IMF WORKING PAPER

WP/91/116

INTERNATIONAL MONETARY FUND

European Department

Apartheid, Growth and Income Distribution in South Africa: Past History and Future Prospects

Prepared by Robert Corker and Tamim Bayoumi 1/

Authorized for Distribution by Desmond Lachman

December 1991

Abstract

Estimates of a supply-side model of the nonprimary sectors, in which particular attention has been paid to modeling key characteristics of the evolution of the apartheid system, are presented. These imply that the wage differential between white and nonwhite workers doing similar jobs fell significantly over the last two decades to around 14 percent in 1990. This relatively small gap implies that medium-term prospects for the advancement of the disadvantaged groups in South Africa depend heavily on their ability to take up skilled employment, with the direct gains from the elimination of apartheid being relatively small.

JEL Classification Numbers:
121,226,441

1/ The authors are grateful to Desmond Lachman and Ken Bercuson for their helpful comments.

Contents Page

Summary

This paper develops a model of the supply side of the South African economy to analyze past and future trends in output growth and income distribution. Particular attention is paid to the distortionary effects of apartheid on labor markets, at both the market and premarket levels. These effects are incorporated into estimates of a production function by assuming, first, that labor input is disaggregated into skilled and unskilled employment, and, second, that white workers receive a rent equivalent to the gap between the wages of white and nonwhite workers doing similar jobs.

The estimation results indicate that this gap diminished from around 90 percent in 1970 to 14 percent in 1990, thereby accounting for much of the rapid growth of wages of nonwhites relative to those of whites in the 1970s and 1980s. The comparatively small size of the gap in 1990 suggests that only limited improvement can be expected in income distribution from the elimination of remaining apartheid restrictions.

The model, which is used to analyze future trends in the South African economy, implies that a turnaround in South Africa's recent weak economic performance will depend on a revival of growth in productivity and on higher investment. A baseline scenario indicates that growth of 3½ percent a year is feasible if the investment-GDP ratio returns to its level of the early 1980s. The baseline assumes a smooth transition to a nonracial society with elimination of the remaining wage gap helping to boost non-white income.

The paper examines two other medium-term scenarios. The first shows that attempts to improve income distribution more rapidly through faster wage growth for the (predominantly nonwhite) unskilled sector of the labor market would be more than offset by slower employment growth. The second shows that a skills bottleneck arising from poor level of education among nonwhites in the 1980s would lower output growth and reduce the improvement in income distribution relative to the baseline.

I. Introduction

The recent moves by the South African government to dismantle the apartheid system promise an end to the restrictions which have denied nonwhites access to, or equal treatment in, many spheres of life in South Africa. One such area is the labor market, where nonwhites have historically faced restrictions in access to both educational and employment opportunities. The freeing of the labor market will potentially help to redress some of the economic inequalities of past years and reduce some of the inefficiencies in the economy. Nevertheless, despite the relevance to the debate about future policies and prospects in South Africa, there have been few attempts to quantify potential economic and social gains from the final elimination of apartheid. 1/ This paper aims to bridge that gap by presenting estimates of existing labor market biases, and, using these estimates as a starting point, examining the prospects for future growth and the distribution of income in post-apartheid South Africa.

The analysis is based on a supply-side model that is centered around estimates of a production function for the nonprimary sectors of the economy. This aggregate production function has three inputs: capital, skilled labor and unskilled labor. Particular attention has been paid to the specification of labor inputs in order to take account of some of the key characteristics of the apartheid system as it has evolved over the 1970s and 1980s. As a result, in addition to providing a description of the process of growth in South Africa over the last two decades, the model can also be used to analyze the path of income distribution across racial groups in the economy.

The main conclusion of the analysis is that, over the course of the 1970s and 1980s, the wage differentials between white and nonwhite workers doing similar jobs were, to a large extent, dissipated. In the early 1970s, the gap is estimated to have been around 90 percent but, by 1990, to have diminished to under 14 percent. Thus it appears that a large part of the direct discriminatory effects of apartheid within the labor market has already been eroded.

This conclusion has important implication for the future evolution of relative wages and income shares in post-apartheid South Africa. The size of the estimated wage gap, for example, provides a limit on the rate at which wages for nonwhite workers can catch up with those of white workers in comparable job categories. If wages are increased above this limit the main effect will probably be slow employment growth with an attendant intensification of socio-economic problems. In the medium-term, substantive gains in income for the nonwhite sections of society will principally depend

---

1/ Some exceptions would include the labor market study of Knight and McGrath (1987), the general equilibrium analysis in Iyengar and Porter (1990), and the projections of future income shares contained in van der Berg (1989) and Porter (1991).

on their ability to enter skilled employment, and on the ability of the economy to grow more rapidly than has been the case in the past two decades.

