International Labour Review, Vol. 121, No. 6, November-December 1982

Basic-needs planning and forecasting: Policy and scenario analysis in four countries

Michael HOPKINS and Rolph van der HOEVEN*

1. Introduction

The 1976 World Employment Conference emphasised that policies designed to meet the basic needs of the poorest groups in society could be effectively pursued only in the context of a broader development strategy encompassing economic growth, structural change and institutional reforms. Readers of the *Review* will already be familiar with the thinking underlying the basic-needs approach, and the present article will therefore merely report on work designed to specify in more detail than hitherto broad policy alternatives for future development strategies. The systems approach has been used in order to show how a large number of interacting policies can be analysed in terms of how they affect the meeting of basic needs. In addition, the systems have been quantified in order to produce a socio-economic planning model. This model was applied to four countries–Brazil, India, Kenya and Colombia, for each of which a case study was developed with the collaboration of national institutes. Hence the underlying work reported on here is "living", i.e. the models sit on computers in the respective countries, policy analysis experiments have been and are being performed, some models are being used as educational instruments for students and all are changing shape over time to meet new demands and to take account of new theories and data or changes in the political climate.

In the rest of this article we take a snapshot look at the work as it exists now and describe how the four country studies have been used to analyse, with the aid of various scenarios, the relative importance of international versus national policy measures in meeting the basic needs of the poorest people and, in consequence, creating full productive employment. Before we examine some of the results, however, we shall briefly describe the methodology used, the basic assumptions and philosophy behind the country analyses, and the scenario approach of the project.

* International Labour Office.

2. Methodology

The systems approach

The systems approach attempts to pull together all relevant factors affecting a given problem.[1] Briefly, the sequence of events is as follows: the definition of the problem, the identification of the boundary of the system, the identification of the major variables within this boundary, the determination of the causal links between each of them, a mathematical representation of these links (usually in the form of a model), the calibration of the model with real-world data, validation and verification of the model with real-world data, and, finally, the performance of a number of experiments or policy analyses in order to obtain inferences as regards the real world. None of these steps is independent and during the process a number of iterations must be made. Clearly a planning or forecasting model devised from such an approach will suffer from all the problems of other forms of policy analysis, in particular those associated with limitations in data and theory. However, the "mental" models that guide analysis and decision-making suffer from the same limitations and, moreover, they cannot be made explicit in the same way as a mathematical model. Its very explicitness makes a mathematical or systems model easier to criticise than a "mental" model, a fact which often brings the process into disrepute. Paradoxically, however, ease of criticism should perhaps be seen as an advantage of the systems approach over the "mental" model, since the latter cannot be easily identified nor can its faults be discovered, its lack of theory and data noticed or its implicit forecasts examined.

The model used

The model as applied to each of the four countries consisted of five major subsystems: a *demographic* (or population) subsystem showing the interactions of demographic factors with the economy and education; an *economic* subsystem which sets up the national accounts and final demand for products; a *labour market* subsystem which determines the supply of, and demand for, labour and the supply of products; an *income and wage distribution* subsystem which allocates income amongst social groups and computes the distribution of this income; and, embedded in each of these subsystems but not distinct from them, a *basic-needs* subsystem which covers economic power, housing, nutrition, health and education.

In terms of disaggregation, population is divided into 15 age groups, subdivided into male/female, urban/rural, and three levels of education (incomplete primary, primary completed, secondary completed). There are between 10 and 15 economic sectors (depending on the country), each disaggregated into urban and rural and into modern and traditional. The

labour market subsystem distinguishes between self-employed workers, unemployed persons, employees and unpaid family workers.

The models are calibrated on data generally covering the years 1967-77. They are recursive, with a one- to two-and-a-half year time step (depending on the country) between successive interactions up to the year 2000.

Theoretically the models can be considered to belong to the family of closed dynamic input-output models with fixed prices. Growth is determined through investment, labour force increase and technical progress. Private investment is allocated according to an accelerator investment theory with an allowance made for distortions where capital-biased sectors are preferred. Public investment is exogenously determined in modern sectors. It is assumed that what capital is produced is used efficiently. In traditional sectors, except agriculture, supply follows demand because it is assumed that lack of effective demand in those sectors is the main constraint on growth and not capacity or supply bottlenecks. Equilibrium on product and labour markets is taken into account only in modern sectors. Even there equilibrium on product markets is achieved only over time and demand meanwhile determines supply. Over time, however, sectoral investment is adjusted so that the model can lurch towards product equilibrium in the next period, i.e. if demand exceeds supply for products in certain sectors investment is increased to match it, and vice versa. Labour supply is based on population growth, and participation rates vary as a function of wages and employment opportunities. Labour demand is determined through using multipliers on output. This simple formulation was made in order to make comprehension of the total system easier, and because of the lack of an empirically reliable theory of the labour market. The price of labour, given the wage share of value added and labour demand, is determined residually—again largely in order to simplify the model and its comprehension.

Basic needs in the model

A main aim of the work was to introduce the concept of basic needs into a socio-economic simulation model. Arguably, such an approach was necessary as all too often the debate on basic needs is couched either in generalisations of socio-economic phenomena or in analyses of micro-economic situations. As a first step, such generalisations are unavoidable. However, in order to gain some insight into the effects of basic-needs policies either as having trade-offs with, or as mutually reinforcing, other economic variables, quantification is essential and hence a dynamic simulation approach was chosen.

Basic-needs satisfaction should be viewed in terms not only of increasing individual well-being but also of providing greater possibilities for the future growth of the economy. Although this latter aspect is often

mentioned in discussions about basic needs, there are no studies that take it into account quantitatively. Thus, a major aim of our exercise was to analyse this relationship further. The main factors that simultaneously affect growth and the satisfaction of the individual's basic needs are the skill composition of the labour force, increased labour productivity, technical progress, migration from rural to urban areas and (in the longer run) birth and death rates.

