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THE ECONOMICS OF SLOWING POPULATION GROWTH

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PREFACE

This booklet is one of a series on population economics prepared by TEMPO under contract with the U. S. Agency for International Development. The work was performed under the general supervision of Dr. Stephen Enke whose earlier work on the subject formed the background for this document. The immediate supervisor of the contract was Dr. James P. Bennett. The design and layout of the booklet were done by Mr. Robert A. Bahlman and technical assistance was provided by Mr. Richard Brown. The author of the work is Dr. David N. Holmes, Jr.

This booklet is intended to be the basis of a lecture and slide presentation on the economic benefits of slowing population growth. Most of the points covered in the text are also presented visually in charts. The charts can easily be made into transparencies for use with an overhead projector.

The material in the text has been carefully selected to provide sufficient information for a lecture lasting approximately sixty to ninety minutes. It is divided into several semi-independent sections so that material may be conveniently omitted for shorter lectures without sacrificing the continuity of the presentation.

The plan of the lecture is briefly as follows: In the introduction, the audience is given an historical overview of world population growth, showing the rapid acceleration during the past century. Part I, encompassing Chapters 1 through 4, attempts to highlight the aspects of this rapid growth which present economic problems. Chapter 1 calls attention to four important economic dimensions of the current population explosion: absolute numbers, the rate of increase, acceleration in that rate, and the momentum of growth. Chapter 2 deals with a disturbing side effect of rapid population growth — the even more rapid concentration of people in urban centers. In Chapter 3, the most pressing economic problem of rapid population growth is shown to be not so much population density but age distribution. Chapter 4 incorporates the age distribution factor into a formal macro-economic simulation model which, by means of economic-demographic projections, shows the quantitative benefits of slowing population growth for a typical less developed country.

Part II, containing Chapters 5, 6 and 7, deals with the means of slowing population growth. Chapter 5 makes rough estimates of the cost of mounting a comprehensive national family planning program. These cost estimates and the estimated benefits derived in Chapter 4 form the basis for a comparison of the returns from family planning with returns from more traditional development investments. In Chapter 6, the "family planning" approach to population control is briefly evaluated with the conclusion that a more comprehensive approach is probably needed in view of the magnitude and urgency of the population problem confronting the less developed nations. Chapter 7 elaborates by attempting to define the "social," as distinct from the "individual," interest in the choice of family size. The divergence of these interests justifies and, indeed, compels stronger government action to curb population growth.

TABLE OF CONTENTS

PAGE

PREFACE 1

ILLUSTRATIONS 3

INTRODUCTION 4
- The Spiraling Effect of Compound Growth Rates
- The Dynamics of the Population Explosion
- Alarmist Projections May Be Counter-Productive

PART I: ECONOMIC DIMENSIONS OF THE POPULATION PROBLEM 8

SUMMARY 9

CHAPTER 1 — THE POPULATION EXPLOSION: A FOUR-PRONGED PROBLEM 10
- Absolute Numbers: A Problem of Balancing Wealth and People Resources are not the Limiting Factor
- Growth: A Problem of the Rate of Population Increase
- Acceleration: A Problem of Increases in the Rate of Population Growth
- Momentum: The Resistance of Population Growth to Deceleration

CHAPTER 2 — THE POPULATION IMPLOSION: A DANGEROUS SIDE-EFFECT 22
- The Population Implosion
- Empty Lands

CHAPTER 3 — A CLOSER LOOK AT THE PROBLEM OF AGE DISTRIBUTION 29
- Age Distribution: A Problem of the Dependency Ratio
- Falling Birth Rates Provide an Extra Dividend

CHAPTER 4 — MEASURING THE EFFECTS OF A CHANGING AGE DISTRIBUTION ON ECONOMIC DEVELOPMENT 33
- The Basic Economic Demographic Model
- What the Model Shows
- Economic Implications of lowering Fertility for the Family

PART II: ECONOMIC ASPECTS OF THE SOLUTION TO THE POPULATION PROBLEM 40

SUMMARY 41

CHAPTER 5 — COMPARING THE BENEFITS AND COSTS OF SLOWING POPULATION GROWTH 43
- The Demand for Family Planning Services
- Contraceptive Methods And Their Costs
- The Maximum Direct Cost of a Program
- The Cost of Preventing a Birth
- The Economic Benefits of Preventing a Birth
- Comparing Investments in Birth Control with Traditional Development Investments

CHAPTER 6 — WILL FAMILY PLANNING SUCCEED? 53
- Will Family Planning Solve the Population Problem?
- Family Planning may not Work Fast Enough

CHAPTER 7 — ASSERTING COLLECTIVE INTERESTS IN LIMITING POPULATION GROWTH 57
- Eliminating Unwanted Births is Probably not Enough
- The Rights and Obligations of Governments
- New Directions for Population Policy
- Coercion is a Last Resort
- Population Control Tradeoffs

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	The World's Population Growth in Perspective	5
2	The Population Spiral	7
3	World Distribution of Population and Output in 1967	12
4	Projected Percentage Increases in Population in 1965 Per Capita GNP as a Percentage of World Mean	13
5	The Development "Race"	15
6	Technological Progress Trends to be Labor Savings	15
7	Antecedents of the Population Explosion	17
8	How the Shape of the Age Pyramid Causes Population Momentum	19
9	The Contribution of Momentum to Population Growth in Selected High Fertility Countries	20
10	The Rising Contribution of Momentum to Population Growth as Fertility Declines	21
11	Average Annual Growth of Urban Population	24
12	Declining Importance of Migration to City Growth Over Time	25
13	The Contributions of Natural Increase to the Recent Growth of Several Cities	25
14	Inputs Required to Create Commercial Farms to Compete in World Markets	27
15	Sources of Change in Food Production	28
16	Age Distribution and Dependency Ratio	31
17	Savings and the Child Dependency Ratio	32
18	The Basic Economic-Demographic Model	35
19	How a Slower Growing Labor Force and a Faster Growing Capital Stock Affect the Growth of Total Output	37
20	Similar Growth of Output but a Slower Population Growth Causes Faster Growth of Output Per Capita	37
21	Marginal Products of Labor and Capital	39
22	Fertility Control Opens New Options for the Family	39
23	Determining the Target Population	45
24	Average Cost Per Acceptor Per Year: 1968	47
25	Marginal Costs Per Birth Averted	49
26	Average Cost Per Birth Prevented in Seven Country Programs	49
27	Comparing Returns from Birth Control with Other Development Investments	52
28	Some Rough Benefit-Cost Ratios for Family Planning	52
29	The Family Planning Approach: Accomplishments and Shortcomings	55
30	"Braking Distance"	56
31	Government Pro-Natalist Policies	59
32	Suggested Tradeoffs in Population Control	60

INTRODUCTION

THE SPIRALING GROWTH OF WORLD POPULATION

Over the whole course of human history, to the year 1900 — literally tens of thousands of years — the world's population grew to approximately one and one-half billion. Around the end of the 19th century, during the Industrial Revolution in Europe, population growth quickened markedly in what are now called the advanced countries. Both the pace of economic development and population growth reached unprecedented levels.

Forty or fifty years later, population growth accelerated even more dramatically in the presently less developed nations, largely as a result of greatly-expanded, world-wide public health campaigns. In only seventy years, from 1900 to 1970, the number of people more than doubled in the less developed countries (LDC's) and nearly doubled in the advanced nations.

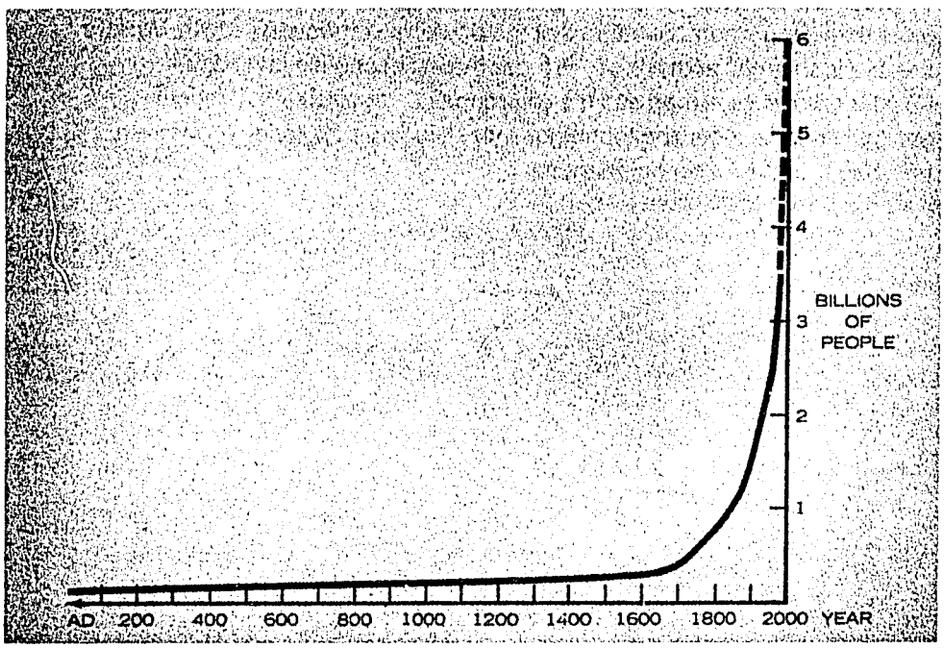
The trend toward accelerating population growth appears to be continuing (Figure 1). According to United Nations projections, population in the LDC's will more than double again by the year 2000, while population in the advanced nations will increase by about fifty percent.

The Dynamics of the Population Explosion

To help comprehend the dynamics of this explosive population increase, imagine the world's population being traced out graphically by a line rotating every one hundred years on a circular field. The field is divided into concentric rings with each ring representing one billion people (Figure 2).

With no population growth, the rotating line simply forms a circle. As population expands over time, the rotating line traces out a spiral with the distance between each turn of the spiral being proportional to the rate of population increase.

In this diagram, population grows so slowly before 1900 that each turn of the spirals (one for the advanced countries and one for the LDC's) is tightly squeezed against the next one. In effect, the lines of the spirals merge into solid balls, each containing tens of thousands of turns, all within the first concentric ring of the field.



THE WORLD'S POPULATION GROWTH IN PERSPECTIVE
(PAST AND U.N. MEDIUM VARIANT PROJECTION)

FIGURE 1

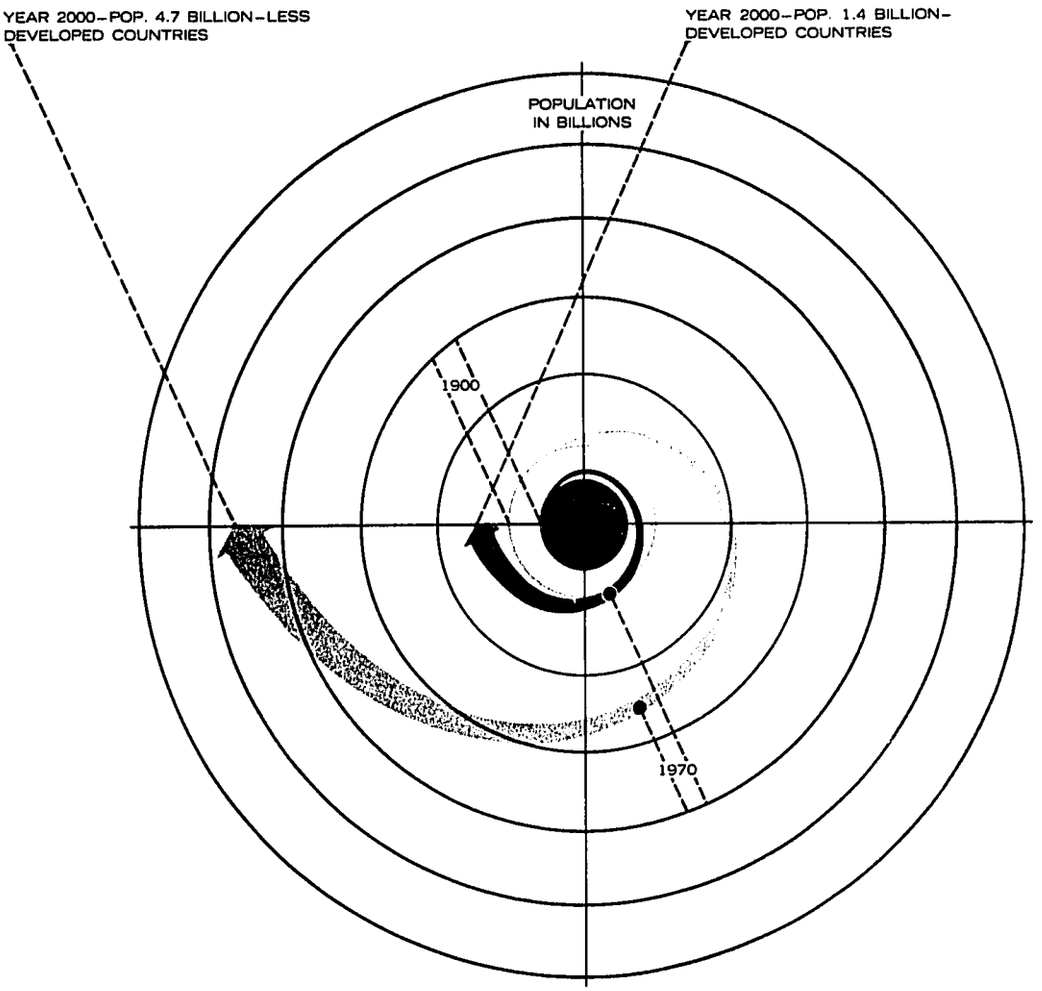
In the last full rotation of the spirals (1900 to 2000), following the U.N. projections for the latter third of the century, the line of the LDC spiral crosses nearly four additional concentric rings. At the same time, the spiral for the advanced countries tranverses approximately one and one-half additional concentric rings.

Additional projections rapidly become alarming when present trends are carried further into the future. To cite one extreme example, in approximately nine more turns of the population spirals in Figure 2, the world's population will have reached the point of standing room only, at present rates of growth.

Alarmist projections may be counter-productive

Such dramatic, long-term projections, while frequently useful in overcoming complacency with regard to the population problem, should be indulged in with discretion. First, they will never come true. Population growth will cease at some intermediate point either through the humane method of birth control or by an accelerated and brutal rise in deaths. Second, as grave as the population problem may be at present, it should not be made to appear worse than it is. People may simply give up hope in the face of what they think are overwhelming odds. Finally, arguments for population control should stress the near future. Events which will transpire 100 or more years from now understandably command small attention on the part of political leaders and government officials who are frequently overwhelmed with immediate problems.

To present a convincing case for greater population control *now* requires far more than simple demonstrations of the power of compound growth. What is needed is a careful analysis of the fundamental economic and social interactions between man and his environment, coupled with a critical evaluation of the tools and techniques for reducing population growth—a task begun in the following chapters.



THE POPULATION SPIRAL

FIGURE 2

PART ONE

ECONOMIC DIMENSIONS OF THE POPULATION PROBLEM

SUMMARY

The field of population economics began with the attempt to define objective criteria to determine when over-population exists. According to the theories which evolved, if more and more labor is added to an essentially fixed quantity of other resources, at some point, the last man consumes more on balance than he produces. He therefore is a net burden on society and, in this sense, has created a condition of over-population.

Such an approach is too static and hence incomplete, when applied to the real world. The quantities of other productive resources are fixed, in practice, not so much by physical constraints, as by man's ingenuity and frugality. History is full of examples of populous nations which prospered with the meagerest of physical resource endowments.

Of far greater import than the size of population or its density, is its rate of growth. Economic development, in terms of increasing per capita output, only occurs when output grows faster than population. For this to happen, capital and technology must more than keep pace with a growing labor force.

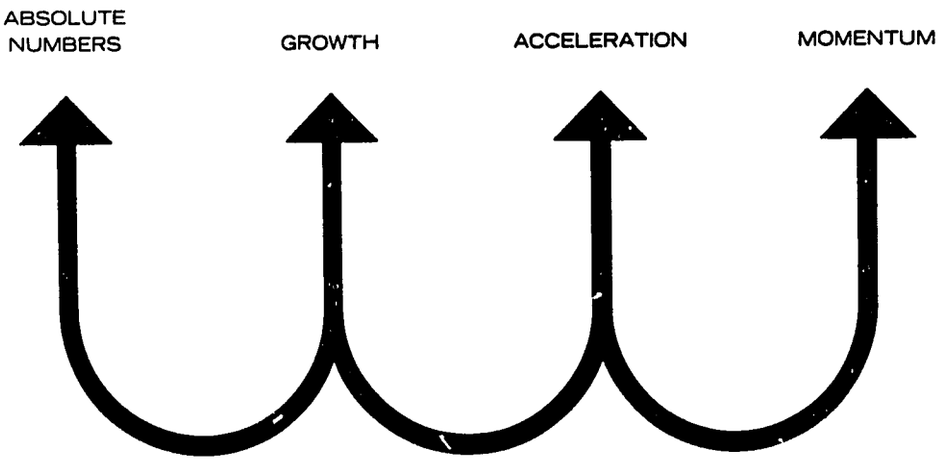
Any increase in the *rate* of population growth itself can have a special adverse impact on the process of economic development through an increase in the ratio of children to work-age adults. And, an acceleration in population growth, once triggered, tends to be self-perpetuating because of a built-in momentum factor.