The paper is organized as follows. Section II provides a brief description of some of the more important trends in relative wages and incomes during the period 1970-90. Sections III and IV, respectively, describe the specification and estimation of a production function based model of labor income distribution. Section V contains an analysis of both the historical evolution of income shares along racial lines plus some illustrative scenarios that examine the implications for future income distribution and growth in South Africa. Conclusions are drawn together in Section VI.

II. Labor Market Trends, 1970-90

It is generally agreed that the gradual erosion of apartheid restrictions began to have measurable effects on the well-being of the nonwhite segment of the population from the early 1970s onward. 1/ As a result, in the 1970s and 1980s, nonwhites enjoyed improvements in real wages that helped to significantly raise their share of total labor income. However, the extent of the increase in their income share was limited by the poor overall performance of the economy in this period, which restricted the growth of employment, and by the rate at which nonwhites could acquire the skills to qualify for higher paid jobs.

In the second half of the 1970s, the South African economy entered a period of low growth relative to that enjoyed in the preceding post-war era. Low growth was accompanied by a drastic slowdown in employment growth, that, for most of the 1980s, fell well below the growth of the population as a whole (Chart 1). The slow growth of employment had a particularly harsh effect on the nonwhite segment of the labor force which was expanding relatively rapidly. As a result, the unemployment rate for nonwhites rose sharply and in 1990 was estimated to have been around 40 percent. By contrast, unemployment of whites has been negligible.

For those nonwhites with jobs, however, employment conditions improved markedly in the 1980s. Real wages for nonwhites in the nonprimary sector increased by about one third between 1980 and 1990 while those of whites stagnated, continuing a trend that had begun in the early 1970s. As a result, average wages for nonwhites were about 36 percent of the average level for whites in the nonprimary sectors in 1990, compared to 21 percent in 1970. Mainly reflecting the rapid growth of nonwhite wages, the share of income accruing to nonwhites in the nonprimary sectors is estimated to have

