the two lines cross and it climbs higher due to the state effect dominating. Finally, Fig. 7 also shows the line for the full scenario in which medium fertility, mortality, and migration assumptions are combined with the assumption of constant school enrollment rates. Because of the great momentum of changes in the educational composition by cohort, this results in the highest population growth only toward the end of the century. But, as Fig. 8 clearly shows, the two different education scenarios show quite different education distributions for the younger age groups in 2061. Since the Indian education expansion has not yet reached all parts of the population, cessation of further expansions would result in a sizable segment of the population with very low or no education. This study has provided insights with implications for the future of India as well as for the future of producing population projections around the world. We have shown how different degrees of accounting for measurable heterogeneity within populations changes the way in which we see the future. No universally valid recommendation can be derived, and we suggest following Long’s pragmatic suggestion to include those dimensions that are informative for the users and for which an empirical basis exists. While age and sex are explicitly included by most producers of population forecasts, we have concluded that education should also be routinely included because it has well-established implications for fertility and mortality, all methods and data are readily available, and the future educational attainment distributions are of great interest in their own right as indicators of a country’s future human capital and development potential.

Since independence, India has seen tremendous expansion in its population size, which has increased by a factor of 3.6 up to today. In the past, only elites were educated, with the majority of the population and in particular women never receiving any schooling. Still, in 1990, 70% of adult women had never attended any school, a proportion that subsequently has declined to 46% today. In parallel, the proportion of adult women with some tertiary education increased from 3 to 7%. Hence, recent years have seen a rapid improvement in education, and a look at younger cohorts shows
that India is set for further rapid expansion. Among women aged 15–19 today, only 14% are without formal schooling, and already 65% have completed junior secondary or higher levels. Given the consistent evidence of the importance of broad-based education, benefits ranging from poverty eradication and economic growth to health and well-being to quality of institutions and even democracy (18–22) suggest likely future improvements in human development. But our analysis also shows that, if the education expansion should stall in the near future, some of this potential benefit might be lost. Where does this leave us with respect to comparison of the world’s two billion-plus populations? Because China has massively invested in universal education since the 1950s, it is about three to four decades ahead of India in terms of human capital. Actually, the education pyramid of India today looks similar to that of China around 1980. And the one projection given here for India in 2050 looks similar to that of China today. While cultural and institutional factors may differ between the two countries, and there can be no perfect analogy, this comparison makes it look likely that India will experience similarly rapid human-capital–driven development as China has over the past three to four decades.