The populations of most less developed countries, in addition to growing rapidly, are crowding together in cities at a rate far greater than the rate of overall population increase, causing a population "implosion." At the same time, vast tracts of the interior are left largely unsettled, creating the illusion of a safety valve for further population pressure. Yet the settlement of new land requires far more than people, and especially children, to be economically viable.

Modern approaches to population economics stress the importance of age distribution. Lower birth rates mean each adult has fewer children to support, thus freeing resources for productive investment. Since the number of adults, in the working age range, is unaffected for at least fifteen years after a fertility decline, output can grow faster during this period. With fewer people and a larger total output, output per capita rises more rapidly.

CHAPTER 1

THE POPULATION EXPLOSION: A FOUR-PRONGED PROBLEM



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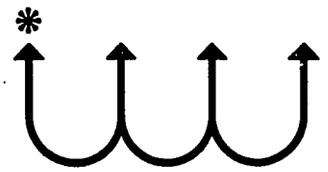


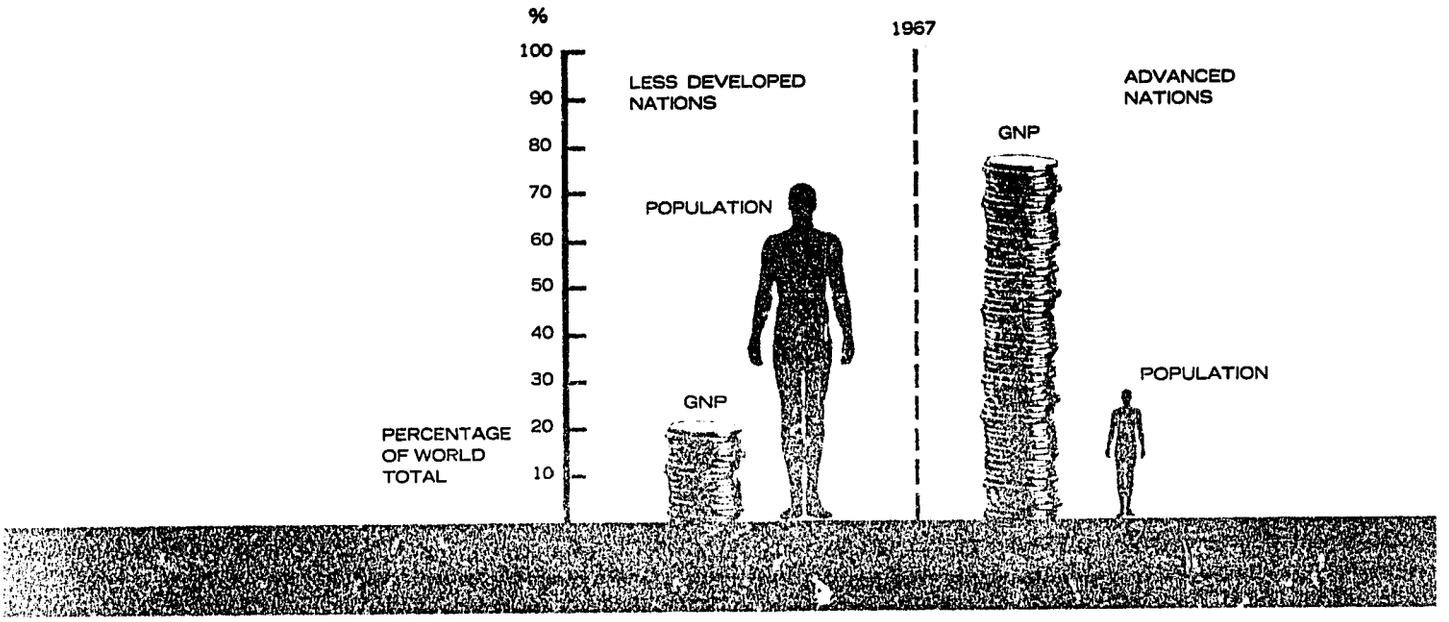
A PROBLEM OF BALANCING WEALTH AND PEOPLE

Critics of population control frequently point to the relatively low population densities of many less developed nations as evidence that they need larger populations to exploit more fully their resource endowments and market potential. This argument is misleading on several grounds. First, it is impossible to determine precisely a desirable ratio between people and physical resources. Resources are very difficult to define and people differ considerably in their capabilities. Secondly, physical resources—land especially—are developed not by people alone, but by capital and technology. These inputs may well increase faster with fewer people (See Chapter Two). Finally, with respect to market potential, higher per capita incomes expand markets, not simply greater numbers of people, and per capita incomes tend to rise more rapidly with slower population growth. (See Chapter Five).

Of far greater economic relevance than the population-land ratio is the ratio between current output and population. A comparison of this ratio among countries shows a rather extreme imbalance. The great majority of the world's people now live in nations which produce a decided minority of the world's output of goods and services (Figure 3). If nothing is done to reverse existing trends, some of the poorest among these nations will suffer the greatest relative population increases over the next several decades (Figure 4).

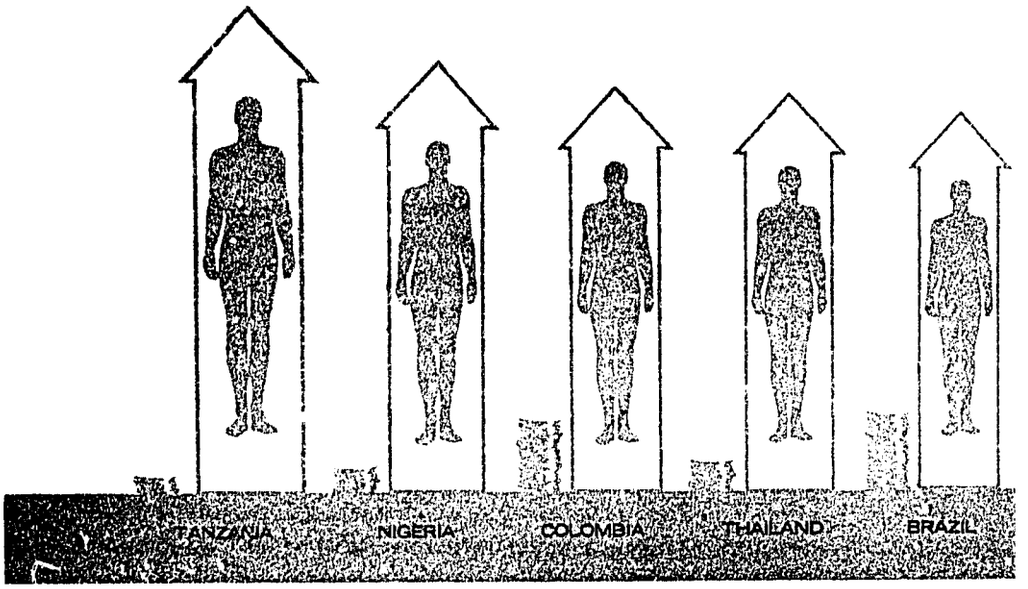
Resources Are Not the Limiting Factor

The multiple factors which interact to determine the average standard of living in a nation are poorly understood. The resource base provides one constraint. However, of far greater importance are political, economic and social institutions. Such institutions change slowly. If they are currently overburdened, as evidenced by low levels of living for the majority of the population, additional population pressure will very likely be a serious handicap for future development despite new resource discoveries or possible technological breakthroughs.



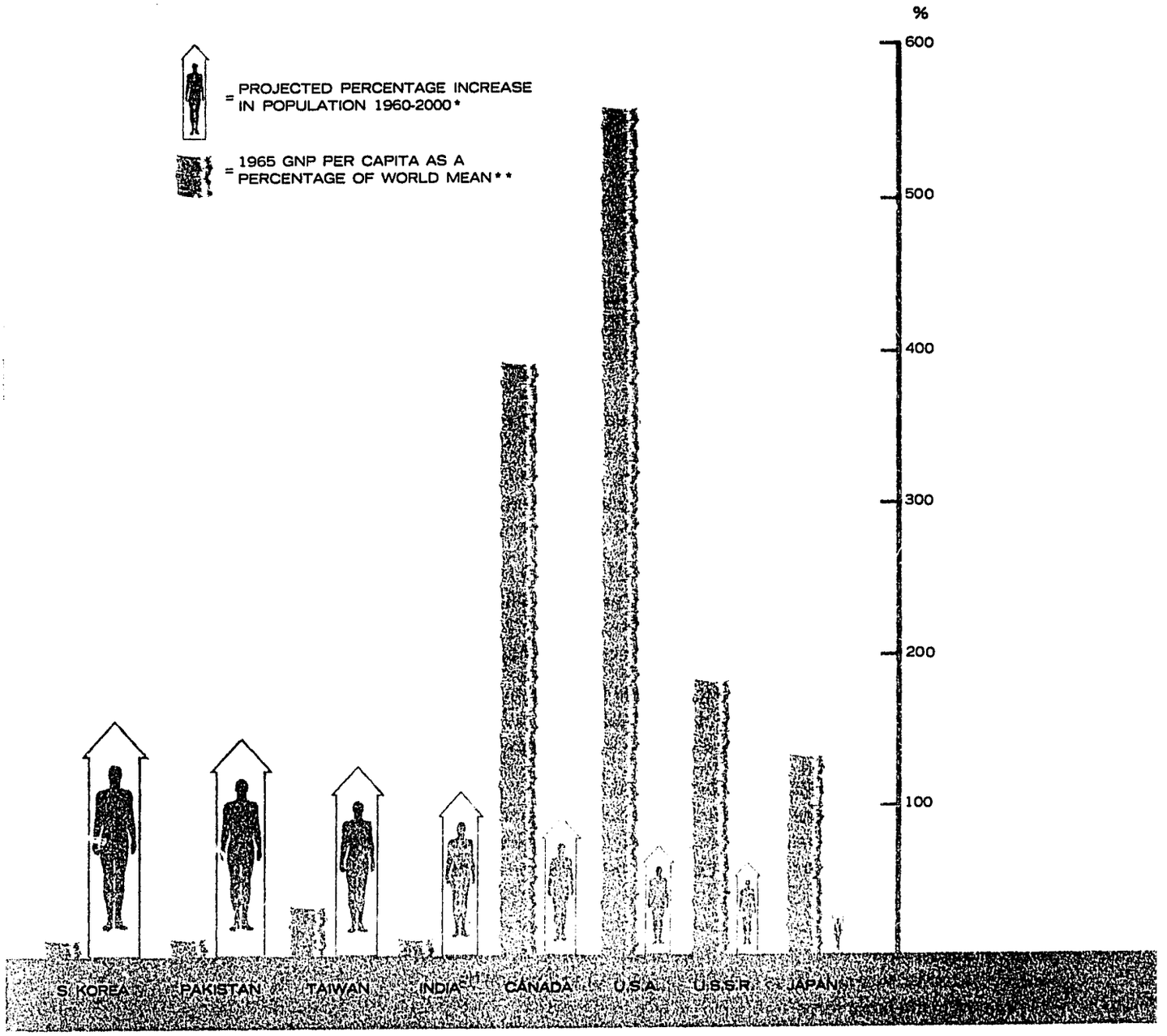
WORLD DISTRIBUTION OF POPULATION AND OUTPUT IN 1967

FIGURE 3



*U.N. MEDIUM VARIANT.

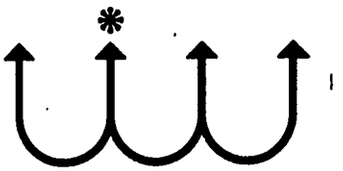
**SOURCE: HAGEN, E., "ANALYSIS OF WORLD INCOME AND GROWTH," ECONOMIC DEVELOPMENT AND CULTURAL CHANGE, VOL. 18.



PROJECTED PERCENTAGE INCREASE IN POPULATION BY THE YEAR 2000 COMPARED WITH 1965 PER CAPITA GNP AS A PERCENTAGE OF WORLD MEAN

FIGURE 4

GROWTH



A PROBLEM OF THE RATE OF POPULATION INCREASE

For per capita incomes to rise, GNP must increase faster than population. The growth of GNP is limited first by the amount of land, labor and capital a country presently possesses and, second, by how efficiently it uses these resources, i.e., by technology.

An increase in population, after a certain lag, means an increase in the labor force but not necessarily a corresponding increase in the other productive inputs. In practice, cultivable land of equal quality cannot increase as rapidly as labor and capital. The rescuing elements, to offset declining labor productivity, are usually technology or imports of foreign capital.

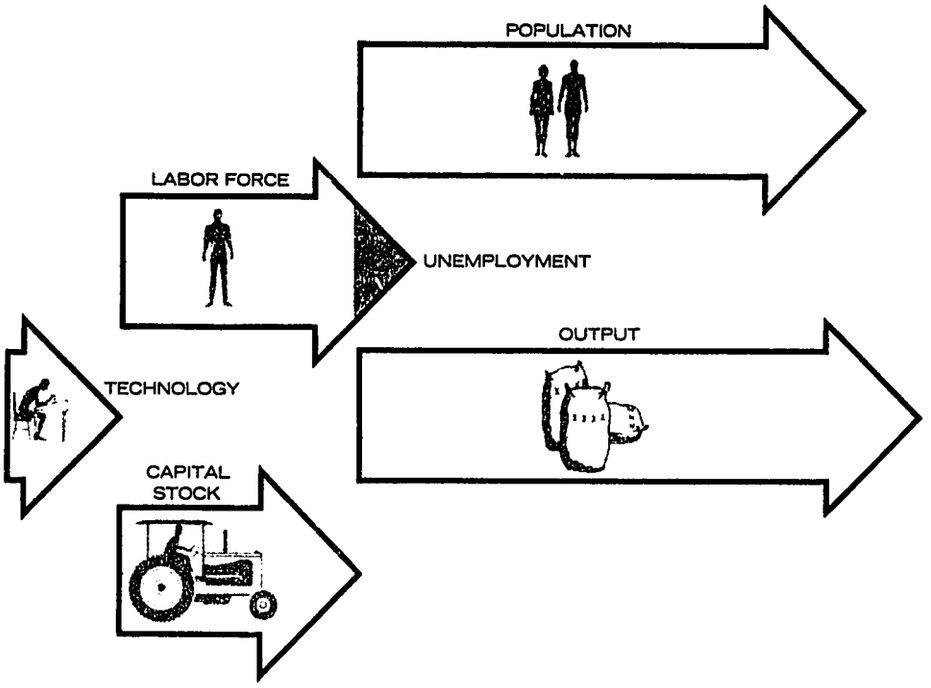
The economic development process, in simplest terms, is a race between the growth of population on the one hand and the growth of capital and technology on the other (Figure 5). One indication that this race is being lost in many countries is the staggering level of urban unemployment.

Statistics are difficult to find and often understate the problem, but measured unemployment rates of 10 to 15 percent of the labor force are not uncommon in LDC's, and the level seems to be rising in many countries.

The task of employing productively a burgeoning labor force is made more difficult by the widespread application of labor-saving technology. The experiences of Venezuela and Jamaica, while not in themselves providing sufficient grounds for generalization, illustrate the point. The economies of both expanded at an average annual rate of 8 percent between 1950 and 1960, but in Venezuela the unemployment rate stood higher at the end of the decade than at the beginning* (Figure 6). In Jamaica, unemployment was at the same level in 1960 as in 1950, despite an emigration of 11 percent of the labor force.

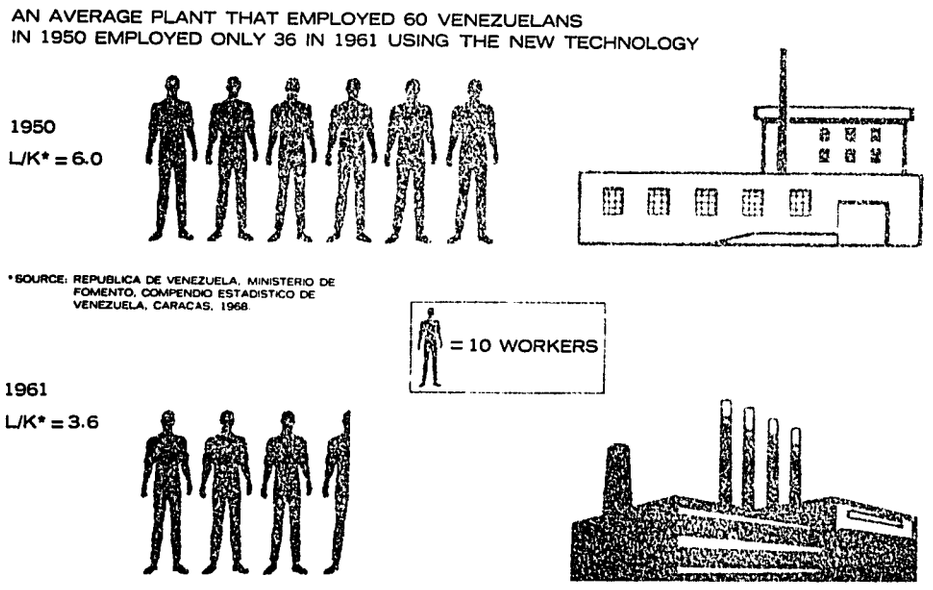
Even without the introduction of labor-saving innovations, it is difficult to see how many LDC's will prevent rising unemployment in the future with a labor force projected to be twice as large as the existing one in the next 30 years, at present rates of growth.