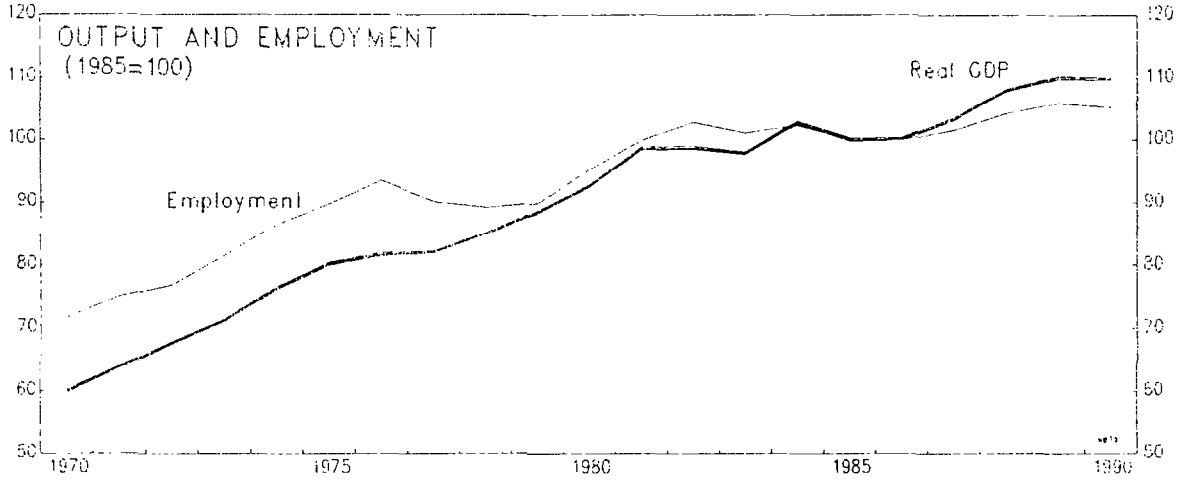
---

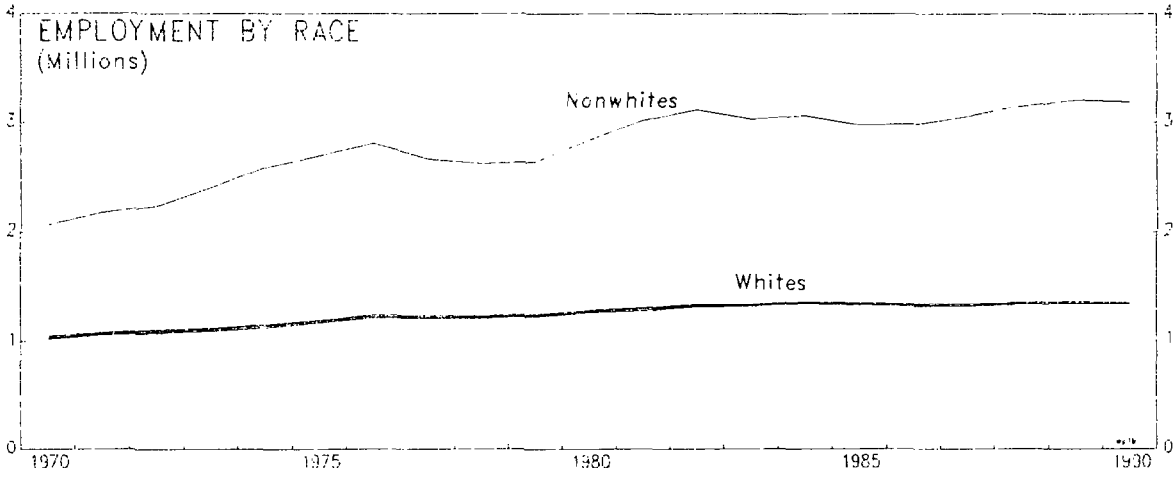
1/ See, for example, Terreblanche and Nattrass (1990). By contrast, in the earlier post-war period nonwhite wages had generally declined in comparison to white wages (Hofmeyr, 1990).

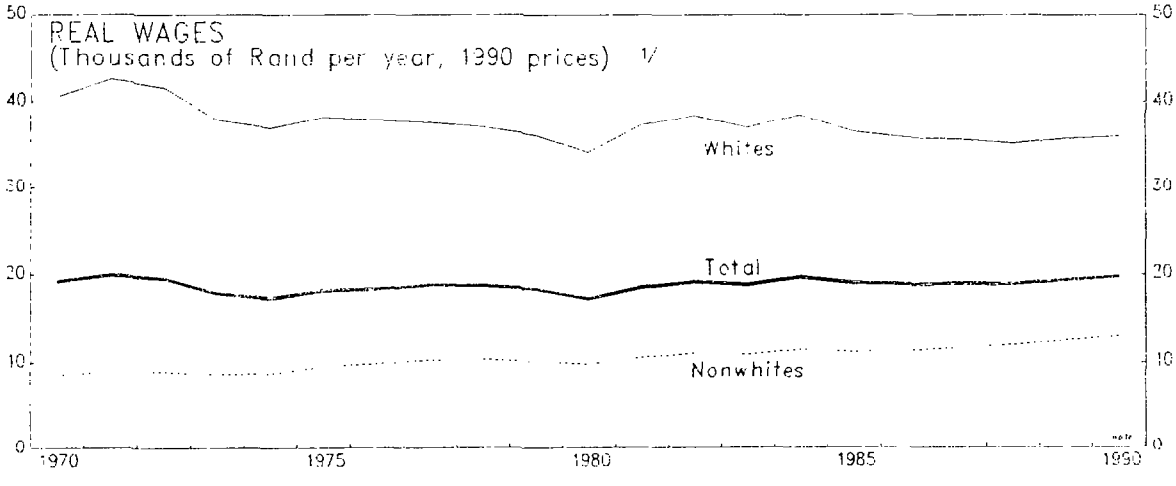
CHART 1

SOUTH AFRICA

Output, Employment and Wages in the Nonprimary Sector







Source: South African Labor Statistics; and Reserve Bank Quarterly Bulletin.

1/ Wages divided by the GDP deflator.

risen from 26 percent in 1970 to 34 percent in 1990 (Chart 2). 1/ This development contrasts with the period 1945-70 when nonwhite labor income share had tended to decline (McGrath, 1990).

Some of the relative rise in nonwhite wages and incomes reflected an improvement in average skill levels of nonwhite workers. Since the early 1970s, the proportion of workers classified in the high- and mid-level categories of the labor force has risen significantly (Chart 3). 2/ Within these two categories--and particularly in the mid-level skill category--the proportion of nonwhites has risen considerably. However, some of this increase reflects the more rapid growth of overall nonwhite employment in this period. It is notable that in 1990, nonwhite workers filled some 95 percent of those jobs classified as unskilled, a slightly higher proportion than at the beginning of the 1970s.

It seems unlikely that the improved skills of nonwhite labor could account for all--or even much--of the relative increase in nonwhite incomes and wages in the 1970s and 1980s. Instead, it appears likely that the diminishing power of the apartheid system to segment labor markets also played a significant role. In the following sections, this role is examined using a model that is designed to isolate the main factors accounting for the betterment of nonwhites in the past two decades.

III. The Model

The model used to analyze income trends assumes that producers in South Africa maximize profits subject to, among other things, the institutional structure of the South African labor market. The starting point for the model is a highly aggregated production function whose parameters play a key role in determining labor demand and, hence, the distribution of income.