How basic needs are met depends mainly on the economic structure and development path of the country; on external factors such as trade, capital inflows and outflows, etc.; and on cultural characteristics. In the project reported on here some of these factors were investigated, especially in the way they influence the internal economic structure.

Basic needs can be satisfied either through incomes deriving from wages and profits or through access to goods and services which are not provided by the market. Important, too, are the future income-earning opportunities and the possibility of mobility allowed by the social structure of the country. A major purpose of the model, therefore, was to distinguish between different social groups; their relative income and their access to non-market goods and services; and their relative power in deciding the future direction of society.

In summary, the important aspects of the analysis were that (1) it emphasised socio-economic groups, the distribution of their income and income-earning assets and how they were affected by basic-needs policies; (2) it took into account the relative position of the socio-economic groups in the economic system; and (3) it examined the effects of trade and aid.

The scenario approach

In order to capture the effects of the external factors of trade and aid on each of our country models and to help comparability across countries, a simple general framework of scenario analysis[2] was developed. Two global scenarios (G1 and G2) and two national scenarios (N1 and N2) were defined for the period 1980-2000, as follows:

G1: easy access of countries in the South to markets in the North, and an increase in world trade of consumer goods in the food, agriculture, textiles and light industry sectors;

G2: difficult access of countries in the South to markets in the North due to strong protective measures introduced against the South and requiring increased inter-South trade;

N1: increase in exports combined with import liberalisation but no concentration on human resources and basic needs;

N2: increase in exports as far as possible, but subject to the expectation that the North will become more protectionist, coupled with much stronger emphasis on rapid skill development and basic-needs satisfaction at the national level.

The Gs and Ns were combined so as to reflect the following cases:

Scenario 1: G1 plus N1–essentially the reference scenario in each case where past trends were extrapolated with optimistic assumptions concerning trade and aid relations;

Scenario 2: G2 plus N1–here the North increases protective measures making aid and trade links more difficult for the South, yet the South pursues an optimistic strategy which assumes greater penetration in Northern markets;

Scenario 3: G1 plus N2–here the North is expected to liberalise trade and aid, yet the Southern country concerned has decided that this is not going to occur in its case and adopts a more defensive posture, concentrating on developing human resources and meeting basic needs while seeking trade links with other Southern countries;

Scenario 4: G2 plus N2–the North introduces strong protective measures and reduces aid and the Southern country has anticipated this by taking up a defensive stand coupled with a concentration on human resources and basic needs.

As far as possible the policy experiments with each country model followed this scheme.

3. Scenario analysis with the four country models[3]

In the ensuing discussion we shall briefly explain how the scenarios for each country were conceptualised and then give some results of policy analysis. The main purpose of scenario analysis is not to forecast the future but to examine how economic and social trends behave under different circumstances by looking at a number of development paths that arise from alternative assumptions. As space is limited the description of the underlying models is restricted to a minimum. Each of the models, however, followed the outline described in section 2 above.

The Brazil case study

Because of the considerable amount of modelling work already done in Brazil, an existing model of Brazil was taken and gradually changed into the basic-needs model described earlier.[4] Four scenario experiments were performed: S1–Base scenario in which high growth is financed through exports and foreign capital; S2–More self-reliant than S1 with slower growth; S3–S1 plus attention given to basic needs; S4–S2 plus attention given to basic needs. Their results are summarised here.

The base scenario (S1)

This scenario is typified by high growth financed by exports and foreign capital flows. It is based on an optimistic growth trend for 1970-80, since this was the assumption at the time when the modelling work was done in Brazil. The main quantitative outcomes for the year 2000 are the following.

In this scenario GDP growth per annum was chosen to be 8.4 per cent for the period 1975-2000 as the result of a planned investment growth of 8.0 per cent per annum. Agriculture grows at 7.2 per cent, per capita income at 5.7 per cent and population at 2.6 per cent. Government expenditure grows just faster than income at 8.8 per cent per annum.

In terms of foreign trade, the base scenario shows a balance-of-payments deficit of around 24 per cent of exports in the year 2000, for two main reasons: firstly, because of the need to finance domestic investment through capital transfers from abroad (these grow at 15.0 per cent per annum over the years 1975-2000) and because of the high growth in imports (15.1 per cent per annum) compared with exports (13.0 per cent per annum).

In modern traded goods sectors, surplus production is exported and excess demand is imported. When this occurs both private and public investment in capital formation are redirected to or away from those sectors where deficits or surpluses are occurring; this results in a lag in equilibrium. In the base scenario the industrial sectors (mining, manufacturing and construction) produce 50.2 per cent of total value added in 1975 and in 2000. Income distribution worsens significantly over the model simulation. The demographic system as a whole is extremely stable despite a high degree of endogeneity for fertility and mortality rates. In the base scenario the participation rates of the population by sex, age, education level and location were kept constant at the level established by the 1970 Population Census. Over-all participation changes slightly over the period because of demographic changes caused by ageing, mortality and education. Over-all the participation rate for the active workforce is 34 per cent. Unemployment rises steadily over the period.

The distribution of economic power is not proportionate to the number of workers in each social group. In particular, employers in the modern sector hold nearly half the power in the country, whereas they account for only 5-8 per cent of the total economically active population. Similarly, subsistence farmers and unskilled workers hold less power relative to, say, their number of votes. In particular, unskilled workers, forming nearly 40 per cent of the labour force, are clearly the most disadvantaged since their numbers increase proportionately over the period but their economic power remains constant. The power distribution changes little throughout the base scenario. The fact that a power imbalance exists suggests that at some point or another the social tension that it implies will manifest itself.