*Measured unemployment was 6 percent in 1950 and 13 percent in 1961.



THE DEVELOPMENT "RACE"*

FIGURE 5

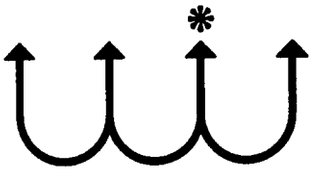


*SOURCE: REPUBLICA DE VENEZUELA, MINISTERIO DE FOMENTO, COMPENDIO ESTADISTICO DE VENEZUELA, CARACAS, 1968.

TECHNOLOGICAL PROGRESS TENDS TO BE LABOR SAVING

FIGURE 6

ACCELERATION



A PROBLEM OF INCREASES IN THE RATE OF POPULATION GROWTH

For most of human history, annual births and deaths were nearly equal, causing population to grow at a very slow rate. Toward the middle of the 18th century, death rates began to fall very gradually in Europe with the advent of improved economic and social conditions, as well as new medical discoveries. The resulting acceleration in population growth was attenuated by a slightly more gradual fall in birth rates beginning at about the same time (Figure 7a).

Two important economic consequences ensued from this gradual decline in birth and death rates. First, the very gradualness of the resultant increase in population growth provided ample time for societies to adjust to this new feature of economic and social life. Second, the fact that relatively fewer babies were born while adults tended to survive longer meant that the average age of the population tended to increase. Hence, the number of work-age adults tended to increase relative to the number of dependent children.

The opposite set of events occurred in the less developed nations. Death rates began to drop precipitously in the late 1930's and early 1940's as the result of world-wide campaigns against major diseases of mankind. However, birth rates remained about constant (Figure 7b). Suddenly, the LDC's were confronted with a population explosion, largely triggered by forces external to their societies. They have had very little time for internal economic and social adjustment.

To make matters worse, from an economic point of view, the decline in mortality was most pronounced among the young, especially infants. The average age of the population thus decreased rapidly.

Today, as the result of these demographic forces, more than three-fourths of the population of a typical LDC is under the age of twenty and over one-half is of primary and secondary school age.

The impact of this skewed age distribution is felt throughout the economy but perhaps most intensely in the educational sector. Most LDC's currently fall far short of the goal of properly educating their children. Improvements in enrollment ratios, the teacher-pupil ratio, and overall improvements in the quality of education are desperately needed. Yet each year, the great majority of additional educational funds must be spent just to keep pace with population growth.

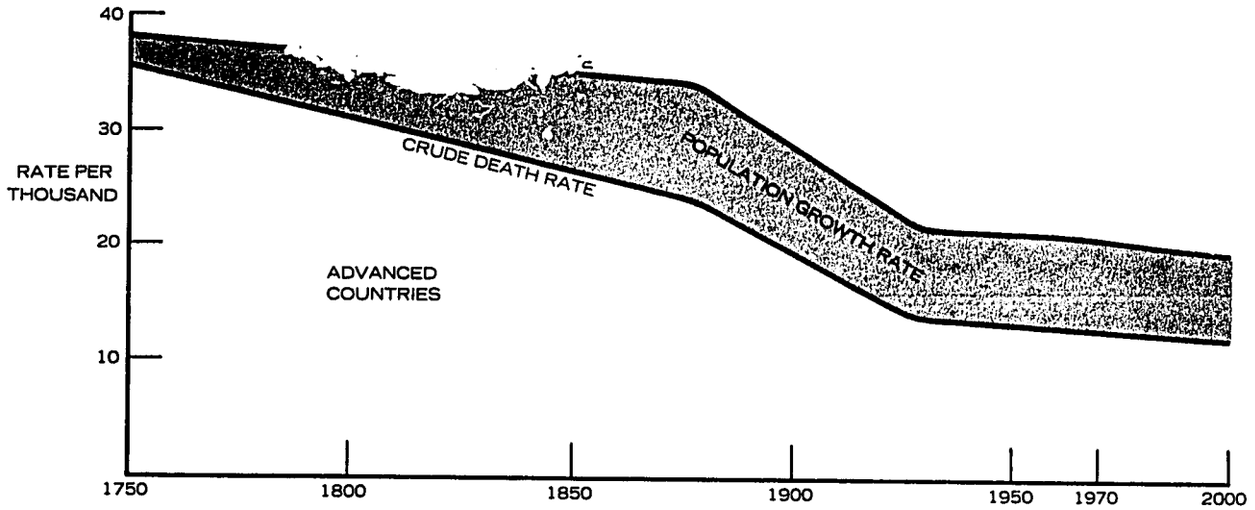
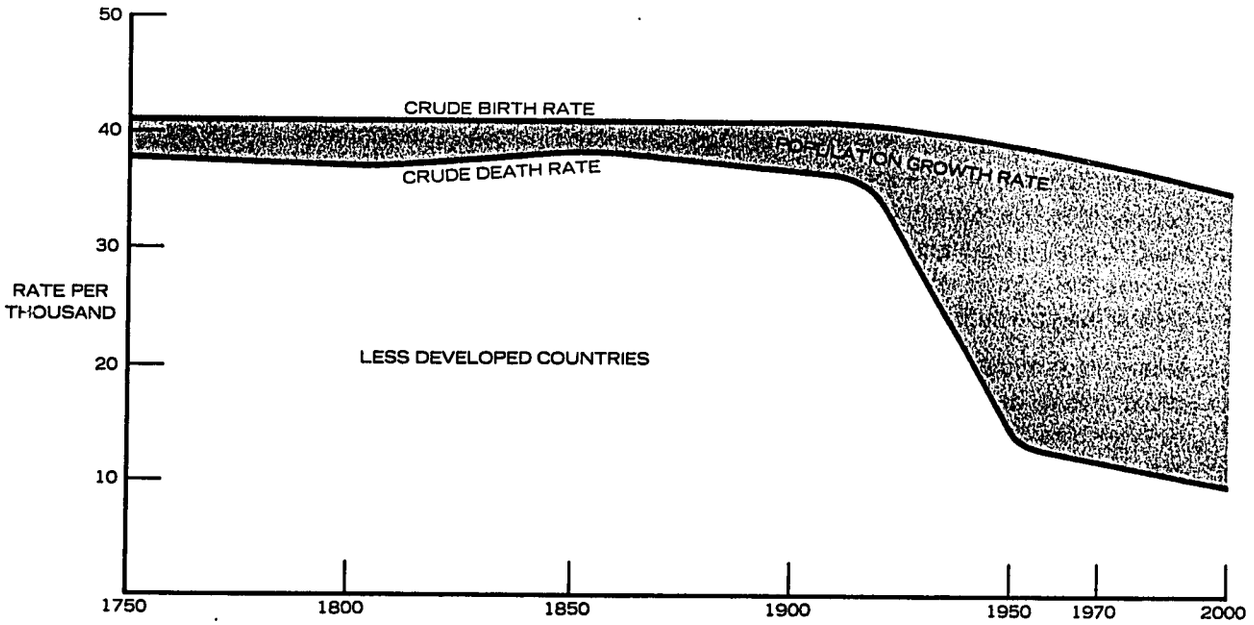


FIGURE 7a

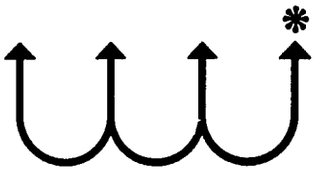


ANTECEDENTS OF THE POPULATION EXPLOSION

FIGURE 7b

*Data for 1750 to 1900 are based on average estimates by Carr-Saunders-Wilcox, as modified by the U.N. in *The Determinants of Population Trends*. Estimated future based on U.N. population projections.

MOMENTUM



THE RESISTANCE OF POPULATION GROWTH TO DECELERATION

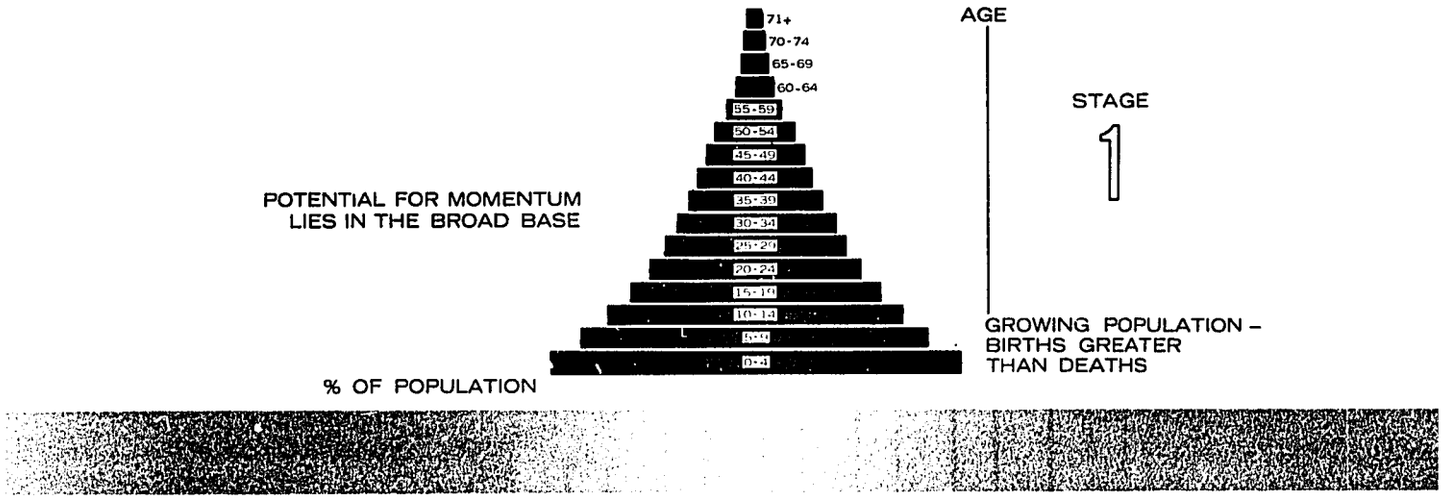
Another important feature of the broad-based age pyramid typical of LDC's is that the number of potential parents increases every year. Hence, even if fertility rates fall, meaning fewer babies born annually per couple, the number of babies born overall may increase simply because there are more couples producing them (Figure 8). This phenomenon is what creates the important *momentum* factor in population growth.

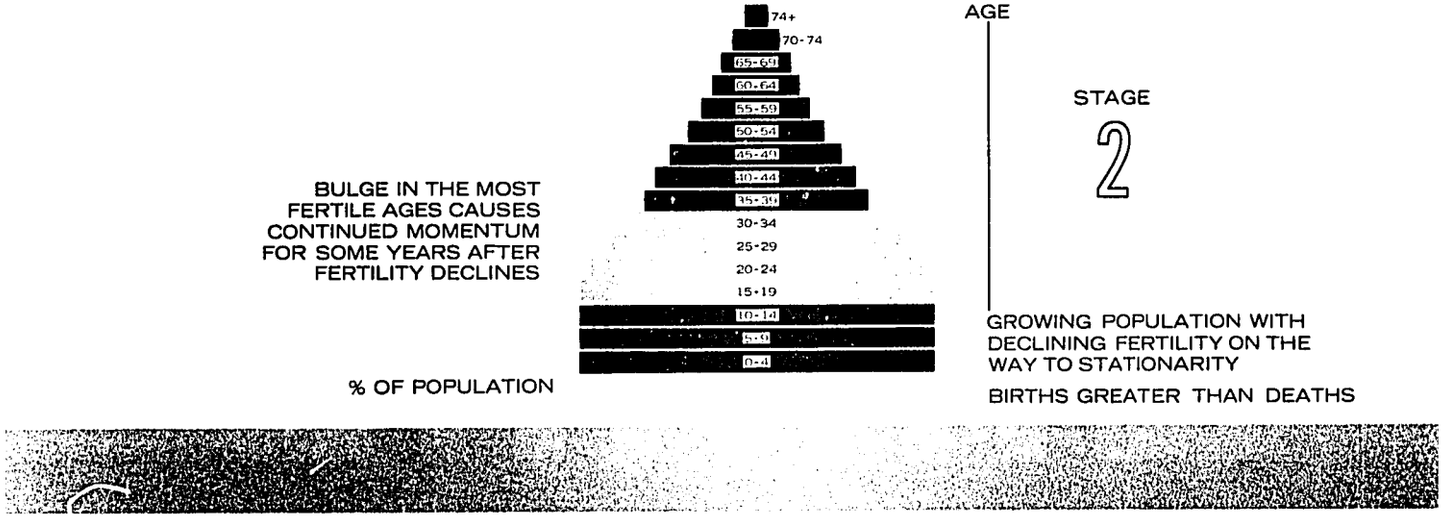
Momentum alone assures that the world's population will increase substantially over the next 30 or 40 years, regardless of what happens to fertility. For example, it is estimated that even if the age-specific fertility rates in the LDC's fell immediately to levels which would merely replace existing parents, the ultimate stationary population would be two-thirds greater than the current one.

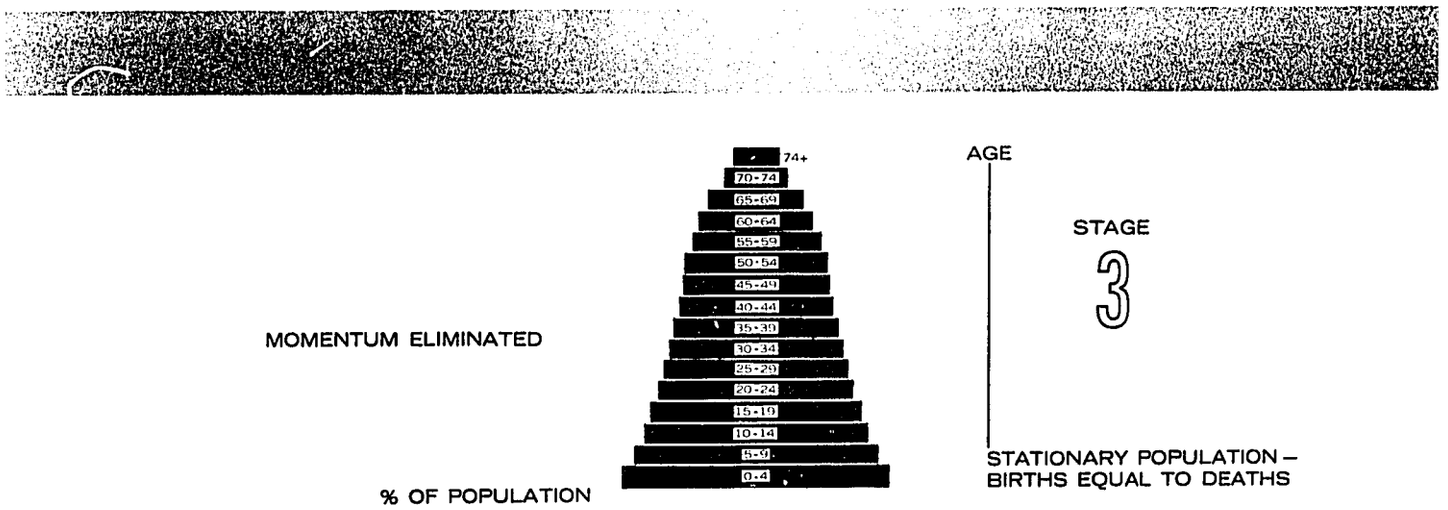
Momentum causes anywhere from one fourth to one third of the population growth in typical high fertility countries* (Figure 9). Furthermore, as might be expected, the importance of momentum in causing continued population growth increases relatively as fertility declines (Figure 10).

The existence of momentum makes fertility reduction all the more difficult. For many years, the candidates for family planning will increase in numbers as today's children grow to adulthood. Thus, in order to achieve even modest declines in the crude birth rate (births per 1,000 population), age-specific rates (births per 1,000 women in age cohort i), must decline substantially below the level necessary to sustain a stationary population given expected levels of mortality.

*The contribution of momentum was found by first calculating the amount of population growth these countries would have experienced had they had stationary age distributions with their current fertility rates, and then subtracting this rate from the actual population growth rate to find the momentum factor.