Any estimation of a production function using data from the past two decades needs to address the impact that the changing nature of apartheid

---

1/ There are conflicting estimates of the overall level of labor's income share. For example, consistent data from South African Labor Statistics for the nonprimary sector estimate the share at around 45 percent (upper panel, Chart 2). This low level probably reflects an under-recording of employment: if the share is grossed up using recent estimates of employment on a "standardized basis" (also available in Labor Statistics), it rises to about 65 percent. By contrast, national accounts data for the whole economy put labor's share at just under 60 percent. In this paper, the largest of these three estimates is used as it is the closest to international norms.

2/ The data are based on South African Manpower Survey definitions. See the appendix for more details.

has had on the labor market in this period. 1/ In this study, apartheid is characterized as having two main effects. First, at the pre-market level, educational discrimination has distorted the supply of skilled labor and restricted the income growth of certain racial groups. Second, at the market level, effective job reservation for white employees has segmented labor markets and allowed white workers to gain an economic rent at the expense of workers in other racial groups. The degree of segmentation was maintained through controls on nonwhite labor supply and mobility, including the so-called "pass laws" (abrogated in the mid-1980s) and restrictions on nonwhite labor organizations. In general, studies support the view that the level of market level discrimination has loosened over the course of the last two decades. 2/ Clearly, the effects of market level discrimination are relatively easy to cure while the effects of pre-market discrimination presents a more long-term problem.

These effects of apartheid are incorporated into the model in two ways. First, rather than assuming that labor is a homogeneous input, it is differentiated between skilled workers, who are assumed to have relatively high marginal product, and unskilled workers, who are less productive. Aggregate labor input can then be calculated from a combination of these skill categories. Second, data on the renumeration of workers by racial group are used to estimate the changing degree of wage discrimination resulting from the evolution of the apartheid system.

Total output is assumed to be produced from aggregate labor and capital according to a Cobb-Douglas production function. Hence:

$$(1)\quad Y = A\,[L(LS,LU)]^{\alpha}\,K^{1-\alpha}\,e^{gt}$$

where Y is output, L is aggregate labor input, LS and LU are skilled and unskilled labor respectively, K is capital input and A is a scaling constant. The coefficient g represents the rate of growth of multifactor productivity, caused by technological progress or improved resource utilization. Under the usual assumptions of profit maximization subject to competitive market conditions, the parameter α represents the share of total income going to labor, with share $(1-\alpha)$ going to capital. Hence equation (1) predicts that the share of income accruing to labor should be a constant over time, a fact that is broadly supported by inspection of available data (Chart 2).

1/ For more detailed discussion of the effects of apartheid on the labor market see Porter (1978), Lundahl (1982) and Findlay and Lundahl (1987).

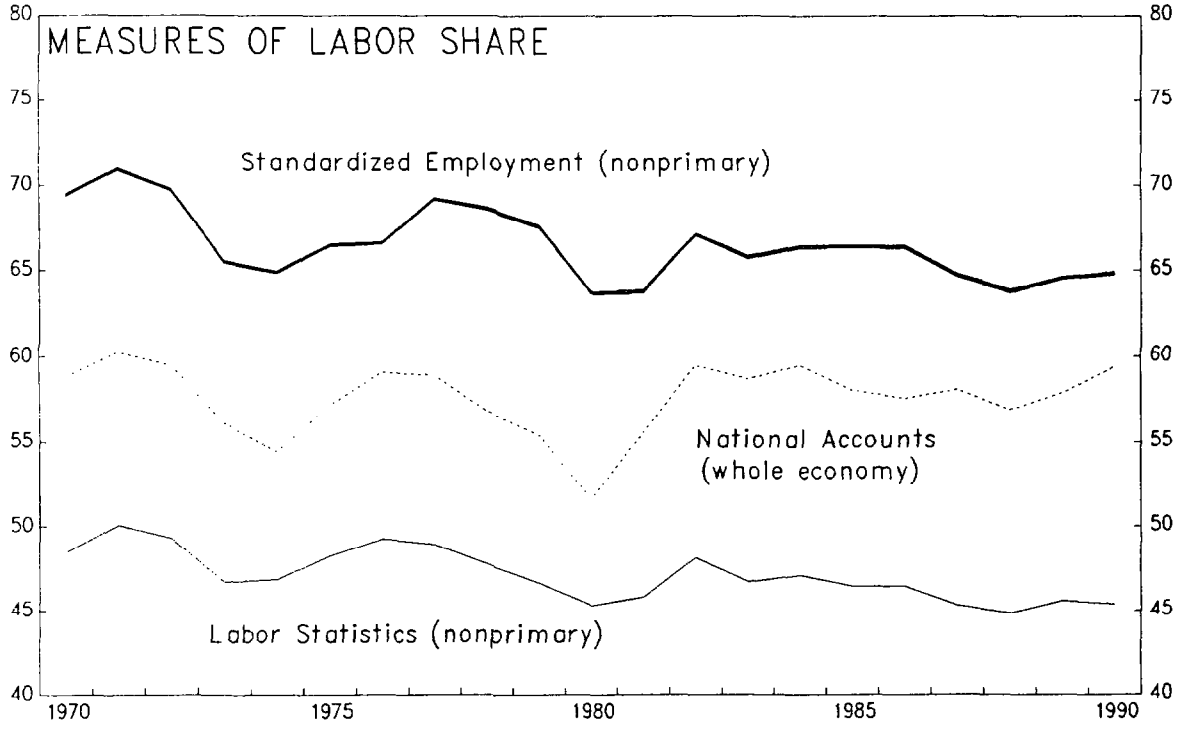
2/ See, for example, Knight and McGrath (1987) and Hofmeyr (1990).