The self-reliance and slow growth scenario (S2)

In this scenario private investment is chosen to grow at 5 per cent per annum and personal income taxes are sharply increased across-the-board by 35 per cent. The distribution of personal taxes across income groups is not changed and, as personal tax is progressive, the income distribution after tax changes somewhat. The movement towards self-reliance or less dependence on the outside world is clear. In addition, the incorporation of a tax of 35 per cent provides a further brake on the imports of luxury consumption items. Even though private consumption as a whole falls fairly slowly, domestic output grows at only 5.9 per cent per annum compared with 8.1 per cent in the base scenario because growth is constrained by lack of capital. This clearly illustrates the driving force of investment financed by outside capital flows in the Brazilian economy, since reduction of private investment considerably reduces the need for foreign capital. Exports drop slightly because output declines in the economy, yet the decline in the amount of debt to be repaid, coupled with the reduction in imports because of lack of effective domestic demand, leads to a significantly improved balance-of-payments position.

Even though per capita incomes fall by an average of 34 per cent by the year 2000, the experiment shows many positive effects: firstly, there is less dependence on the outside world; secondly, the social indicators do not perform too badly compared with a higher growth scenario; and thirdly, the distribution of income improves significantly.

The base scenario plus attention to basic needs (S3)

This scenario increases government spending on education, redistributes the burden of taxation and allows the impact of better nutrition to improve the productivity (and wages) of the two social groups most affected by poor nutritional levels. GNP growth remains almost the same as in the base scenario. Revenue from income tax is also much the same as in the base run, dropping slightly and reducing domestic savings because of the increased private consumption resulting from the redistribution of taxes. Hence it is implicitly accepted that poorer groups save less than richer groups. Yet the neo-Keynesian closure (assumed in the model) does not allow aggregate investment to decrease and thus foreign borrowing increases.

The combined effects of the three policy experiments appear at first sight to be contrary to expectations in that unemployment at first increases and then decreases but the pre-tax distribution of income becomes more unequal. Briefly, this occurs because the productivity experiment has the effect of pushing poorer workers into unemployment while boosting the incomes of richer workers still in jobs. Over time the increased growth from higher productivity, coupled with total effective demand for goods and

services, which has not decreased, actually serves to raise the over-all demand for workers even though income distribution worsens before tax, since the progressive tax distribution helps to correct for negative effects on demand. Finally, in S3 both the level of employment and the post-tax distribution of income marginally improve. This illustrates the importance of effective planning in an economy to counteract the negative effects of desirable increases in productivity.

Exports drop because the sharper focus on basic needs leads to higher demand from the poorer groups. Since excess capacity was used to increase exports in the absence of domestic demand higher domestic demand leads to a fall in exports and a rise in the demand for imports. The balance of payments worsens, the more so because the pattern of demand that prevails leads to reduced savings and, since aggregate investment remains the same as in the base scenario, forces up the need for foreign investments.

What hopes does this scenario hold out for an approach that centres on the satisfaction of basic needs? Firstly, it is clear that it falls far short of offering a complete basic-needs package: wealth and land distribution remain unchanged, few additional public services are included, the distribution of economic power is left unaltered, etc. Secondly, the expected returns to growth from an increase in the effectiveness and productivity of human capital (e.g. from income redistribution through taxation together with higher levels of education, nutrition and hence labour productivity) only just materialise within the 25 years covered by the simulation. However, towards the end of the period considered, improvements in employment and income distribution begin to work their way through the system.

The self-reliance and slow growth scenario plus attention to basic needs (S4)

This scenario illustrates the importance of capital accumulation and growth in meeting basic needs since, with low levels of investment and growth, the impact of redistribution and improvements in human capital–at least with the elasticities assumed here–is insufficient to make up for the shortfalls caused by smaller growth rates. This is clearly indicated by the large increases in unemployment and the worsening performance of the endogenous social indicators for life expectancy and nutrition.

The experiment thus implies that, although self-reliance and basic-needs satisfaction may be desirable goals, without growth and interaction with international markets the hoped-for economic benefits are not easily achieved.

Summary

It is difficult to perceive precise implications for basic-needs approaches

from the work carried out in Brazil, largely because the experiments that it was possible to perform and the model used were far from adequate for examining a full package of basic-needs policies. However, an important, although negative, conclusion is that the expected returns to growth from an increase in the effectiveness and productivity of human capital–arising from income redistribution through taxation coupled with higher educational and nutritional levels and the consequent increases in labour productivity–do not occur within the 25 years considered in these experiments. Moreover, an examination of the distribution of economic power showed little change from one experiment to another.

The results of the self-reliance and basic-needs scenario suggest that there is a choice between, on the one hand, desirable social objectives–basic-needs satisfaction and self-reliance–coupled with poorer economic performance and, on the other, higher growth through capital accumulation financed from international markets with all that that implies (increased external debt burden, more dependence, etc.).

Even with high foreign borrowing to finance investment a choice exists. Public policies must either concentrate on growth, leaving trickle-down (as in S1) to improve the satisfaction of basic needs, or make an early attempt at redistribution of income-generating assets so as to improve human capital and productivity with a view to a more immediate satisfaction of basic needs, while hoping that any adverse movements in the structural indicators (higher debt, lower growth and worsening balance-of-payments performance) will eventually be redressed. In our scenario experiments such improvements in the structural indicators do in fact occur. Hence, a strategy concentrating on redistribution *before* growth has the decided advantage that the poorest people are assured of the fulfilment of their basic needs immediately rather than after 25 years, and should be preferred to the extent that the improvement of the quality of human capital which a more adequate fulfilment of basic needs helps to bring about will eventually redress the adverse trends in other economic indicators.

The India case study[5]

The base scenario

The base scenario of the model essentially extrapolates past trends. In terms of demographic variables this implies a continuous decline in the total fertility rate, though at a decreasing tempo, from 190 per thousand in 1971 to 124 in 2000. The crude birth rate registers a decline from 42 per thousand in 1971 to 36.6 in 1981 and 30.2 in 2000. This is not, however, reflected in the over-all population growth rate because of the simultaneous rapid decline in mortality during the same period. The model suggests that female labour force participation will increase from 19 per cent in the base year to 30 per

cent in the year 2000, primarily because of the greater access of women to education and the associated reduction in fertility rates.