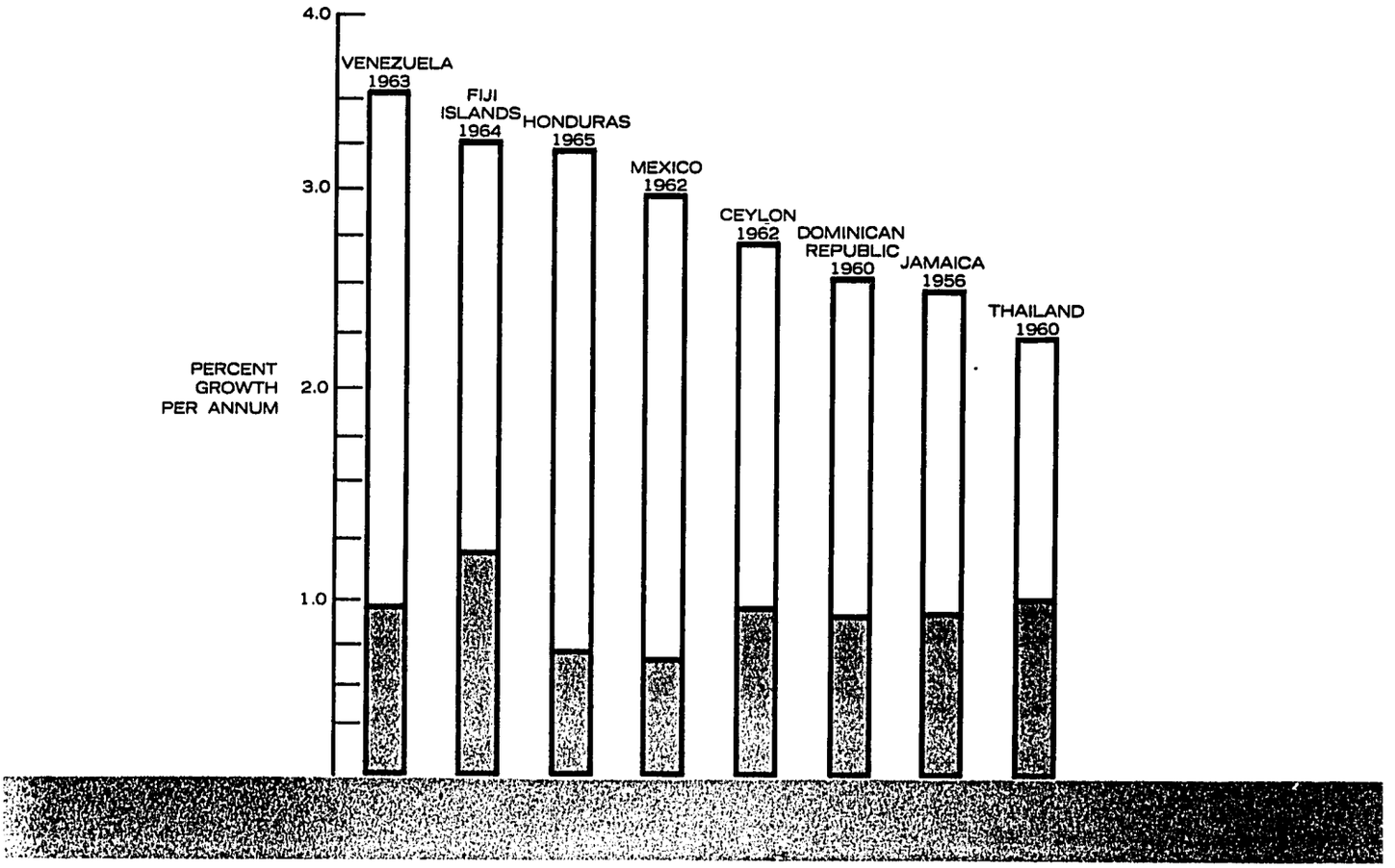




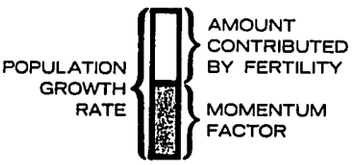


HOW THE SHAPE OF THE AGE PYRAMID CAUSES POPULATION MOMENTUM

FIGURE 8

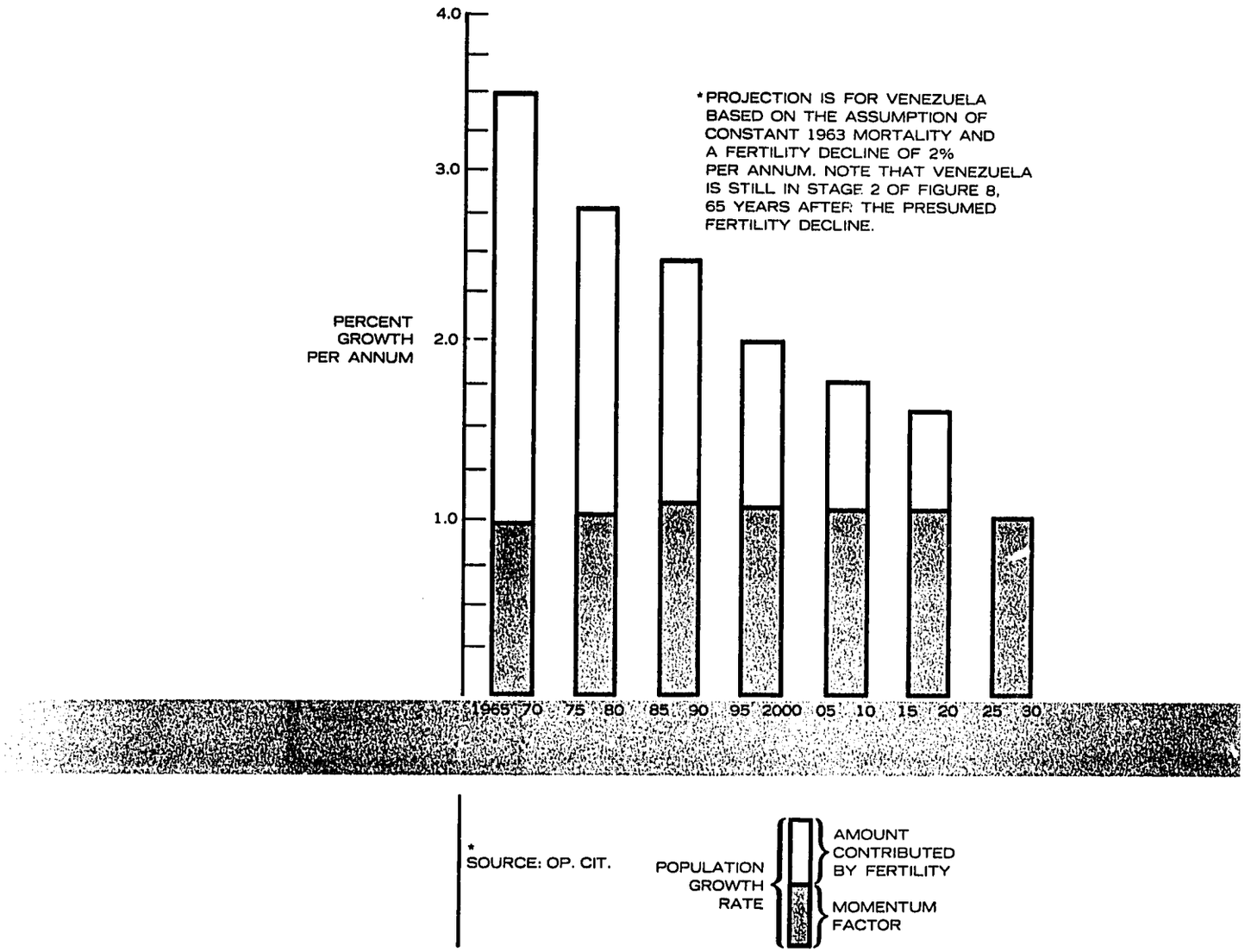


*SOURCE: PRESTON, SAMUEL H., "EMPIRICAL ANALYSIS OF THE CONTRIBUTION OF AGE COMPOSITION TO POPULATION GROWTH," DEMOGRAPHY, 7:417-433.



THE CONTRIBUTION OF MOMENTUM TO POPULATION GROWTH IN SELECTED HIGH FERTILITY COUNTRIES

FIGURE 9

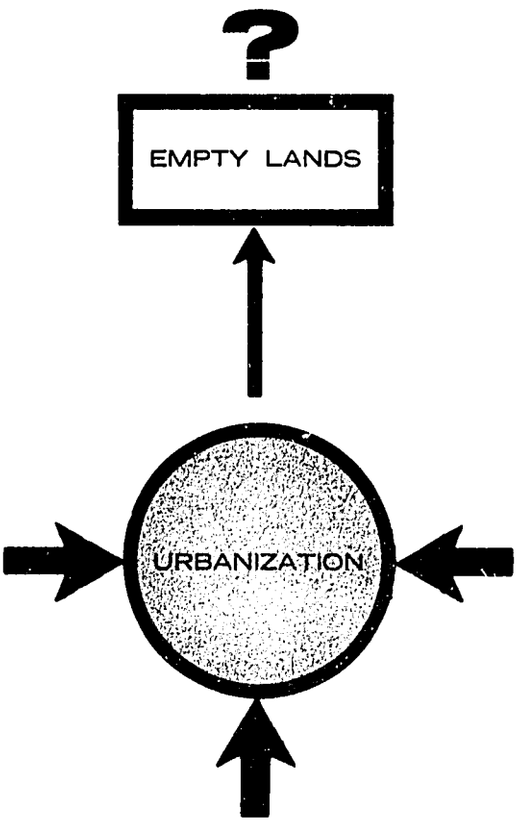


THE RISING CONTRIBUTION OF MOMENTUM TO POPULATION GROWTH AS FERTILITY DECLINES*

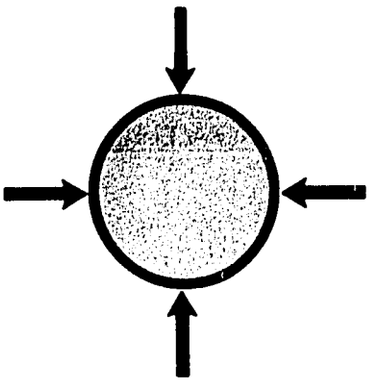
FIGURE 10

CHAPTER 2

THE POPULATION IMPLOSION: A DANGEROUS SIDE EFFECT



THE POPULATION IMPLOSION



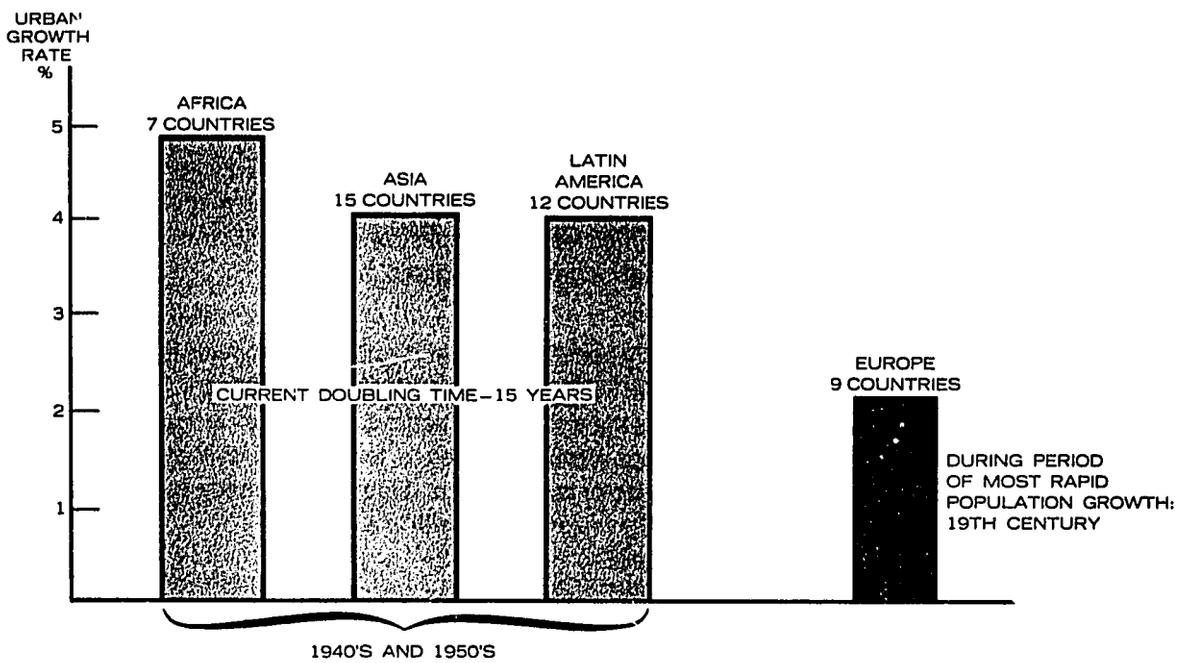
One of the disturbing consequences of explosive population growth is the rapid growth of cities in the less developed countries. The current doubling time of large cities in these countries is about fifteen years, which implies a growth rate more than twice that of the population as a whole.

Largely as the result of rural-urban migration, the percentage of urban dwellers to total population is also rising rapidly in most of the LDC's. This unprecedented rush to the cities exceeds by a factor of two the rate of urbanization of Europe during its period of most rapid population growth in the 19th century (Figure 11). An understandable preoccupation with urban growth has led many governments to the belief that the solution to the population problem lies mainly in diverting or slowing urban migration. The contributory role of high fertility to rapid city growth is correspondingly de-emphasized. This view is very shortsighted, however, for a number of reasons.

High rural fertility already contributes significantly to the impetus for rural-to-urban migration. Furthermore, the effect of migration on city growth is bound to decrease as the degree of urbanization rises, as is happening in nearly all less developed countries. Hence, fertility will inevitably become an increasingly important factor in city growth (Figure 12). Already, natural increase accounts for the majority of growth in a number of important cities in the LDC's (Figure 13).

The generally held tenet that urbanization itself tends to cause a reduction in fertility rates provides an unwarranted excuse for government inaction in family planning. While it is true that rural fertility rates are often higher than urban rates, studies of the fertility behavior of urban migrants in less developed countries over the past few years indicate that their fertility is not significantly reduced in the first generation. Unfortunately, the fertility-reducing effects of urbanization alone can be expected to do little to slow overall population growth.

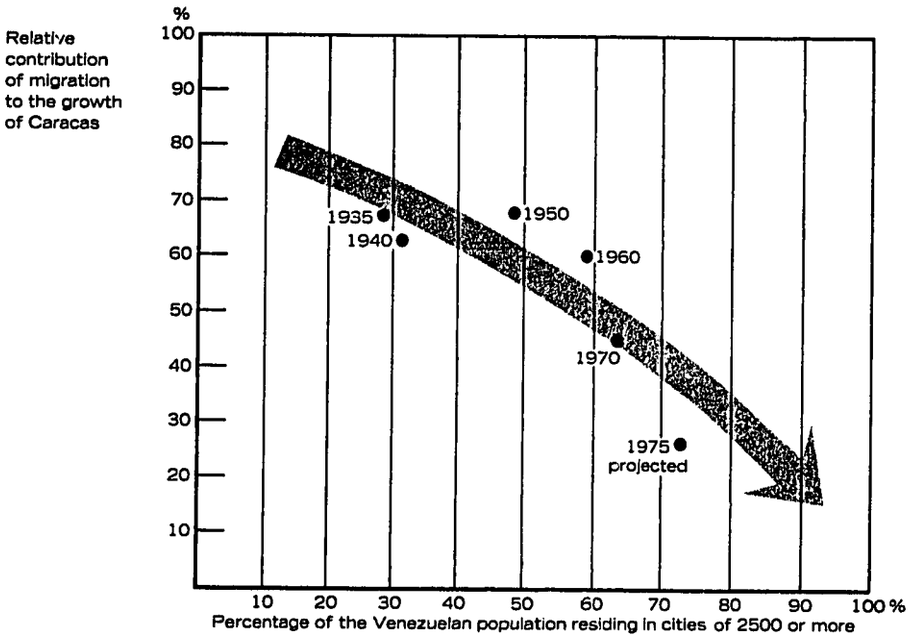
CITIES ARE GROWING TWICE AS FAST AS TOTAL POPULATION IN THE LDC'S AND TWICE AS FAST AS EUROPEAN CITIES DURING EUROPE'S PERIOD OF MOST RAPID POPULATION GROWTH