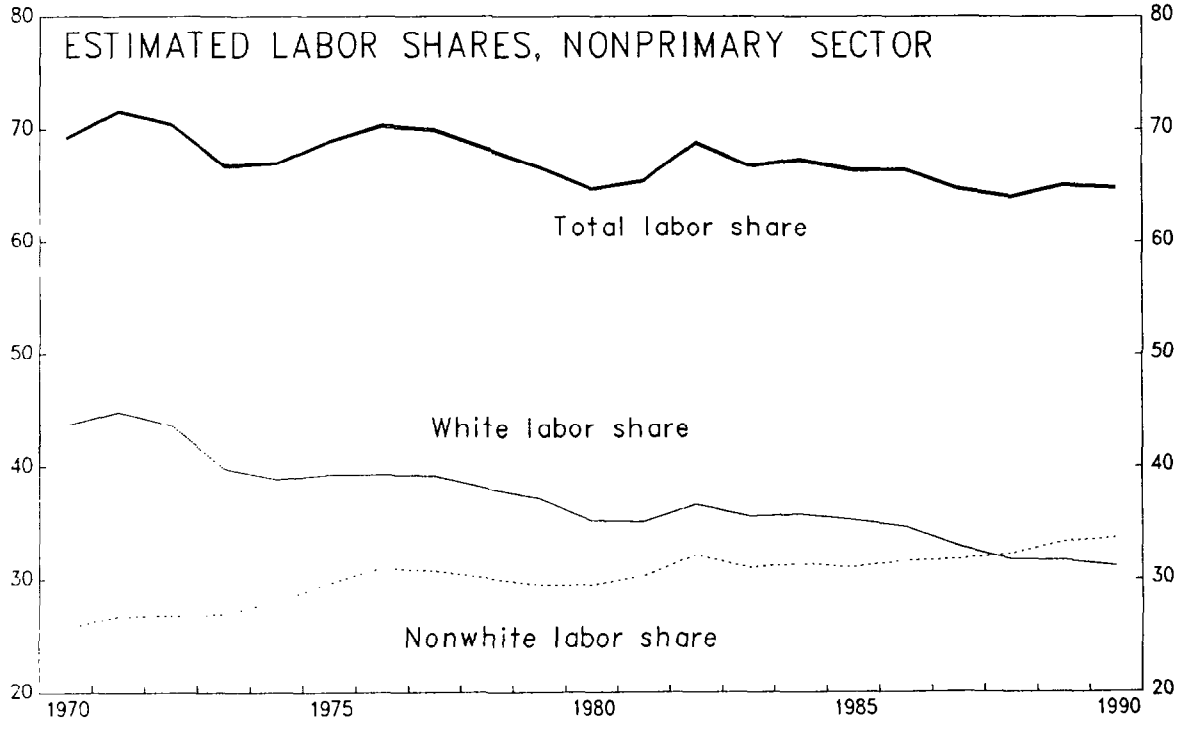
CHART 2

SOUTH AFRICA

Labor Income Share

(Percent of sectoral GDP at factor cost)