The share of the primary sector in GDP declines from 52.1 per cent to 47.9 per cent and that of the manufacturing sector steadily increases from 30.2 per cent to 33.4 per cent. One would have expected much more structural change over 30 years but, judging from the past performance of the manufacturing sector in real terms vis-à-vis the primary sector, these trends appear quite realistic. Parallel with these changes, the share of food in total private consumption drops from 64 per cent to 60 per cent. Most of the macro-economic variables like gross domestic product, private and government investment and consumption grow on average at just over 3 per cent per annum at constant prices. Exports, which have been growing at 5.4 per cent in the first 26 years of India's planned development, are assumed to grow on average at 6.6 per cent in the next 30 years under study. The rate of growth of imports is seen to decline from the long-term average of 3.6 per cent between 1950 and 1976 to 2.2 per cent during 1971-2001. Near self-sufficiency in food since the late 1960s and a growing level of sophistication in manufactures support these results.

The labour force increases from 136.8 million to 271.1 million in the rural sector and from 35.9 million to 106.5 million in the urban sector during the 30 years. Unemployment rates double in rural areas (from 8.9 per cent to 18.1 per cent) and rise from 6.2 per cent to 8.1 per cent in urban areas. Urban employment grows faster than rural owing to the favourable impact of the growth of manufacturing and service sectors.

Rural per capita income significantly improves in relation to urban per capita income. The rural income per adult equivalent is 53 per cent of the corresponding figure for urban in the base year but improves to 69 per cent in the year 2000.

The share of wages in GDP also improves marginally. The average earnings of employees and employers in rural areas increase by about 15 per cent during the 30-year period. The corresponding figures for urban areas register marginal improvement during the first 20 years (10 per cent for employees and 5 per cent for employers) and decline thereafter.

The over-all income distribution in real terms does not significantly change during the simulation period in this model since the income inequality trend during the last three decades has been estimated to remain about the same with a slight tendency to increase.

The illiteracy rate goes down from 70 per cent in the base period to 62.3 per cent in the final year. Primary and secondary school enrolments increase from 70 per cent and 20.5 per cent in the base period to 80 per cent and 32.7 per cent respectively. Thus, it appears that even when the economy is growing very slowly the educational variables are substantially improving. This is due to increasing private and government expenditure on education.

Though per capita income increases by only 37 per cent, per capita

private consumption expenditure on basic needs other than food goes up by 62 per cent.

Calorie consumption per capita goes up from 1,985 to 2,225 a day. Finally, the prospects for substituting commercial energy for the fuel wood energy used in the household sector appear to be extremely dim as the commercial energy availability index remains more or less the same throughout the period.

Alternative scenarios

Four scenarios were investigated in combinations of the two global scenarios.

G1 and G2 with two national scenarios: one which increased exports as far as possible, minimised imports in all sectors and gave favourable internal terms of trade for agriculture (N2); and one which also promoted exports but excluded import controls and left the terms of trade for agriculture untouched compared to the base run (N1). Unlike those for the other countries, all the simulations increased government expenditure on basic needs for education, housing and health. However, because of the changes in the terms of trade for agriculture N2 could be considered to be more biased towards basic needs than N1.

Combination of the global with the national scenarios gave S1: G1 (easy access to Northern countries) with N1 (export promotion, no import restriction, untouched terms of trade); S2: G2 (difficult access to Northern countries, emphasis on South-South trade) with N1; S3: G1 with N2 (export promotion, import restriction, improved agricultural terms of trade); S4: G2 with N2.

Comparative analysis of the four scenarios

In response to global scenario G1, S3 and S1 both emphasise the export of consumer goods to the North and both increase expenditure on basic needs. They differ in that S3 includes favourable internal terms of trade for agriculture and minimises imports, while S1 relaxes the import restriction. In response to global scenario G2, S4 and S2 promote exports of capital goods to Southern countries and also increase expenditure on basic needs by comparison with the base run. Once again, S4 and S2 differ from each other with respect to import policy and internal terms of trade.

None of the four scenarios has a population policy that directly affects the demographic subsystem. The indirect effect through feedbacks from the economic and basic-needs subsystems is weak. For these reasons the impact of the four simulations is greater on economic subsystem outputs than on demographic ones. It is evident that liberalisation of imports has a strong favourable impact on the volume of exports since they are quite high under

scenarios S2 and S1. The similar results of S1 and S2 also imply that the global scenarios G1 and G2 really need not affect India's export performance, provided the country adopts the appropriate response strategy. S3 and S4 are not the preferred scenarios as far as export maximisation is concerned. Increase in private investment is highest under S3 (113 per cent) and lowest under S2 (42 per cent). The percentage increase in private and government consumption also follows the same order, i.e. maximum under S3 and minimum under S2. Once again, the impact of the global scenario, be it G1 or G2, has little influence on investment responsiveness. Clearly this is because the Indian economy has historically had a relatively small foreign trade sector.

From the point of view of employment creation, strategy S1 is best, with rural and urban unemployment rates falling by 34.5 per cent and 40.3 per cent respectively. This is followed by strategy S2, with corresponding figures of 24.8 per cent and 26.6 per cent. In contrast, strategy S4 leads to an 8.4 per cent increase in the rural unemployment rate.

In terms of wages, strategy S3 is better than S2. This is because S3 has focused on labour-intensive–rather than capital-intensive–industrial exports and because the agricultural sector has been given favourable internal terms of trade. S2 in contrast has emphasis on capital-intensive exports, import liberalisation (which keeps domestic investments low) and relatively adverse internal terms of trade.

As far as basic needs are concerned, the increase in private per capita consumption of basic-needs goods and services is at its maximum under S3 (44.9 per cent), more or less the same (35 per cent) under S4 and S1 and least under S2 (23.6 per cent). The same order also holds for the other basic-needs variables considered. The impact of female life expectancy is substantially the same for all four strategies.

Summary

As the foregoing analysis shows, none of the strategies evolved in response to the two global scenarios is the best in all respects. Different strategies are good for the achievement of different development goals, so that to arrive at a single optimal strategy one would have to strike a balance by giving due weights to different development targets. However, the analysis indicates that strategy S3 appears preferable if one takes several of the domestic development goals into account, and strategy S2 is most suitable for the maximisation of trade as a whole.