SOURCE: DAVIS, KINGSLEY, "THE URBANIZATION OF THE HUMAN POPULATION," SCIENCE, 213:31-53

AVERAGE ANNUAL GROWTH OF URBAN POPULATION

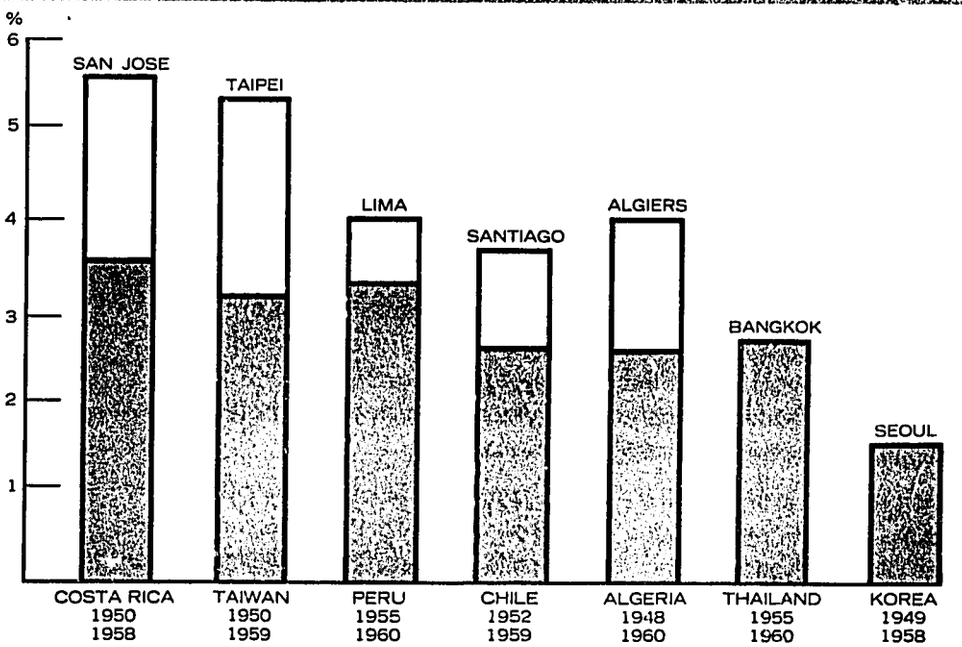
FIGURE 11



SOURCE: Calculated from data in U. N. Demographic Yearbooks

THE CONTRIBUTION OF MIGRATION TO CITY GROWTH TENDS TO BE SELF-LIMITING

FIGURE 12

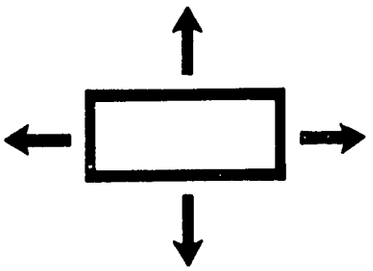


SOURCE: Calculated from data in U. N. Demographic Yearbooks

THE CONTRIBUTION OF NATURAL INCREASE TO THE RECENT GROWTH OF SEVERAL CITIES

FIGURE 13

EMPTY LANDS



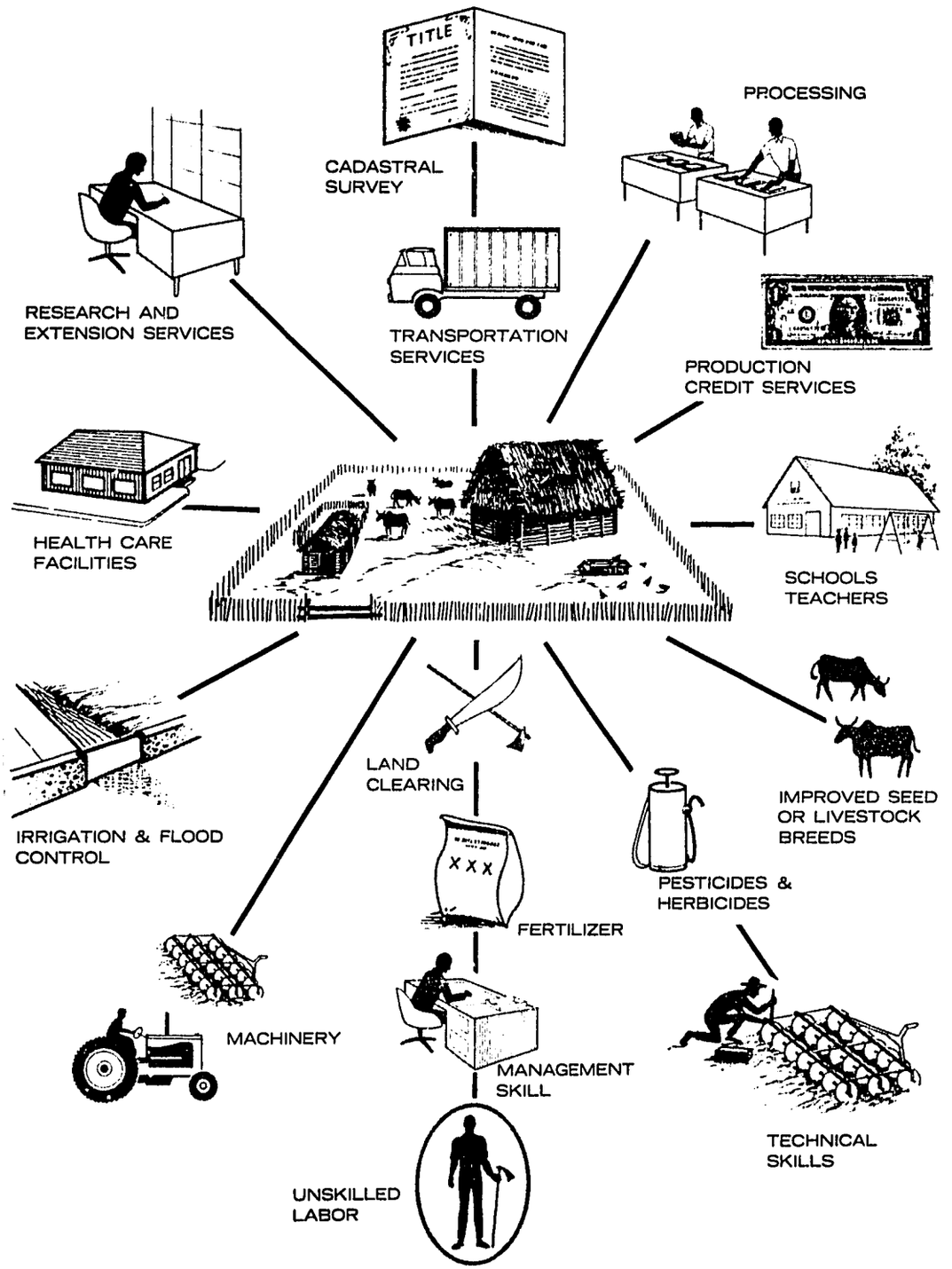
Many less developed nations have sparsely populated areas. Opponents of population control frequently assert that such lands will provide relief from urban crowding and that additional population growth is needed to develop these regions.

This view is misleading. Children are born where their parents live—usually in cities. Furthermore, children do not settle empty lands. What is needed are adults with skills, determination and, above all, capital. Most potential migrants with these qualifications prefer the city.

For land settlement to be viable, a whole complex system of inputs is required, among which unskilled labor is the least important (Figure 14). Empty lands are generally empty for a good economic reason: they do not yield a competitive return on invested capital. More simply, rates of return on capital are higher in other sectors of the economy.

Admittedly, new land settlement during the early stages of development of some of the now advanced nations provided a powerful economic stimulus. However, conditions have changed. Increasingly, farmers everywhere must compete in world markets. Simply creating more subsistence farms on new lands is hardly a worthwhile strategy for development.

For economic progress to occur in the agricultural sectors of less developed countries today, farmers must abandon traditional methods of cultivation in favor of the kind of advanced technology that has revolutionized agriculture in the advanced nations. The gains in output achieved by the new technology are derived to only a small degree from increases in land and labor (Figure 15). So, the settlement of currently uncultivated land holds little promise for solving the population problem or for promoting economic development.



INPUTS REQUIRED TO CREATE COMMERCIAL FARMS TO COMPETE IN WORLD MARKETS

FIGURE 14

UNITED STATES

SOURCES OF CHANGE IN FARM OUTPUT 1940-1955

INPUT	PERCENT OF INCREASE ATTRIBUTABLE TO THIS INPUT
ADDITION OF NON-FARM PRODUCED POWER	23%
IMPROVEMENTS IN OUTPUT PER ACRE FROM THE APPLICATIONS OF ADVANCED TECHNOLOGY	43%
CHANGE IN PRODUCT ADDED BY LIVESTOCK	25%
ADDITIONS OF **LAND**	**9%**
ADDITIONS OF **LABOR**	**0%**
	100

SOURCE: FAO, CROP PRODUCTION LEVELS AND FERTILIZER USE, ROME, 1962, P. 45.

INDIA

SOURCES OF CHANGES IN FOOD GRAIN PRODUCTION 1956-61

INPUT	PERCENT OF INCREASE ATTRIBUTABLE TO THIS INPUT
FERTILIZER	41%
IRRIGATION	27%
IMPROVED SEED	13%
DOUBLE-CROPPING	10%
ADDITIONS OF **LAND**	**9%**
ADDITIONS OF **LABOR**	**0%**
	100

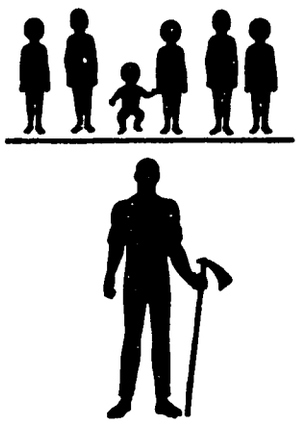
SOURCE: OP. CIT.

SOURCES OF CHANGE IN FOOD PRODUCTION

FIGURE 15

CHAPTER 3

A CLOSER LOOK AT THE PROBLEM OF AGE DISTRIBUTION



AGE DISTRIBUTION

A PROBLEM OF THE DEPENDENCY RATIO

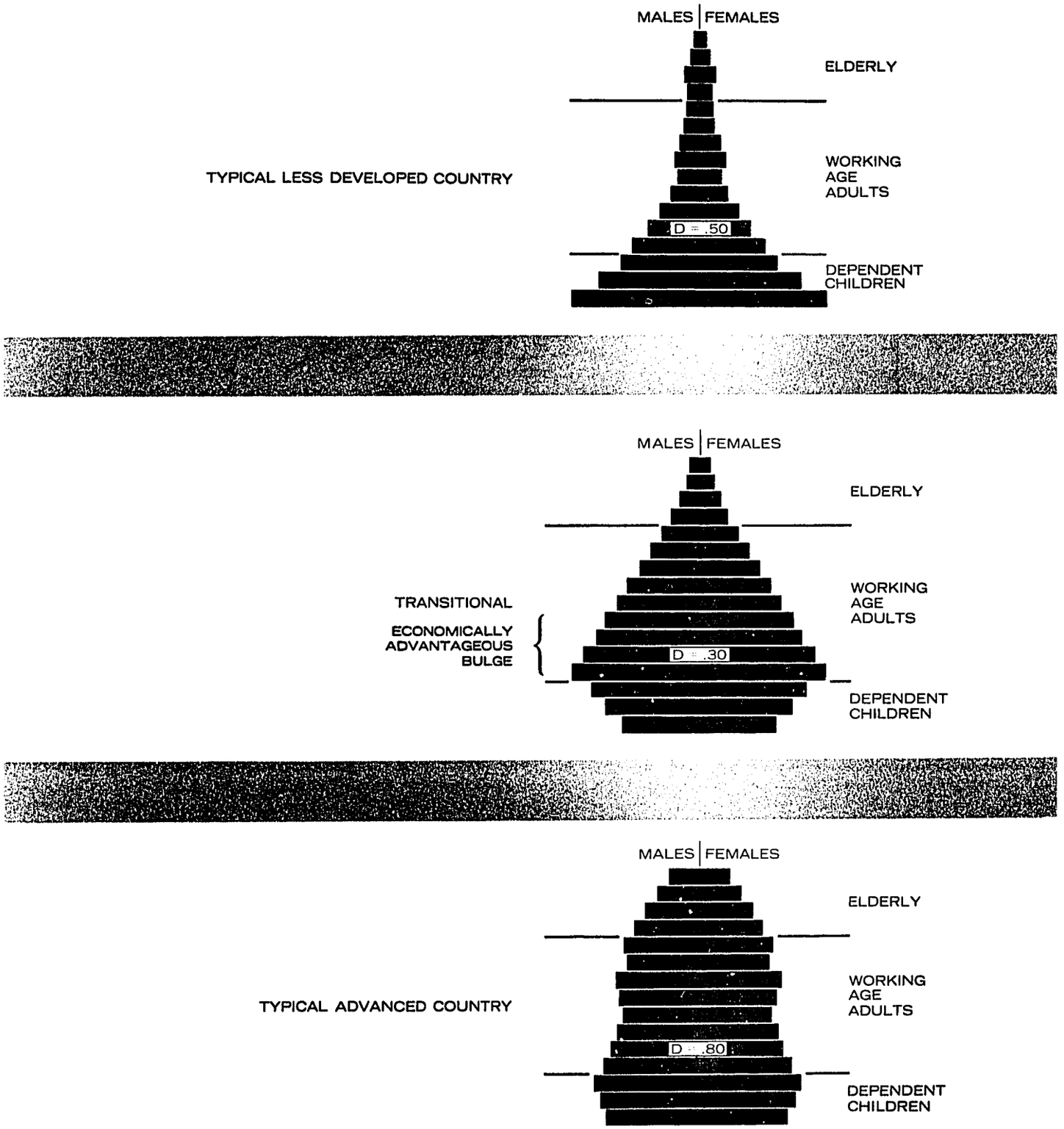
The false issue posed by the contention that "empty lands" need more people tends to divert attention away from the real issue of rapid population growth—the problem of age distribution. A rapidly growing population is characterized by a high child dependency ratio (children/work age adults), usually in the neighborhood of .8. Most advanced nations, by contrast, have child dependency ratios of around .5* (Figure 16). In more poignant terms, the typical head of household between the ages of 20 and 35 in an LDC, in addition to being handicapped by poor education and little capital, must support himself, his wife and four or more dependent children; his counterpart in an advanced country supports only two or three dependents. The result is not only that the LDC worker enjoys a much lower standard of living, but equally important, he is able to save less.

Accordingly, there exists a fairly strong inverse relationship between the child dependency ratio and the savings rate among countries (Figure 17). Of course, a high rate of saving is not impossible with a high child dependency ratio as the figure shows, but rather it is much more difficult and thereby less likely.

Falling Birth Rates Provide An Extra Dividend

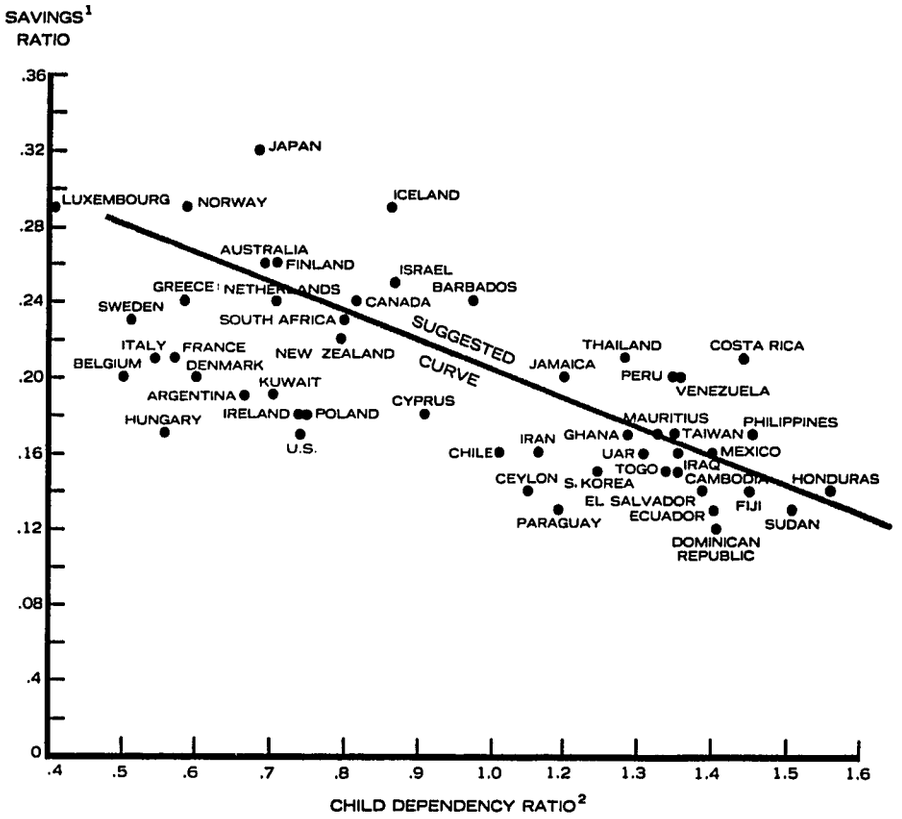
Just as the high child dependency ratios characteristic of LDC's create an added handicap to development, so falling birth rates can provide an extra dividend. When population growth slows, the changing age distribution can give a powerful thrust to the economy because the dependency ratio first falls below the level of the ultimate stationary population (Figure 16).