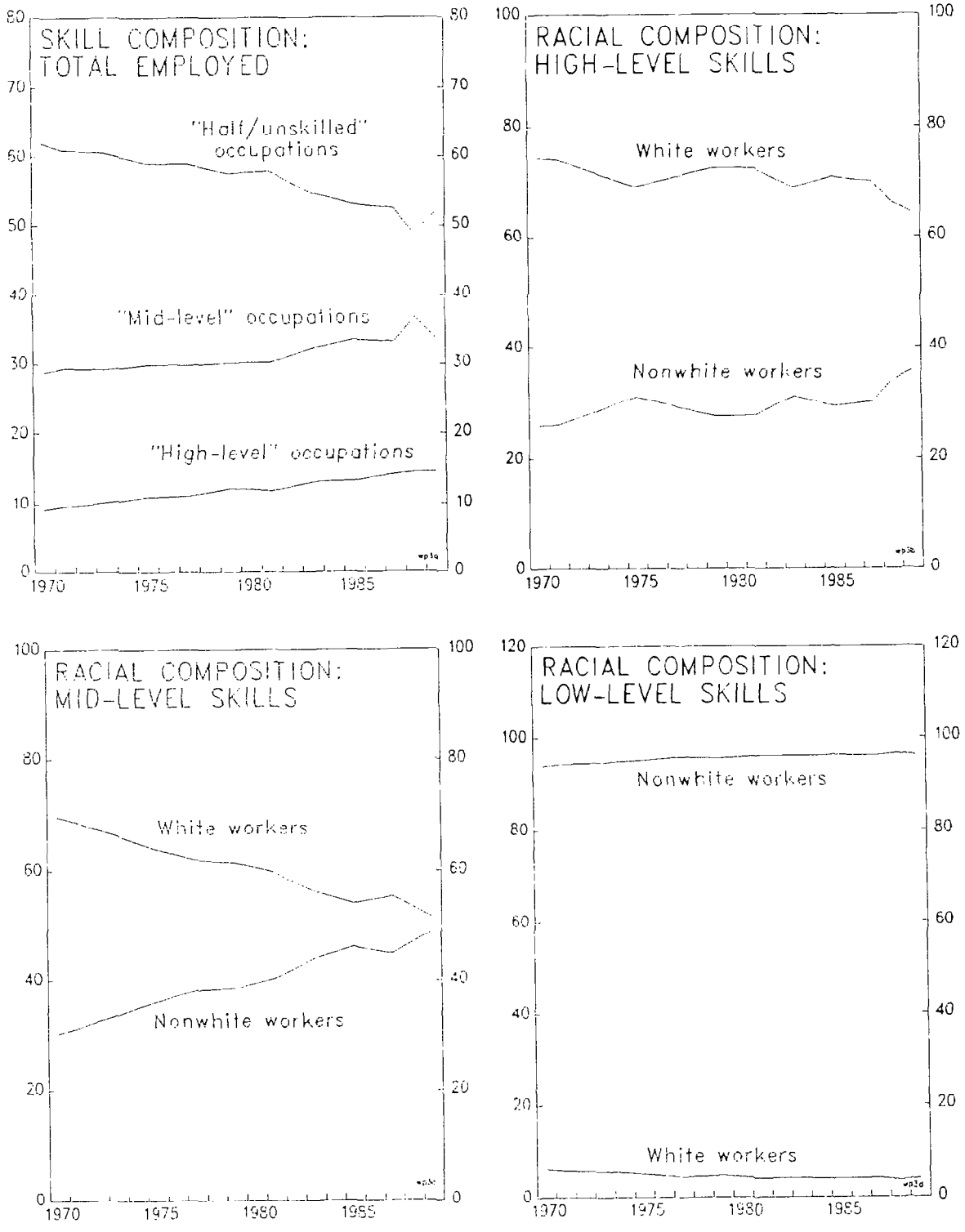
Source: Staff estimates.

CHART 3

SOUTH AFRICA

Skill Composition of Employment

(Percent)



Source: South Africa, Manpower Surveys.

Aggregate labor input is composed of two components: skilled and unskilled labor. 1/ It is assumed that in the production process skilled and unskilled labor have a constant elasticity of substitution (CES), which implies that aggregate labor can be written in the following manner:

$$(2) \quad L = B.(LU^{\rho} + \phi.LS^{\rho})^{1/\rho}$$

where B, ρ and ϕ are constant terms. Since the marginal productivity of skilled workers exceeds that of unskilled workers, it follows that skilled wage rates exceed unskilled wage rates. The constant elasticity of substitution between skilled and unskilled workers is given by the formula:

$$(3) \quad \sigma = 1/(1 - \rho)$$

Ideally, estimated of σ and ϕ could be obtained by estimation of the implied log-linear relationship between the ratio of skilled to unskilled workers and the ratio of their relative wages. Unfortunately, this course was not open because the required data on relative wages were not available. Instead, the parameters were estimated utilizing information on labor income shares in nonprimary industries on a racial basis, obtained from South African Labor Statistics. While this alternative method produces less precise results, it has the benefit of illuminating some of the reasons for trends in racial income shares over the past and of quantifying the impact of changes in apartheid.