A surprising result of these experiments is that an increase in per capita income is insufficient in itself to bring about any significant reduction in population growth. Moreover, most of the basic-needs variables–life expectancy, literacy rates, etc.–do not respond significantly to changes in the economic system.

A few preliminary experimental simulations (the results of which are not presented here) suggest that all scenarios considerably improve if a strategy to reduce fertility is simultaneously pursued. The result is still better if there is a corresponding reduction in illiteracy as well. Some initial results point to an optimum strategy which consists of increased investment in the satisfaction of basic needs coupled with a reduction in fertility and illiteracy rates.

It is interesting to note that many of the output variables under S1 converge to the corresponding figures under S4 at the end of the simulation period. This is because although these variables grow relatively faster under S4 than under S1 in the initial years, a reversal occurs subsequently. The implications of such findings could be far-reaching. For example, it shows that a country today pursuing a North-oriented export policy with favourable conditions in the North could achieve the same growth rate over a period of time even if it changed to a South-oriented export strategy with appropriate domestic policies. This points to the wide options available to planners and policy-makers in selecting long-run development strategies.

One of the basic objectives of the India study has been to demonstrate the usefulness of policy analysis country models. The exercise has accomplished this objective despite the fact that this type of model is the first of its kind in India and that the present version has serious limitations coupled with a large number of simplifying assumptions. Nevertheless it can provide a mechanism for a policy-maker to analyse the impact of a single policy change–or a set of changes–on the output of the economy over a period of time and to examine the relative merits and demerits of different policies and strategies.

The Kenya case study[6]

The base scenario

Social aspects of development are incorporated in the model in the form of a number of demographic variables and an analysis of poverty for various socio-economic groups. The degree of poverty of each group is directly associated with the degree of its basic-needs satisfaction.

We shall discuss first some results of the base run for 1976-2000. Population grows at a rate of around 4 per cent per annum. Urban population grows initially at a rate of over 6 per cent but slows down eventually (to 5.3 per cent by the year 2000) because of a decrease in migration. Female life expectancy at birth increases from 53.5 years in 1976 to 58.8 years in the year 2000, while the illiteracy rate drops from 82 per cent to 73 per cent. The base run extrapolates past trends to give a modest increase in the satisfaction of basic needs by the year 2000 (defined as a minimum required annual income per adult equivalent to K£21 in rural areas and K£68 in urban areas).

GDP increases from K£1,405 million in 1976 to K£4,918 million in 2000, initially with an annual growth rate of 5.0 per cent per annum, gradually increasing to 5.8 per cent per annum. As population growth is around 4 per cent per annum per capita income growth remains modest. Agriculture grows in the beginning rather slowly, at 3.2 per cent per annum, but picks up at the end of the base run to a level of 4.5 per cent per annum.[7] This is due to the increasing share of modern agriculture which, under the base run, grows faster than small-scale agriculture. Non-agricultural activities grow at a rate that creeps up from 6.0 per cent to 6.3 per cent per annum. This affects income distribution, which becomes more unequal over the simulation period.

The system in the base run has some difficulties in maintaining the—albeit modest—growth rate. The savings gap grows from K£42 million to K£409 million, or about 8.3 per cent of GDP, by the year 2000. The balance-of-payments deficit also increases from K£51.4 million to K£264 million by the year 2000; as a share of export earnings, it rises from 11.3 per cent in 1976 to 16.7 per cent by the year 2000. Hence, in order to avoid excessive inflation, capital imports on concessionary terms are needed at the end of the century to cover both the local resource gap and the foreign exchange gap.

Despite its low remuneration, the agricultural labour force increases from 4.7 million in 1976 to 10.7 million by 2000, implying an annual growth rate of 3.5 per cent over the whole period. The non-agricultural labour force increases from 1.3 million to 4.0 million by 2000, representing an annual growth rate of 4.5 per cent.

The model distinguishes between eight socio-economic groups: urban and rural; skilled and unskilled workers; urban and rural employers (including high-income self-employed workers); urban informal-sector workers and peasant farmers. The four poorest groups are the peasant farmers, the informal-sector workers and the urban and rural unskilled workers. In the base run, the income of the peasant farmer group increases over the period 1976-2000 at approximately the same speed as its size, resulting in hardly any increase in the average income of the individual. Consequently, the percentage of peasant farmers living in poverty remains constant. The percentage of the poor in the urban low-income socio-economic groups (informal-sector workers and unskilled workers) drops considerably. However, because of the large share of traditional farmers in the labour force as a whole, the country-wide percentage of people not meeting their basic needs drops only slightly.

The basic-needs scenario

This scenario captures aspects of a basic-needs policy. In order to take both supply and demand effects into consideration, the following changes from the base scenario were made. On the supply side, productivity growth in small-scale and large-scale agriculture was increased from 0.5 and 2.5 per

cent respectively to 4 per cent for both sectors (this then equalled the population growth rate). In order to finance such an increase in productivity, corporate taxes in all sectors were increased by 20 per cent compared with the base scenario. On the demand side, the pattern of aggregate consumption was changed by giving a more equal distribution of incomes. Exports followed the same pattern as in the base scenario. This, coupled with the changes in income distribution in favour of the poorer groups, raised the level of demand for agricultural products and led to the increased agricultural production being mainly consumed locally.

By the year 2000, total GDP is 6 per cent higher than in the base run. Its composition has changed considerably, however. GDP growth in agriculture is 5.32 per cent per annum compared with 4.53 per cent per annum in the base run and that of industry 6.10 per cent per annum compared with 6.27 per cent. The share of agriculture in GDP is 28 per cent higher. This structural change has positively influenced both the balance-of-payments deficit and the savings gap: the former has decreased from K£264 million to K£18 illion, and the latter from K£409 million to K£288 million. Excess capacity has gone up slightly, from 6.0 per cent to 7.2 per cent.