*Advanced countries have relatively more elderly dependents than LDC's but their overall dependency ratios are nevertheless some 40 percent lower.



AGE DISTRIBUTION AND DEPENDENCY RATIO (D)

FIGURE 16



The savings ratio used is the ratio of fixed capital formation to gross domestic product. It was measured by averaging the 4 most recent listings for each country from the U.N. *Yearbook of National Accounts Statistics*, 1967. Hence, the data represent an average for the early 1960's.

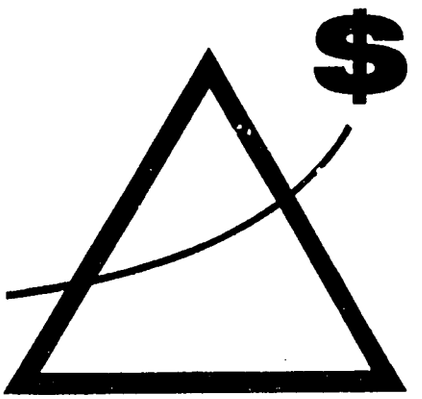
[2]The child dependency ratio comes from Bogue, Donald J., *Principles of Demography*, John Wiley & Sons, New York, 1969. The data are from the most recent census of each country in every case.

SAVINGS AND THE CHILD DEPENDENCY RATIO

FIGURE 17

CHAPTER 4

MEASURING THE EFFECTS OF A CHANGING AGE DISTRIBUTION ON ECONOMIC DEVELOPMENT



THE BASIC ECONOMIC-DEMOGRAPHIC MODEL

The full range of interactions between the age distribution and the economy is somewhat more subtle and complex than implied in the previous chapter. These interactions are most easily explained with the aid of a formal model such as the one illustrated in Figure 18.

In this model, the future age structure of the population is determined by the initial age structure and the subsequent effects of age-specific birth and death rates. The age structure together with the size of the population determines the numbers in the labor force. The size of the capital stock determines the number actually employed.

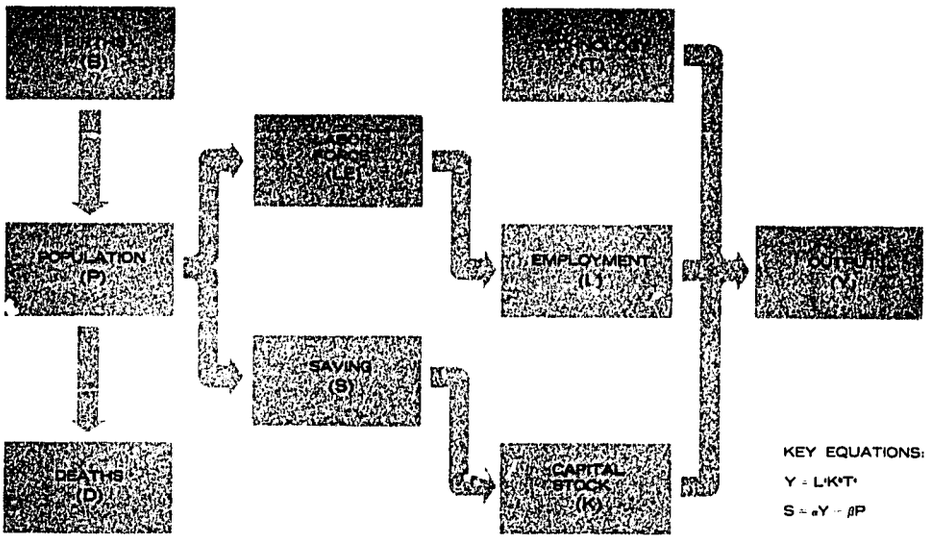
Each member of the population is assumed to have a minimum claim on total output. Hence, with fewer people, resources that otherwise would have been consumed are available for investment. Thus, the size and rate of change of population affect the growth of the capital stock.

The capital and labor inputs, plus an exogenous compounding factor, called technology, determine output. Output divided by population yields output per capita, a broad measure of economic development.

Such a model projects each of the variables over time. The demographic variables and the initial values of the economic parameters determine what happens in the economic projections. In the simplest case, depicted here, there are no feedbacks from the economic to the demographic sides of the model.

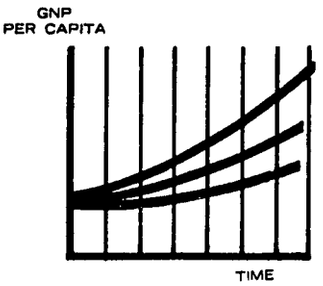
Two key equations in the model specify a production function which relates output to inputs and a savings function which determines the resources freed for investment by slowing population growth (Figure18).

The production function, relating changes in GNP to changes in labor, capital and technology, is a standard one used by economists. The savings function—also commonly used—expresses per capita savings as a function of per capita income.



HOW POPULATION GROWTH HELPS DETERMINE A COUNTRY'S FUTURE OUTPUT

FIGURE 18



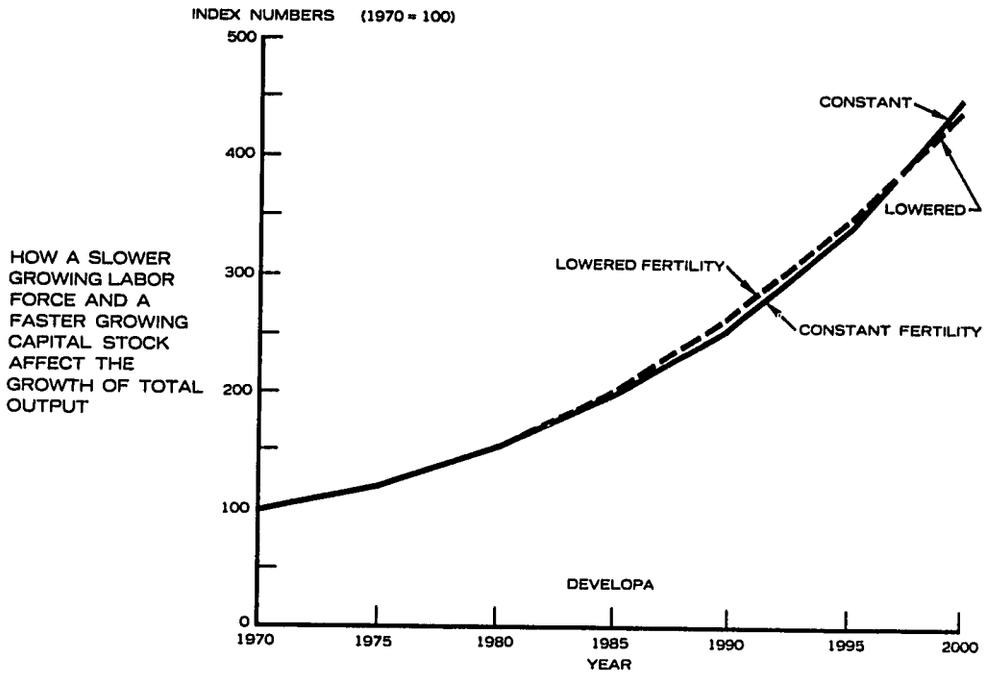
Two basic interactions in the model determine the effects of slowing population growth on the growth of total output. Their effects tend to be offsetting. On the one hand, a slower rate of population growth means that the labor force grows more slowly—but only after a lapse of fifteen or twenty years. This is the time it takes children to mature and enter the labor force. So, after this time lapse, the rate of growth of output due to the labor input will be slower under low fertility.

On the other hand, the rate of increase of the capital stock is amplified by a slower population growth because more resources are freed for investment. The resulting larger capital stock makes output grow faster. Thus, the output-diminishing effect of a smaller labor force is partially offset by increases in output due to the larger capital stock.

The net result is that GNP is virtually unaffected for the first fifteen years after a fertility decline. Thereafter, for the next fifteen or twenty years, in a typical case, GNP rises slightly faster under lowered fertility. Finally, in about twenty-five to thirty years, GNP under constant fertility catches up and surpasses GNP under lowered fertility (Figure 19).

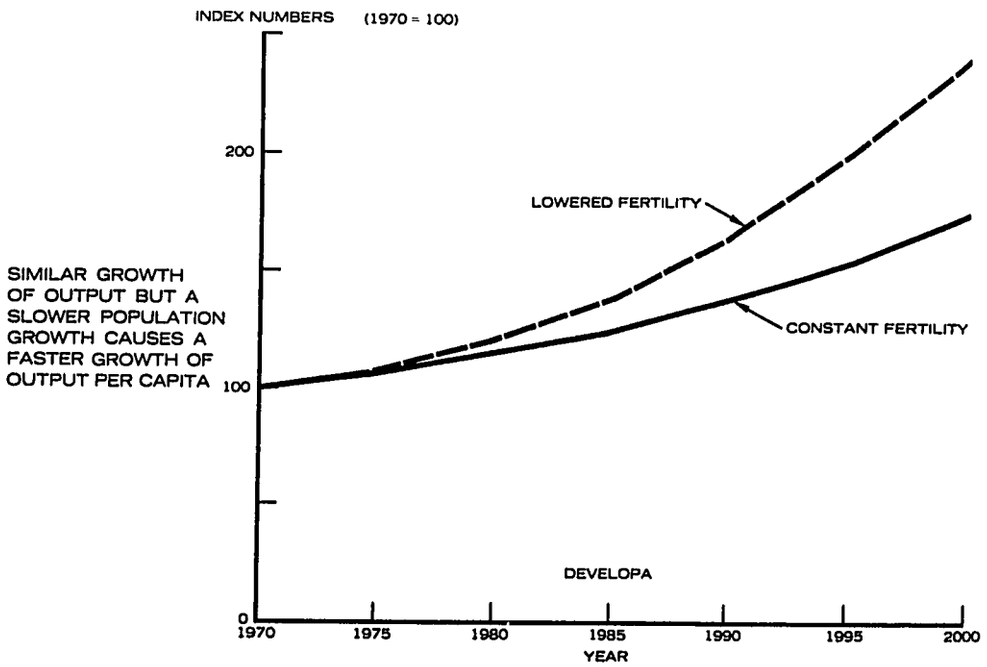
The important conclusion of the exercise follows logically from the above result: with almost the same GNP under constant and lowered fertility but with fewer people, GNP *per capita* must rise much faster with declining fertility* (Figure 20).

*These projections were made for a hypothetical country called DEVELOPA. For a complete description of DEVELOPA and of the assumptions used in making the projections, see Bennett, J. and S. Enke, *Population Growth and Economic Development, Background and Guide*, prepared for the U. S. Agency for International Development, Santa Barbara, 1971.



GROWTH OF GNP

FIGURE 19



GROWTH OF GNP PER CAPITA

FIGURE 20

ECONOMIC IMPLICATIONS OF LOWERING FERTILITY FOR THE FAMILY

The model also shows how slowing population growth can reduce disparities in income distribution. With a faster growing capital stock and a slower growing labor force, the marginal product of labor and hence labor's rewards tend to rise relative to the returns from investing in physical capital (Figure 21). Since most families in the lower income brackets derive all of their incomes from labor, while many wealthy families derive a substantial portion of their incomes from interest on capital, an important side effect of slowing population growth is to narrow the income gap between the two groups.

Large families and poverty tend to go hand in hand. The reasons for this are manifold and not easily differentiated, making it difficult to incorporate a family size variable into the model. However, it is not difficult to imagine many advantages accruing to a family which limits its size, advantages which no doubt strongly influence its ascent up the socio-economic ladder over a period of time (Figure 22).

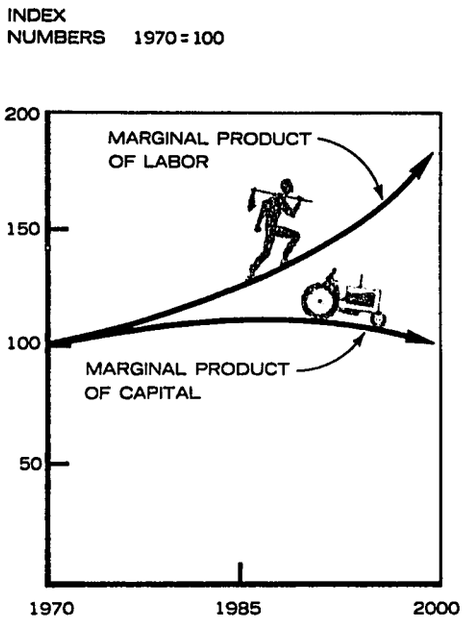
One supposed *disadvantage* of limiting family size is that children may provide the only form of old-age insurance for many parents in LDC's. In these countries, savings institutions and securities markets are often non-existent, government or private life insurance largely unavailable, future inflation likely and real property unattainable or insecure. If the average family in the LDC's is as large as it is today, because of parents' desire for old-age security, then voluntary family planning programs alone will have little effect on reducing birth rates.

However, a recent study has shown that birth rates as high as current ones are not ordinarily required for old-age insurance.* With contraception available, births can be spa' ed further apart so that fewer children can provide the same old-age insurance that larger families provided in the past. For most of the less developed countries, the difference in required birth rates could reduce population growth rates by as much as one percent per annum.

*See O'Hara, Donald, *Are High Birth Rates Required for Old-Age Security?*, General Electric TEMPO, Santa Barbara, 1970.

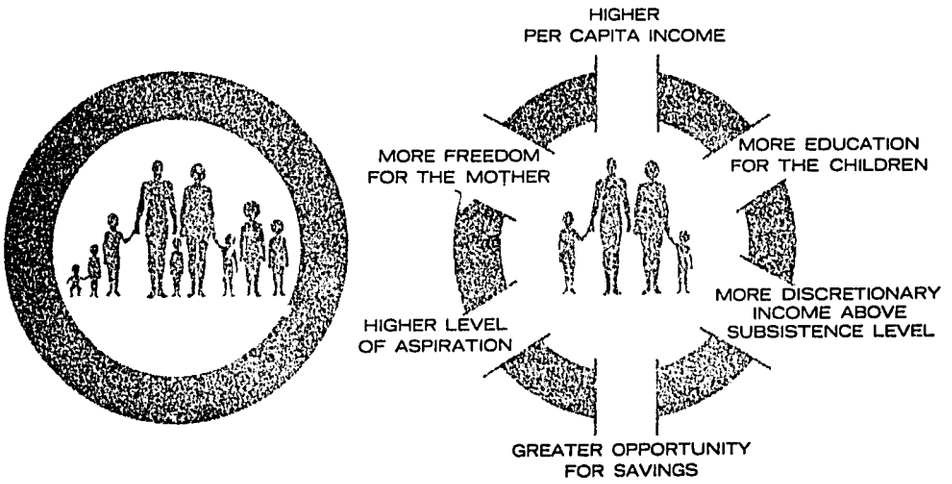
THE MARGINAL PRODUCT OF LABOR RISES RELATIVE TO THE MARGINAL PRODUCT OF CAPITAL TENDING TO REDUCE DISPARITIES IN INCOME DISTRIBUTION*

*FROM PROJECTIONS WITH THE MODEL FOR A TYPICAL LDC



THE IMPACT OF LOWERED FERTILITY ON THE MARGINAL PRODUCTS OF LABOR AND CAPITAL

FIGURE 21



QUALITATIVE ADVANTAGES OF LIMITING FAMILY SIZE

FIGURE 22

PART TWO

ECONOMIC ASPECTS OF THE SOLUTION

SUMMARY

Over thirty less developed countries today are engaged in efforts to reduce population growth through family planning. Nevertheless, the vast majority of adults throughout the world remains unexposed to modern contraceptive technology. Family planning has so far failed to have any significant impact on world population growth.

The problem lies partly in the low level of commitment of resources. No country in the world spends even a fraction of one percent of its GNP on fertility control, yet most spend five to ten percent of GNP on economic development. Diverting even a small portion of these traditional development expenditures to family planning could significantly reduce fertility and promote economic development as well.

To prevent currently unwanted births, which is the expressed goal of most family planning programs, no more than ten percent of the total population need be directly involved. With existing contraceptive technology, it should not, in principal, cost more than around $5 per acceptor per year to service this fraction of the population. In per capita terms for the nation as a whole, the cost would be about 50¢—far less than the roughly $10 per capita that most nations now spend on economic development.

However, given the nature of public programs, administrative costs may drive the actual costs of family planning programs much higher than the hypothetical ones calculated above. We simply do not know what it would cost to enlist ten percent of a population in family planning programs. No program so far has succeeded in covering more than about 2.5 percent of the people in any country. We do know that in 1968, costs per acceptor per year in seven country programs ranged between $2 and $8. But the same data indicate that costs per acceptor tend to rise sharply after an initial one-fourth to one-third of the eligible couples has been enlisted.

Allowing for the hazardous nature of generalizing from a few cases, it nonetheless seems that most countries can probably prevent a birth for something like $30 or less for the next decade or so. For this investment, the model developed in Chapter Four shows that in a typical LDC a return of approximately $2,000 in discounted additions to per capita income can be

expected. The same $30 spent for traditional development investment might yield about $100. Thus, in this highly simplified calculation, the investment in birth prevention turns out to be twenty times as effective in promoting economic development as an expenditure on capital goods.