The alternative estimation procedure starts from the presumption that, while white and nonwhite labor are equally productive within each skill category, the wage rates obtained by white workers include an element of economic rent associated with apartheid labor restrictions. Thus, the amount of income going to white workers can be written as the sum of white skilled and unskilled labor each multiplied by their "fair" wage rate (the wage rate which is equal to their marginal product) and by a markup representing the economic rent associated with apartheid. 2/ That is,

$$(4) \quad \text{White Labor Income} = Z_s \, LS_w \, W_s + Z_u \, LU_w \, W_u,$$

where W represents the "fair" wage, and the subscripts w, s and u refer to white, skilled, and unskilled labor respectively. The factors Z are assumed

---

1/ In principle, the labor force is composed of a continuous spectrum of skills. The division here (broadly speaking) classifies professionally qualified workers and managers in the skilled category and the remainder of the labor force in the unskilled category. See the appendix for more details.

2/ This is an algebraic representation of the model of apartheid in Porter (1978); in particular see Figure 2. In the interests of brevity, the precise algebraic model derived by the present authors is not detailed here.

to be greater than or equal to one and represent the economic rents obtained by white workers, expressed as a markup on the fair wage. If the Z's were equal to one, white wages would equal the "fair" values. Nonwhite labor is assumed to receive the residual value of the total income accruing to labor.

It is useful to rewrite equation (4) in terms of the shares of total income going to different types of workers. Writing the shares going to white, nonwhite, skilled and unskilled workers as α_w, α_n, α_s, and α_u, respectively, the shares are equal to,

(5a) $\alpha_w = Z_s(LS_w/LS).\alpha_s + Z_u(LU_w/LU).\alpha_u$
(5b) $\alpha_n = \alpha - \alpha_w$.

In order to convert equations (5) into an estimating equation, the unknown values α_s and α_u must be modeled and the wage wedges Z_s and Z_u parameterized. The modelling of α_s and α_u utilizes the following property of a CES function:

$$(6) \quad \alpha_s/\alpha_u = \phi(LS/LU)^{\sigma^*},$$

where $\sigma^* = (\sigma - 1)/\sigma$ and ϕ is given in equation (2). From this expression, relative income shares by skill category can be expressed in terms of available data on the skill composition of employment. Turning to the wage wedges, it was assumed that the wedge between the wages of white and nonwhite workers was the same in each skill category and that it has declined steadily over time. Specifically, the following function was used:

$$(7) \quad \text{White Wage/Nonwhite Wage} = 1 + \beta e^{-\delta t},$$

The coefficient β measures the markup of white wages over nonwhite wages in the period where t=0 (normalized to 1985 in the estimation), while the coefficient δ measures the speed at which the wedge is eroded over time.

Combining these assumptions together, the following equation was obtained,

$$(8) \quad \alpha_w/\alpha_n = (1 + \beta e^{-\delta t})\left[\frac{(LU_w/LU) + (LS_w/LS)\phi(LS/LU)^{\sigma^*}}{(LU_n/LU) + (LS_n/LS)\phi(LS/LU)^{\sigma^*}}\right]$$

where Greek letters represent coefficients to be estimated.

IV. Estimation Results

Equation (8) was estimated using nonlinear least squares using data on renumeration and skill levels by racial group over the period 1970-89. The

year 1970 was chosen as the initial period for two reasons: it was the earliest period for which consistent data could be obtained and it marks the approximate start of the erosion of the apartheid system (Terreblanche and Nattrass, 1990). The following results were obtained:

	Value	Standard Error
β	0.22	0.09
δ	0.10	0.02
ϕ	3.42	2.61
σ^*	0.64	0.44

DW = 1.21 $\quad \bar{R}^2 = 0.98 \quad$ SE = 0.033

Estimation period = 1970-1989.

The coefficients related to the erosion of the apartheid wage wedge (β and δ) are relatively precisely estimated, with both coefficients being significant at conventional levels. The point estimate of β indicates the degree of the wage wedge between whites and nonwhites due to "apartheid rents" in 1985. At 22 percent, the estimate here corresponds closely to the measure of wage divergence attributed to discrimination by Knight and McGrath (1987) in their more detailed study of wage differentials in South Africa. 1/ The coefficient δ indicates that this wedge has been declining by 10 percent annum over the entire sample period. This implies that the wedge has declined from a value of 92 percent in 1970 to slightly less than 14 percent by 1990. Knight and McGrath (1987) also present data for wage differentials in 1976; the estimated wedge implied by the estimated equation, around 50 percent, again is in the range of the estimates in that more detailed study.

The coefficients related to the CES production function, σ^* and ϕ, are less well estimated, with t-statistics slightly below conventional significance levels. The estimated value of σ^* implies an elasticity of substitution between skilled and unskilled labor of 2.76. This relatively high value (a Cobb Douglas production function implies an elasticity of unity) implies that the expansion of the skilled work force over the estimation period has been associated with a relatively small fall in the

1/ The numbers in Knight and McGrath refer to the difference between white and black workers. However, since the other races are a relatively small part of the overall workforce the comparison is still useful.

relative wages of skilled workers. 1/ This result is consistent with diagrammatic evidence in Knight and McGrath (1987, figures 2-4) which indicates little change in relative wages of skilled and unskilled workers of the same race between 1976 and 1985.