This structural change has, of course, affected the distribution of incomes. Average earnings in small-scale agriculture are 47.5 per cent higher in 2000 than in the base scenario, and the number of people not meeting their needs in that group has dropped by 40 per cent. The income of unskilled workers has remained the same as in the base run. The income of the informal-sector workers has decreased as a consequence of a drop in the demand for their services. GDP per capita has increased by 5 per cent, but because of the increase in the income of workers in small-scale agriculture, the percentage of people not meeting their basic needs has gone down by 40 per cent, and is 27 per cent in the year 2000 under this scenario.

The urban growth rate is 5.6 per cent lower and female life expectancy 1 per cent higher than in the base run. Over-all population growth remains high at 4 per cent per annum.

The export-oriented scenario

This scenario attempts to capture the consequences of a successful export-oriented policy on the assumption that Kenya is able to increase its exports without reducing the price for its products. The following changes from the base scenario have been made: during the first 15 years of the simulation exports of agricultural and manufactured food products increase by 7.5 per cent per annum instead of 5 per cent, while exports of all other products increase by 6.5 per cent per annum instead of 5.0 per cent. It is further assumed that during those 15 years the economy is able to diversify and that exports of agricultural and manufactured food products consequently increase by 6.5 per cent per annum and exports of other products by 7.5 per cent per annum during the last ten years of the scenario.

It is also assumed that the Government applies a more liberal tax policy for industries. Corporate taxes are therefore decreased by 20 per cent compared to the base scenario.

Over-all economic performance is favourable under the export-oriented scenario. Total GDP in the year 2000 is 14 per cent higher than in the base run, while GDP increases both in and outside agriculture, by 5.2 and 6.7 per cent respectively, compared to 4.5 and 6.3 per cent in the base run. Furthermore, both the savings gap and the balance-of-payments deficit are almost closed at the end of the period under consideration, the former having dropped from K£409 million to K£67 million and the latter from K£265 million to K£21 million compared to the base run. The excess capacity has also decreased from 6 to 2.3 per cent because of the increased demand effects.

However, not all groups of the population have benefited. Although per capita GDP is up by 14 per cent at the end of the period compared to the base scenario, average earnings in small-scale agriculture have increased by only 1.4 per cent. As a consequence, the Gini ratio of over-all inequality is 3 per cent higher than in the base run, and more than 50 per cent of the population depending on small-scale farming have incomes below the poverty line, thus raising the national percentage to 43. In urban areas, however, the number of people living in poverty has decreased considerably compared to the base scenario (urban informal-sector workers by 22 per cent and unskilled workers by 37 per cent).

Regarding social variables, female life expectancy is 2 per cent higher than in the base run, while the crude birth rate is 1.6 per cent lower. Total population is more or less unaltered, although by the end of the simulation period the population growth rate is modestly decreasing. The percentage of persons living in urban areas remains unaltered. This is because both industry and large-scale agriculture are growing faster than in the base scenario and are providing a counterbalance to the effects of migration.

Summary

The two scenarios presented above both lead to an increase in total GDP compared to the base scenario. Under the export scenario, GDP is 14 per cent higher, and under the basic-needs scenario 6 per cent higher, in the year 2000. The structure of the economy, and consequently the income distribution between the various socio-economic groups, differs considerably between the two.

Under the export scenario, the share of agriculture in GDP is 26 per cent in the year 2000, while under the basic-needs scenario its share is 33 per cent. This, coupled with technical progress in small-scale agriculture, leads to much higher incomes for workers in the latter scenario.

The basic-needs scenario leads to a much less unequal income distribution and to a lower percentage of population living in poverty. The Gini coefficient for the basic-needs scenario is 0.52 compared to 0.62 for the export-oriented scenario, while the proportion of population living in poverty under the basic-needs scenario is 27 per cent compared to 43 per cent under the export-oriented scenario.

Although per capita income, as well as the income of non-agricultural workers, is lower than in the export-oriented scenario, it is still higher than under the base scenario. Thus, a basic-needs scenario will not hamper growth more than the base scenario. A general conclusion is therefore that there is only a relative trade-off between a basic-needs scenario and an export-oriented scenario—relative in the sense that although somewhat higher growth rates could be obtained in the latter case, this is conditional upon a favourable development of world markets for Kenya's export products, an assumption which is surrounded by great uncertainties. Even then, a high growth rate achieved in this way will lead to greater inequalities and the persistence of poverty.

The Colombia case study[8]

Here income, consumption and basic needs are disaggregated with reference to seven socio-economic groups (urban capitalists, urban skilled workers, urban informal-sector workers, rural *latifundistas*, medium- and small-scale farmers, rural unskilled workers). The model is essentially demand-driven.[9] Five computer experiments are summarised, the base scenario and four others, namely scenario 1: open economy with optimistic assumptions concerning trade and aid; scenario 2: closed economy; scenario 3: open economy plus concentration on basic needs; and scenario 4: closed economy plus concentration on basic needs.

The base scenario

In the base scenario historical trends in all variables and parameters are assumed to continue until the year 2000. Furthermore, GDP is solely determined by demand factors without taking into account supply constraints. As a consequence the national accounts are not balanced and disequilibrium between supply and demand exists. Although it is recognised that this scenario corresponds to a hypothetical situation, its main purpose is to serve as a basis for comparison with results obtained under alternative situations which might be more likely to occur.

GNP shows a moderate rate of growth during the over-all projection period. Industry and services grow faster than agriculture. Investment shows a moderate rate of growth. External savings grow at approximately the same rate as domestic sources of savings.

Per capita income grows faster in the rural than in the urban areas. The reason for this is the continuing displacement of people from rural to urban areas, in spite of a declining migration rate during the period, so that higher rates of growth of industry and services are more than offset by the arrival of migrants in the urban centres. Illiteracy rates decline in all groups, but considerably faster among the urban groups. Low-income groups show the smallest rates of decline, and the existing gap between them and the rest of society thus becomes wider.