If the above calculations are even close to correct, then governments have a strong incentive to commit more funds and efforts to family planning. Suppose, however, that the number of children wanted by individual couples adds up to a population growth rate which the government decides is too high for the good of the nation as a whole. In this case, simply providing more contraceptives and family planning clinics will not suffice. A more comprehensive approach to population control is required.

Population control can logically be approached by governments on four levels. The first level of effort, encompassing family planning, attempts to reduce the cost of preventing or terminating pregnancies and its focus is on technique. The second level of population control aims at making couples bear more of the cost of rearing children, e.g., educational costs. Its primary aim is to undermine the current pronatalist bias of existing governmental policies. The third level attempts to reward couples who limit their families through various bonus, tax and welfare programs. The fourth and most drastic level employs the coercive powers of government to restrict family size. However repugnant such measures may seem, a balanced discussion of population control demands their consideration.

CHAPTER 5

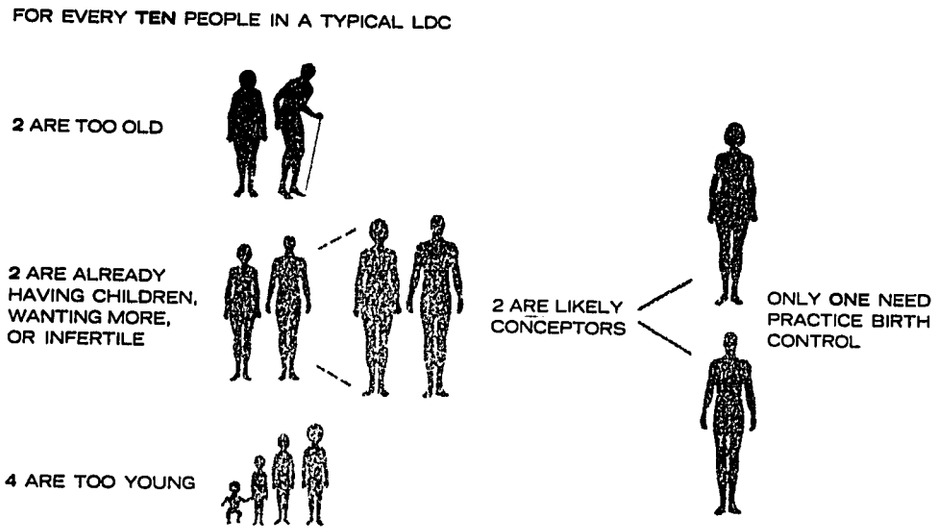
COMPARING THE BENEFITS AND COSTS OF SLOWING POPULATION GROWTH

THE DEMAND FOR FAMILY PLANNING SERVICES

Family planning programs are directed primarily at facilitating the prevention of unwanted pregnancies. Hence, the target population for such programs cannot comprise much more than ten percent of the total population. For every ten people in a typical LDC, approximately four are too young to have children, two are too old or not having regular sexual intercourse, and two are either having children, want more or are naturally infertile. Only two, then, are left as potential contraceptors, and only one member of each couple need practice birth control in order to prevent conception (Figure 23).

In actual practice, no family planning program has succeeded in enlisting more than a fraction of this target population. The Korean program, one of the most successful, was servicing only 23 percent of the eligible couples in 1969. The relatively new Tunisian program was servicing only five percent.

In short, no family planning program so far has succeeded in attracting more than about 2.5 percent of the total population and most programs reach a far smaller percentage than this. Thus, the ten percent figure used above provides an upper limit for estimating the maximum target population for a voluntary national family planning program.



DETERMINING THE TARGET POPULATION

FIGURE 23

UNDER THE BEST CONDITIONS VOLUNTARY CONTRACEPTORS WOULD PROBABLY NOT TOTAL MORE THAN 10% OF THE TOTAL POPULATION

CONTRACEPTIVE METHODS AND THEIR COSTS

The past decade has witnessed substantial improvements in contraceptive technology. As late as 1963, birth control primarily consisted of "traditional" contraceptive techniques such as rhythm, withdrawal, abstinence, condoms, contraceptive foams and jellies, and the diaphragm. The failure rate was high.

Today, people can use a wide variety of new, effective and often inexpensive devices and methods: the pill, the IUD, a greater variety of spermicides and applicators, and various sterilization procedures, as well as the traditional techniques. The IUD has come to be the most frequently used device in family planning programs in the LDC's. The cost of manufacturing an IUD is about only $.02. The bulk of the cost is for insertion of the device and subsequent check-ups, which may run as high as $5. Costs of other devices have been significantly reduced in recent years. Condoms can now be purchased for as little as $1.50 per gross (144). A monthly cycle of pills can be bought in bulk for a few cents per day.

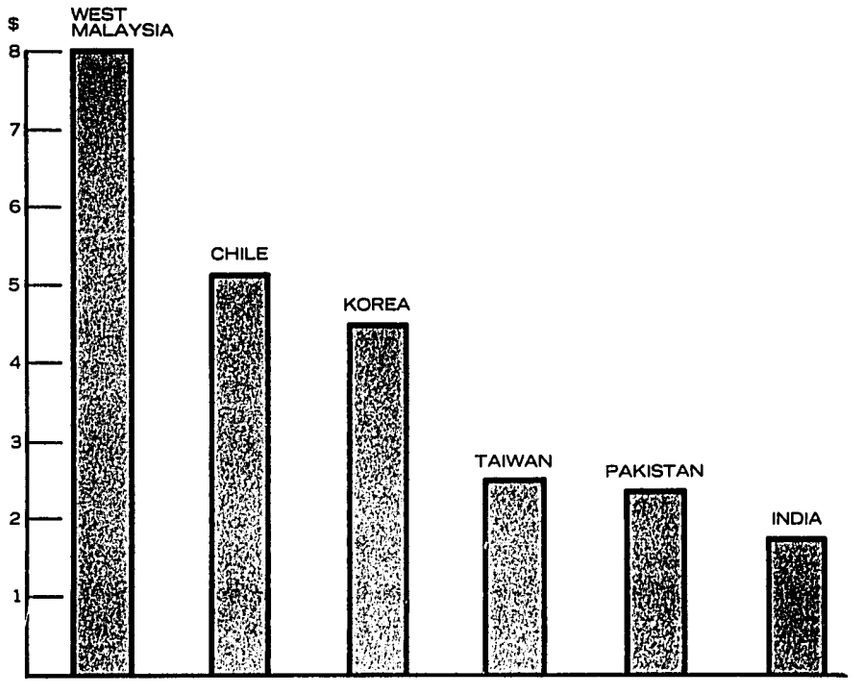
THE MAXIMUM DIRECT COST OF A PROGRAM

A feasible mix of contraceptive methods in a typical LDC should not presently cost more than $5 per accepting couple per year. New techniques under development, such as the once-a-month injection, may considerably reduce this cost in the future. With a maximum of ten percent of the population covered, this would mean an annual cost of approximately 50¢ per capita.

Most LDC's spend at least $10 per capita annually for economic development. Hence, the direct costs of a family planning program would not consume more than a fraction of the existing development budget.

The actual financial experience of various programs has been mixed, as shown in the chart of average costs which range from a high of $8 per acceptor per year in Malaysia to a low of $2.40 in Pakistan, with most programs at the lower end of the spectrum (Figure 24).

Thus, the figure of $5 per acceptor per year used above probably is a conservative high estimate for average costs in a typical program.



SOURCE: PRELIMINARY FIGURES SUPPLIED BY THE U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

AVERAGE COST PER ACCEPTOR PER YEAR - 1968

FIGURE 24

THE COST OF PREVENTING A BIRTH

For a variety of reasons, the cost per birth prevented is substantially higher than the cost of a year of contraceptive protection for one couple. For example, with characteristic age-specific fertility rates, three or four women, on the average, must practice birth control to prevent the birth of one child. This number increases with increasing average age of the participants.

Experience has shown that a high percentage of participants are women between the ages of 30 and 50 who already have several children. They are past the period of high risk of pregnancy and are highly motivated to prevent an additional birth anyway. Thus, in practice, programs have enrolled primarily those women who already have a low risk of pregnancy.

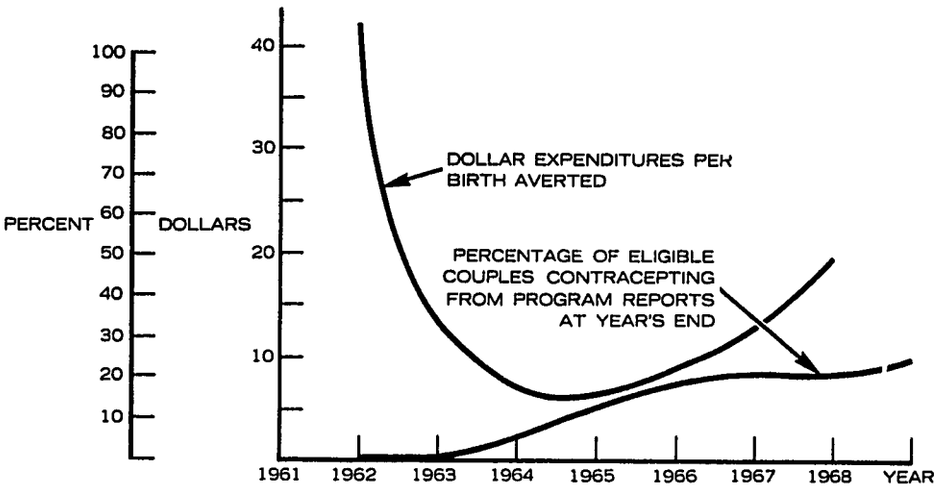
Another costly feature of family planning programs is that they are characterized by very high dropout rates, especially among pill users. Women are especially fertile for a time after discontinuing the pill. Therefore, some fraction of the funds spent in the program not only fails to prevent births but may even increase the risk of pregnancy for some women.

Finally, there is always some risk of contraceptive failure which, while statistically not very important, no doubt increases people's reluctance to enter the program and thereby raises recruiting costs.

Average costs tend to fall first and then rise as the percentage of eligible couples in the program increases beyond an initial ten or fifteen percent (Figure 25).

Among the seven country programs shown in Figure 26, cost per birth prevented, averaged over several years, ranges from a high of $60 in West Malaysia to a low of around $9 in India.

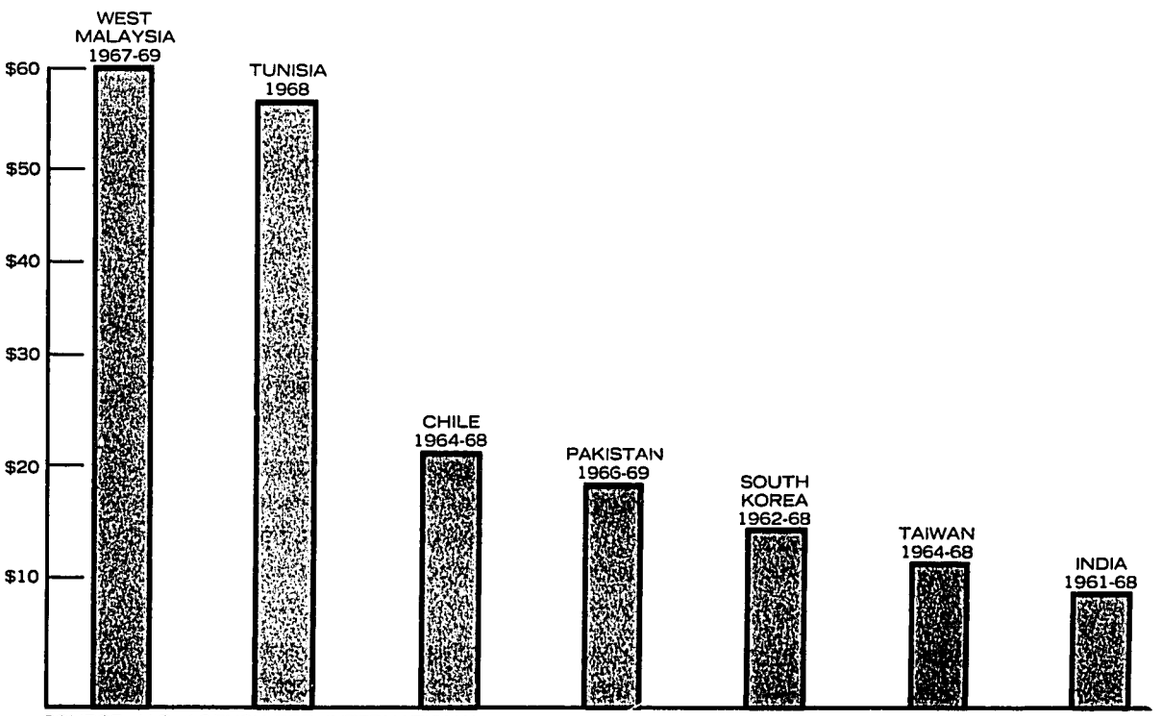
Despite the difficulty of generalizing from these figures, it is probably safe to estimate that a birth can be prevented in most LDC's for not more than $30 over the coming decade, and perhaps for much less with the introduction of new techniques such as the once-a-month shot or the morning-after pill which are now being developed.



SOURCE: U.S. AID, UNPUBLISHED PRELIMINARY ESTIMATES

ASPECTS OF FAMILY PLANNING IN KOREA

FIGURE 25



SOURCE: U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT, OP. CIT.

AVERAGE COST PER BIRTH PREVENTED IN SEVEN COUNTRY PROGRAMS DURING THE 1960'S

FIGURE 26

THE ECONOMIC BENEFITS OF PREVENTING A BIRTH

Various methods have been used to estimate the net benefit to society from preventing a birth. The general approach consists of subtracting the expected consumption of an unborn child, over his lifetime, from his expected production.* It turns out that for a typical LDC, at discount rates in excess of about four percent, the value of an additional birth is negative by most calculations.

An alternative approach, taking advantage of the basic economic-demographic model outlined in Chapter 4, is to discount the stream of additions to per capita income which result from preventing a birth. The present value of this dividend stream, then, represents the maximum reward that society could afford to offer a couple to prevent a birth. From this figure, the actual cost of preventing a birth is subtracted, yielding the net benefit to society.

Experiments with the model, using a typical LDC case where per capita income is initially $200 and population is around ten million,** show the present value of the future additions to per capita income as the result of preventing one birth to be around $2,000. Deducting the estimated average cost of preventing a birth of around $30, the net benefit to society is $1,970 (see following explanation).

This calculation should only be regarded as illustrative and approximate. The results can vary widely depending upon the discount rate chosen and various assumptions of the model. However, under almost any combination of assumptions, the plausible value of preventing a birth will far exceed the cost in most LDC's.

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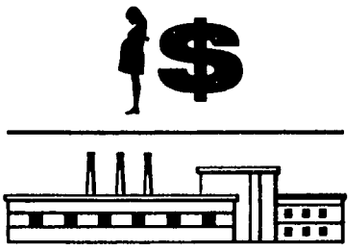
* This involves discounting the expected dollar value of the consumption-production stream of the unborn child to derive a net present value.

** DEVELOPA, *op. cit.*

COMPARING INVESTMENTS IN BIRTH CONTROL WITH TRADITIONAL DEVELOPMENT INVESTMENTS



In a typical LDC, the $30 investment required to prevent one birth would produce about $10 in additional annual income through investment in plant and equipment. At a ten percent discount rate, this income stream in perpetuity has a present value of $100. The same investment in birth control can yield $2,000, as we have already seen. Thus, by these calculations, a dollar invested in birth control is twenty times as effective in promoting economic development as a dollar invested in the traditional way (Figure 27).

It takes $3 invested in additional plant and equipment to produce $1 in additional output

It costs $30 to prevent a birth worth $2000 today in discounted future additions to per capita income

That same $30 invested in plant and equipment would yield a perpetual income stream of $10 per year

YEAR	1	2	3	∞

$$\text{PRESENT VALUE} = \$10 + \frac{\$10}{1+r} + \frac{\$10}{(1+r)^2} + \cdots + \frac{\$10}{(1+r)^\infty}$$

$$PV = \frac{\$10}{r}$$

AT A DISCOUNT RATE OF 10% the present value of $10 per year in perpetuity is **$100.**

$$\frac{\text{PRESENT VALUE OF PREVENTED BIRTH}}{\text{PV OF RETURN ON OTHER INVESTMENT}} = \frac{\$2000}{\$100} = 20$$

COMPARING RETURNS FROM BIRTH CONTROL WITH OTHER DEVELOPMENT INVESTMENTS: A HYPOTHETICAL EXAMPLE

FIGURE 27

Other estimates of the comparative advantage of investing in birth control have ranged as high as 100. Because of the wide variety of possible assumptions and different methods of calculation, no single estimate should be taken too seriously. Furthermore, these estimates have generally failed to take account of the fact that marginal cost per birth prevented may be far higher than the average cost, and it is the marginal cost which is relevant to investment decisions.