Per capita daily calories increase for all groups, but the rural sector shows a higher increase than the urban one. Again, rural-to-urban migration is responsible for this result. It is interesting to note that if present trends continue all groups in Colombian society will enjoy more than the minimum requirement of 2,000 per capita daily calories. These results contrast with those obtained for the illiteracy rate, which will still be around 20 per cent for low-income groups in both urban centres and rural areas.

Infant mortality rates decline substantially. However, the rate for the rural sector, specially for wage earners, will still be very high in the year 2000, even though it decreases during the projection period. Female life expectancy at birth shows a higher rate of growth in the rural sector, and for rural wage earners, thus reducing over time the gap between the urban and the rural sector, and between low-income groups and the rest.

Per capita square metres of housing show higher rates of growth in rural than in urban areas, as is only to be expected because of rural-to-urban migration. Urban wage earners will have the least housing space per person by the year 2000 if present investment and migration trends continue.

Labour productivity will grow at rates close to historical trends. The over-all rate of growth of labour productivity was 2.2 per cent for the period 1951-64 and 4.6 per cent for 1964-73. Historical trends also show a higher rate of growth of labour productivity in the rural than in the urban sector in the period 1964-73 (8 per cent versus 5.7 per cent).

The total fertility rate shows a declining pattern during the over-all projection period, continuing the trend noted since 1965 but at a decreasing rate. As a result of fertility decline the dependency rate will also drop substantially during the period.

Rural-to-urban migration rates are also expected to fall in the coming years since urbanisation rates are approaching saturation levels. Even with a 50 per cent drop during the period 1975-2000 the model shows that 72.6 per cent of the total population will be living in urban areas by the year 2000.

As a result of lower fertility, population growth rates also show a declining trend through the period. If this continues the total population of the country will be around the 38 million figure, which is substantially lower than the 46 million population obtained under the 1975 assumption of a 3.4 per cent annual rate of population growth.

Unemployment rates show a declining pattern during the first ten years of the projection, in spite of the increase in women's labour force partici-

pation rates during the period. However, the rate remains almost constant at around 9 per cent for the rest of the projection period. The main reason is the reduction in labour demand due to increases in labour productivity.

Real wages are expected to rise as a result of reductions in the labour supply and increases in labour productivity.

Scenarios 1 and 2

Under both open- and closed-economy scenarios growth is slower than in the base run. These results are expected since the latter is unconstrained, while growth in the open economy is constrained by its inability to supply sufficient products in sectors not involved in international trade, and the same applies in all sectors of the closed economy. Results for most economic aggregates in the open-economy case are rather similar to those in the base scenario. It seems that investment reallocation in the case of a closed economy seriously affects growth, since investment has to be allocated to less dynamic sectors[10] to restore equilibrium in the final product markets.

Income distribution remains unchanged over time when the economy is open, and improves when it is closed. This result is due to the fact that the agricultural sector has higher rates of growth in the closed economy than in the open one and hence low-income groups in the rural sectors benefit.

Thus in the open scenario the economy seems to perform better in terms of growth, but worse in terms of income distribution. Nevertheless, basic-needs indicators perform better in the open economy than in the closed. This demonstrates the importance of growth in poverty alleviation when it is assumed that basic-needs satisfaction is closely related to growth in incomes per capita.

Population grows less fast in the open case than in the closed one and, therefore, unemployment rates tend also to be lower. Real wages are lower in the closed than in the open economy.

The main conclusion emerging from these experiments is that an open economy which promotes growth of the more dynamic sectors of the economy tends to facilitate the achievement of higher standards of basic-needs satisfaction, and hence to reduce poverty, in low-income groups. This conclusion must be tempered by the underlying assumptions of the model, in particular the assumption that all excess production over domestic demand can be exported to available international markets. This is, clearly, not always the case.

Scenarios 3 and 4

The results show that a combination of policies having a basic-needs focus—namely tax reform, increases in government health and education expenditures, and a redirection of these expenditures towards low-income

groups–improve basic-needs satisfaction by comparison with scenarios 1 and 2 without reducing the rate of growth of the economy, since investment losses due to tax reform are more than compensated by improvements in productivity. The only negative effect of this strategy is an increase in unemployment rates due to the rise in labour productivity.

The best results are obtained when the economy is open. This suggests that an optimal basic-needs strategy requires the working of rapid growth conditions (open economy), a fiscal policy which obtains additional funds for the Government, and the redirection of those funds towards the low-income groups of the population in both urban and rural areas.

Summary

The following conclusions can be derived from the analysis for Colombia.

Reductions in private and public investment do not necessarily mean low output growth. Results show that if additional government funds are spent on basic-needs-oriented activities, productivity gains could more than compensate for investment reductions.

A strategy that combines an open economy with internal policies aimed at spending additional government funds on satisfying the basic needs of low-income groups seems to produce the best results, since productivity gains permit the achievement of rates of growth that are as high as under a growth-oriented approach without redistribution. This result rests partly on the very optimistic assumption that goods produced for export can find a market and that there are no import constraints for those sectors that cannot meet domestic demand.

Except for nutrition, the basic needs of the low-income population will not be satisfied by 2000, even with relatively optimistic assumptions concerning economic growth, unless a strategy is defined to accomplish minimum goals by that year.

4. Conclusions

The models used for the scenarios examined in the article had to be constructed in a short period and existing data had to be used. This meant that national accounts data had to be reworked to fit the specification of the models and that existing studies had to be used to determine the behavioural relations.

Regarding the first set of data, it should be remembered that the models deal with questions concerning the distribution of income and the satisfaction of basic needs. These issues are not usually covered in national accounts data and hence these data needed to be reorganised, e.g. to break

down income and consumption among the various socio-economic groups. Further, information on the distribution of productive assets and wealth was notably absent in all countries. Clearly stronger research efforts are needed in this direction. A second area in which much less was done than initially intended was the consumption behaviour of various socio-economic groups. In Brazil we were fortunate to have access to raw data files of a consumption survey and from these food consumption by each socio-economic group could be established, while in Colombia a mapping procedure could be developed. In the case of Kenya and India, more simple procedures had to be adopted.