Recent data allow us to estimate the marginal cost per birth prevented in the seven programs shown in Figure 28. For the sake of illustration, suppose that benefits will amount to five times current per capita income.* What then would be the benefit-cost ratio of additional investments in family planning in each of the seven countries?

Figure 28 shows that, except for Korea and Tunisia, investment in family planning can be expected to yield far higher returns than traditional investments. The results for Tunisia are not conclusive because the program is relatively new and marginal costs per prevented birth are falling. However, marginal costs are definitely rising in Korea, and further expenditures on birth control in that country may be difficult to justify on economic grounds without some additional cost-saving innovations, unless returns are far higher than those estimated in Figure 28.

		B	C	
COUNTRY	GNP PER CAPITA IN 1968[1]	TIMES 5 EQUALS BENEFITS	MARGINAL COST PER PREVENTED BIRTH[2]	B/C
CHILE	606	3030	136	22.3
MALAYSIA	326	1630	93	17.5
PAKISTAN	121	605	48	12.6
TAIWAN	300	1500	208	7.2
INDIA	84	420	110	3.8
KOREA	188	940	2506	.38
TUNISIA	74	370	660	.56
	TRADITIONAL INVESTMENTS			3.3[3]

[1]SOURCE: Office of Statistics and Reports, Bureau for Program and Policy Coordination, Agency for International Development, Gross National Product, April 30, 1970

[1]See Figure 27.

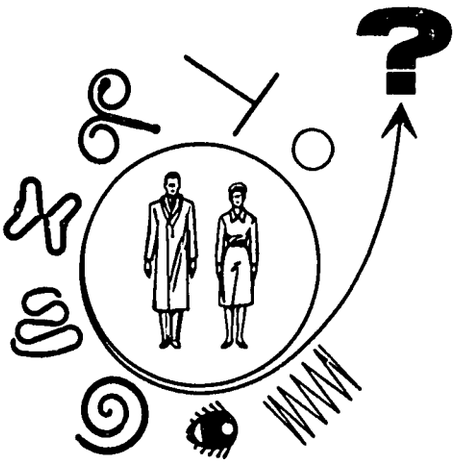
SOME ROUGH BENEFIT COST RATIOS OF INCREMENTAL INVESTMENTS IN 7 FAMILY PLANNING PROGRAMS

FIGURE 28

* Recall that in the DEVELOPA case, benefits from preventing a birth turned out to be ten times current per capita income.

CHAPTER 6

WILL FAMILY PLANNING SUCCEED?



WILL FAMILY PLANNING SOLVE THE POPULATION PROBLEM?

Family Planning Has an Important but Limited Role

Family planning organizations usually do not claim that their efforts will solve "the population problem." Indeed, most such organizations are not concerned with overall social issues, but rather with giving each woman more choice of whether or not to have a child.

The purpose of family planning assistance is accordingly to prevent unwanted pregnancies and children. In some societies, such as the United States, according to recent research, the net reproduction rate would fall to replacement levels if *all* unwanted births could be prevented.* Whether this would be true in the developing countries is an open question, but certainly eliminating unwanted births would *slow* population growth.

The result of the U.S. study and the relative success of certain family planning programs in the developing countries, such as those in Taiwan and Korea, have tempted some to claim that the family planning approach alone is sufficient for current population control efforts. This claim has touched off a heated debate over the direction of future population policy (Figure 29).

The advocates of the family planning approach argue that what is needed is simply the commitment of more resources and manpower to voluntary birth control programs. The thrust of their efforts is to enlist greater official support for existing programs and to institute programs where they are lacking.

The critics of the family planning approach do not dispute the desirability of expanding family planning programs, but fear that overblown claims for family planning will act as a palliative. Governments and international organizations in the population field may be tempted to ignore or delay taking additional, urgently-needed measures to stem population growth. In short, the critics fear that acceptance by many governments of token family planning programs tends to subvert true population control efforts and postpones a real coming to terms on the part of governments with the full implications of continued population growth.

Family Planning May Not Work Fast Enough

Even if it were true that simply eliminating unwanted births would eventually cause population growth to cease or at least slow it to the point of not seriously jeopardizing national goals, voluntary family planning might not work fast enough. The rate of decline of population growth might be too slow to prevent serious overpopulation in the interim. It is doubtful if national family planning efforts, under the best of circumstances, can succeed in reducing population growth by as much as 1% in 20 or 30 years. The interim population growth implied by these and longer delays is shown in Figure 30.

No criticism of the family planning approach should be interpreted to mean that government programs should not always stress voluntary contraception. But they may have to offer abortion as a "back-up" under some circumstances. In addition they may have to vigorously educate adolescents and younger couples, before they have too many children, concerning the possibilities and advantages of birth control. Traditional family planning was passive. Expanded government programs must be more active and positive if they are to serve overall social objectives.

ACCOMPLISHMENTS

- Worldwide surveys show overwhelming approval of FP by potential practitioners.
- More than 30 countries are currently trying or planning to reduce population growth.
- Political leadership in most countries is aroused.
- People in the LDC's want less children than they are currently having as shown by every comprehensive study.
- New devices such as the pill and the IUD have revolutionized FP in the past 10 years.
- Chemical control of conception is in its infancy—major breakthroughs are just over the horizon.
- New techniques and enlarged markets will bring down the cost per prevented birth.
- Private communication about FP is much greater than anticipated.
- Experiments show that illiteracy and rural residence are not significant barriers to acceptance of FP.
- FP is just starting to pay off. Much criticism is premature.

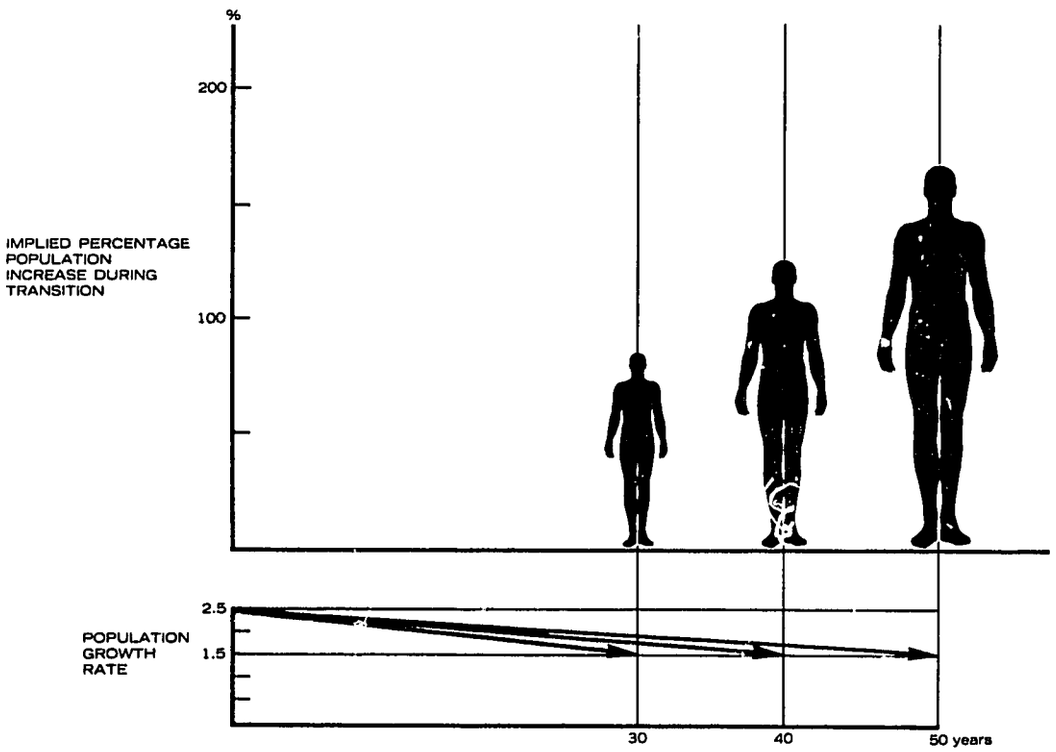
SHORTCOMINGS

- FP only strives to eliminate unwanted births. In LDC's this still implies a high rate of multiplication.
- By making individual choice sovereign in determining family size, FP ignores society's interest.
- People continue to have more children than they say they want, even where FP is available.
- Many countries have endorsed FP but have done little to implement it.
- FP focuses on contraceptive technique and often opposes or ignores other vital fertility control measures such as induced abortion, sterilization and economic and social incentives.
- Some of the apparent success of FP is illusory—Acceptors are simply substituting one device for another—programs attract mostly high-parity women over 30 for whom the risk of pregnancy is low anyway.
- Most FP programs are characterized by high dropout rates. Marginal costs per acceptor will rise steeply once the 20% or 25% cream of highly-motivated women is skimmed off.
- FP is a palliative which permits people to avoid the difficult political and psychological issues of true population control.
- FP is only one element in the multi dimensional set of problems surrounding economic development. Preoccupation with this one element distracts us from seeing the complete picture.

THE FAMILY PLANNING DEBATE

FIGURE 29

*Bumpass, Larry and Westoff, Charles, *"The Perfect Contraceptive Population: Extent and Implications of Unwanted Fertility in the U.S."*, Unpublished Draft, Princeton, 1970.

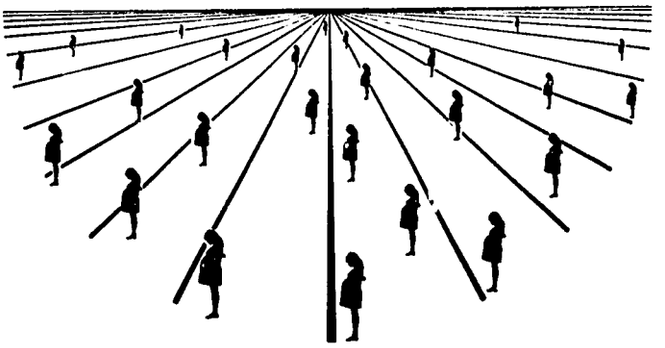


"BRAKING DISTANCE": IMPLIED RELATIVE POPULATION GROWTH FOR A TYPICAL LDC CAUSED BY DELAYS IN FERTILITY REDUCTION

FIGURE 30

CHAPTER 7

ASSERTING COLLECTIVE INTERESTS IN LIMITING POPULATION GROWTH



Eliminating Unwanted Births Is Probably Not Enough

Numerous studies in the LDC's indicate that the average couple wants four or more children. With this number of births and projected mortalities, a typical LDC population will double every forty years. Such rapid growth, if continued for several generations, will jeopardize the economic aspirations of most governments.

The above-cited evidence alone could justify additional governmental activity in the sphere of population control. However, the case is further bolstered by other theoretical and practical considerations concerning the proper role of government in a free society and the nature of free choice over family size.

The Rights and Obligations of Governments

Frequently individuals transfer some of the costs and benefits of their personal decisions to society at large. Where such costs outweigh the benefits derived by society, government is traditionally accorded the right, and indeed the obligation, to redress the balance. This often means shifting some of the costs back to the individual. In the area of population control, such policies as increasing parental contributions to educational expenses or eliminating tax exemptions after a certain number of children are examples.

Government in a free society should also attempt to persuade the individual not to make self-injurious decisions which he mistakenly perceives to be in his best interest. In matters of family size, the barriers imposed by extreme poverty make it practically impossible for couples to realize the full range of options open to them. Not only are they restricted by their ignorance of reproductive physiology and contraceptive technique, but their preferences are strongly conditioned by religious doctrines and anachronistic cultural norms.

Furthermore, many governments themselves have restricted free choice in the past by prohibiting abortion and the dissemination of contraceptive information and devices.

New Directions for Population Policy

The first step toward a comprehensive population control policy is to determine reasonable goals for slowing population growth. The second step is to eliminate legal restrictions on preventing or terminating pregnancies. The third step is to counter-balance the inherent pro-natalist bias in many other government policies, such as benefits and exemptions which increase with the number of children (Figure 31). The fourth step, required if the first ones are not sufficient,

consists of attempting to increase couples' incentives for not having children through various bonus plans and propaganda campaigns.

Coercion Is a Last Resort

The final step, which will hopefully never be taken, is to increasingly restrict the freedom of couples to reproduce. Measures might include the separation of the sexes during a period of required national service, raising the legal marriage age and sterilizing women or men after some legal limit on births.

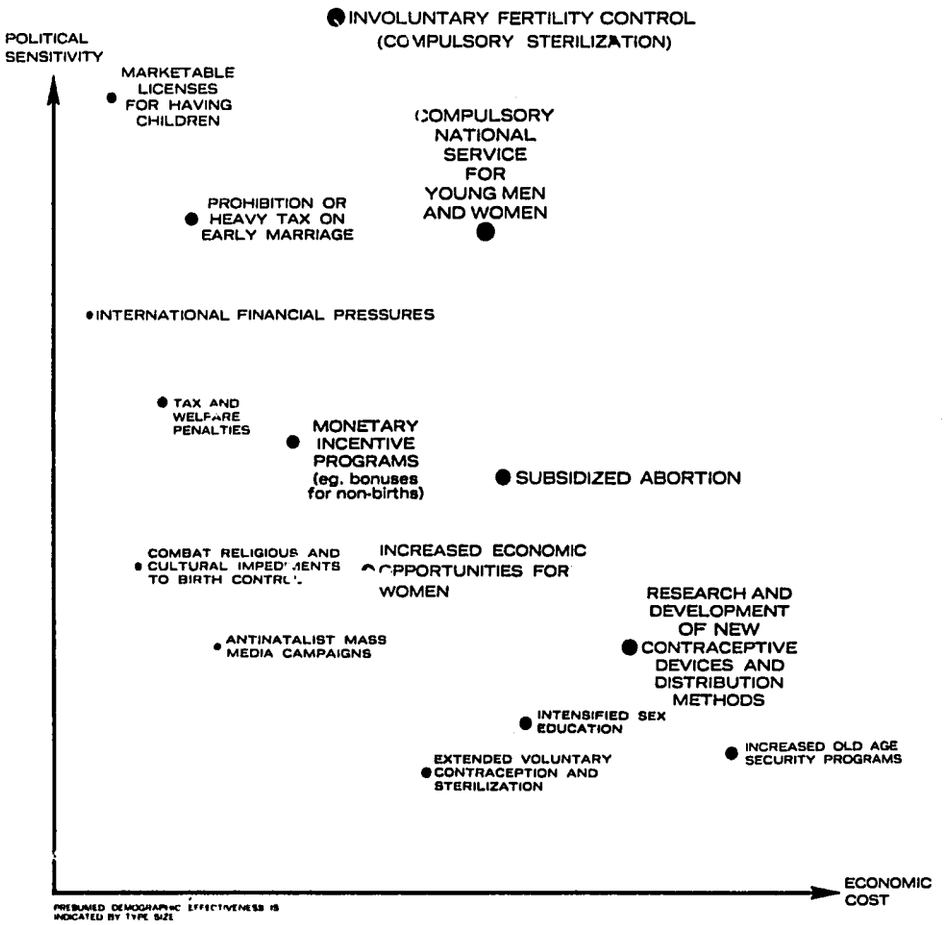
PROHIBITING ABORTION OR THE DISTRIBUTION OF CONTRACEPTIVES AND CONTRACEPTIVE INFORMATION.	FEMALE EMPLOYMENT DISCOURAGED—LACK OF LEGAL SANCTION AGAINST SEX DISCRIMINATION.
CHILD LABOR ALLOWED—CHILDREN CAN EARN FOR PARENTS.	PREGNANCY LEAVES WITH VACATION PAY.
EARLY MARRIAGES PERMITTED.	SUBSIDIZED PUBLIC HOUSING AND HEALTH CARE.
FREE PUBLIC SCHOOLING.	FAMILY WELFARE ALLOWANCES.
INADEQUATE SOCIAL SECURITY MEANING PARENTS DEPEND ON CHILDREN IN LATER LIFE.	TAX DEDUCTIONS FOR CHILDREN.
INFLATION—ENCOURAGES DEPENDENCE ON CHILDREN RATHER THAN FINANCIAL INVESTMENT FOR OLD-AGE SECURITY.	EXPANDED PUBLIC HEALTH—REDUCES CHILD MORTALITY AND INCREASES FECUNDITY.

TYPICAL GOVERNMENT POLICIES CONTAINING IMPLICIT PRONATALIST ELEMENTS

FIGURE 31

Population Control Tradeoffs

Nothing in the foregoing analysis is meant to suggest that governments abandon socially desirable programs, such as free education, because of their pronatalist bias. However, they should be aware of the full implications of such programs in order to offset undesirable demographic side-effects. The difficult task for governments in embarking on further population control is to select a mix of measures that is both demographically effective and politically and economically acceptable in terms of the overall objective of promoting a better life for the people of the nation. Figure 32 suggests the tradeoffs implicit in a representative mix of conceivable policy measures.



POPULATION CONTROL TRADEOFFS

FIGURE 32