Regarding other behavioural relations, the most difficult one turned out to be the impact of basic-needs satisfaction on the productive capacity of the workers in the various socio-economic groups. Existing research either concentrates on micro-situations, based upon surveys in plantations, certain agricultural areas, etc.,[11] or on macro-relations, such as total GDP based upon inter-country data sets.[12] However, in order to arrive at a meaningful framework for policy simulation at the country level, analysis between these two levels is necessary. An attempt was made in the Brazil case to link nutrition and labour productivity. In Colombia estimates of the effects of education, nutrition, health and housing on labour productivity were made. In Kenya a simulation of the decline in poverty and its effect on productivity was run. In India this link was not established.

A third area which remains relatively unexplored is the effect of foreign trade on the relative well-being of the various socio-economic groups. Studies which were available enlarged broad knowledge of the external situation of the countries concerned but did not provide sufficient detail to be built into the system. In the light of these limitations, what do the simulations with the different scenarios teach us?

The base scenarios in each case—which in general extrapolated past trends under the hypothesis of no surprises—show that poverty or unsatisfied basic needs will still be with us 20 years from now in each of the four countries studied[13] if nothing is done to remedy them.

The scenario analyses in each case attempted to determine the extent to which basic needs were satisfied under different conditions. Here the fundamental question under study was the relative importance of international versus national policy measures in meeting the basic needs of the poorest. The best results of the four scenarios examined came *either* when the developing countries followed a strategy expecting favourable conditions in developed-country markets and their expectations in terms of aid and trade were met; *or* when the developing countries followed a defensive strategy concentrating on basic needs and human resources development and international markets and aid flows were more restrictive.

Generally the best results in economic terms by the year 2000 came in the scenarios where a country could export excess (and import deficit) production at will, i.e. where it followed a growth-oriented approach with

only superficial attention to basic needs. India was an exception to the extent that trade is not as important as in the others. Closely following these scenarios in success were their virtual opposites, where the developing countries assumed increases in protection in the North, i.e. where they could not export their surpluses and concentrated them on the satisfaction of basic needs.

To our minds this latter strategy has the advantage because, at least, the basic needs of the poor are satisfied earlier than under the growth alternative. Moreover, the developing countries seem to be less vulnerable to changes in international circumstances if they concentrate less on exporting to world markets and more on developing their own domestic resources.

Notes

[1] A review of system thinking and its application is given in J. Clark et al.: *Global simulation models, a comparative study* (London, John Wiley and Son, 1975). See also G. Rodgers et al.: "The myth of the cavern revisited: Are large-scale behavioral models useful?", in *Population and Development Review* (New York, The Population Council), Sep.-Dec. 1976.

[2] We define a scenario as an exogenously defined consistent set of parameters for a model.

[3] Tables giving the results for each of the four country studies are not presented here because of space limitations. Interested readers should refer to the original papers indicated in the notes which follow. These are available from the authors on request.

[4] The model used here is described in M. Hopkins: *A socio-economic framework for basic needs planning: Brazil case study* (Geneva, ILO, 1981; mimeographed World Employment Programme research working paper; restricted). The original model is described in J. B. Burle de Figueiredo and M. H. da Cunha Rato: *Bachue–Brazil national version: a demo-economic model* (Geneva, ILO, 1977; mimeographed World Employment Programme research working paper; restricted). S. L. de Bragança, J. B. Burle de Figueiredo, M. H. da Cunha Rato: *The simulation of economic and demographic development in Brazil* (Geneva, ILO, 1980); Fundação Instituto Brasileiro de Geografia e Estatística, Diretoria Técnica: *Atividade de simulação na área econômico-demográfica no IBGE*, Série estudos e pesquisas, 3 (Rio de Janeiro, Superintendência de Estudos Geográficos e Sócio-econômicos, 1979).

[5] J. G. Krishnayya et al.: *India–Basic needs: A socio-economic and demographic simulation model* (Geneva, ILO, 1981; mimeographed World Employment Programme research working paper; restricted).

[6] R. van der Hoeven: *A socio-economic framework for basic needs planning: Kenya case study* (Geneva, ILO, 1981; mimeographed World Employment Programme research working paper; restricted).

[7] The slower growth rate in agriculture is due not only to the lower rate of technical progress, but also to the decreasing share of agriculture in private consumption which drops from 52 per cent in 1976 to 34 per cent in the year 2000. Agricultural growth in the base scenario is thus restricted by both supply and demand constraints.

[8] H. Banguero: *Colombia 2000: A framework for population, employment, growth, income distribution and essential human needs planning* (Geneva, ILO, 1981; mimeographed World Employment Programme research working paper; restricted).

[9] Although there are three distinct sets of rules concerning equilibrium, namely a reference run which is demand-led and unconstrained on supply of products, an open economy where surpluses are exported and deficits imported and a closed economy where excess supply (or demand) on product markets is built up as stocks (or deficits) and serves to redirect investment in subsequent periods.

[10] Those sectors with high capital-to-output ratios.

[11] R. Ram and T. W. Schultz: "Life span, health, savings and productivity", in *Economic Development and Cultural Change* (Chicago), Apr. 1979.

[12] D. Wheeler: "Basic needs fulfillment and economic growth: A simultaneous model", in *Journal of Development Economics* (Amsterdam), Dec. 1980; G. Sheehan and M. Hopkins: *Basic needs performance*, An analysis of some international data (Geneva, ILO, 1979).

[13] With the exception of nutrition needs in Brazil, where, under the assumption of high continuing growth rates of 8 per cent per annum, these needs will be satisfied on average for all social groups considered. Unfortunately, the most disadvantaged social group—unskilled urban and rural workers—was not disaggregated enough to identify the most underprivileged. These latter, mostly living in the north-east of the country and working in subsistence agriculture, were subsumed with other, better-off, marginal workers and therefore could not be identified in the model.