The estimate of ϕ implies that skilled workers have a marginal product which is some seven times that of unskilled workers. Since the definition of skilled workers is a relatively restricted one, comprising between 10 and 15 percent of the work force (see the Annex for more details), this would appear to be a reasonable estimate of the relative productivity of the two types of workers.

Because the estimate of the elasticity of substitution is relatively imprecise, experiments were carried out in which different values of σ were imposed on the estimation process. In general, it was found that changing the elasticity of substitution had a relatively small effect on the measured apartheid wage wedge (i.e., on the estimates of β and δ) but rather larger effect on the implied path of relative wage rates our time. As σ falls toward unity, for example, the relative wage of skilled workers was estimated to have declined substantially during the sample period. Correspondingly, the higher the value of σ the smaller the fall in relative wages. Overall, while the uncertainty about the elasticity of substitution remains, it would appear that a fairly high estimate is most consistent with the other evidence discussed above, and hence with probable future trends in relative wages.

Using the estimated parameters, a series for skill-adjusted labor input can be constructed using equation (2). This series shows that, after adjusting for quality, labor input grew somewhat faster on average than total employment (Chart 4). The result reflects the faster growth in employment of the more highly productive skilled labor force.

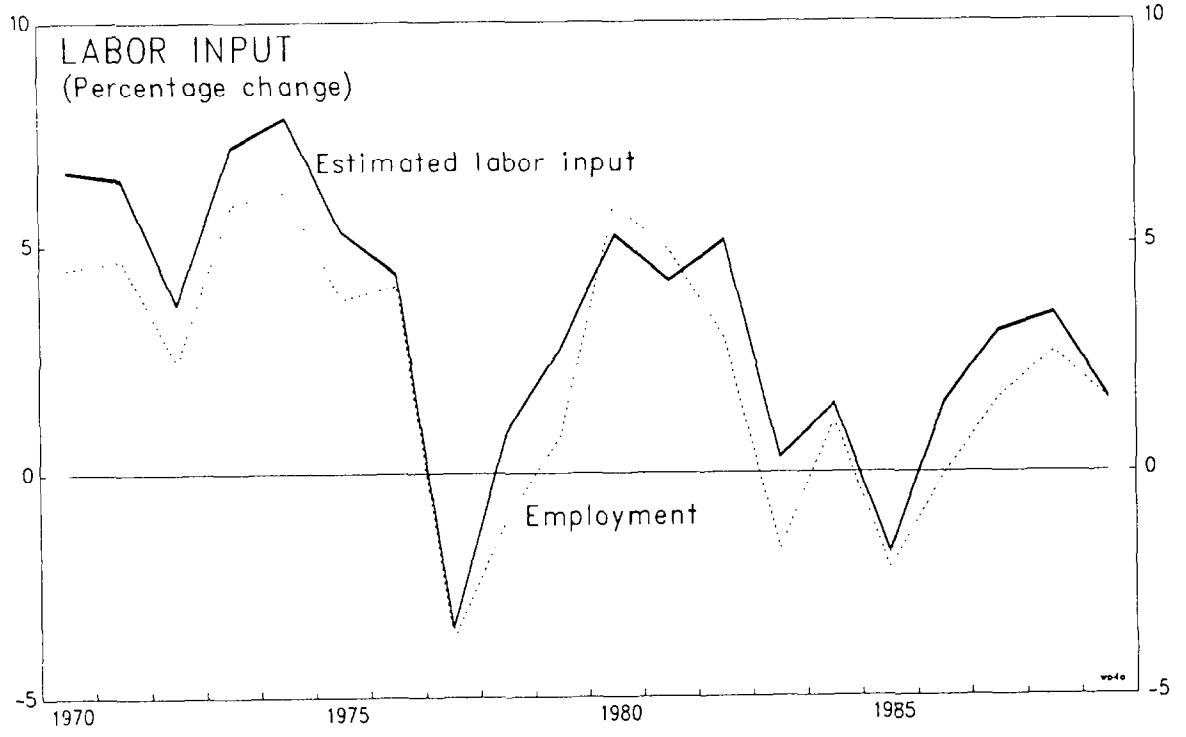
The remaining parameter of the aggregate production function, multifactor productivity, can be estimated residually as the "unexplained" growth in nonprimary GDP after accounting for the contributions from capital and labor input. Multifactor productivity ("g" in equation (1)), has been falling slightly over the last two decades, although since 1983 the growth rate has been close to zero (the analysis is complicated by the influence of cyclical factors). The estimates here correspond closely to estimates of multifactor productivity published in South African Labour Statistics, which also paint a rather disappointing picture (Chart 4, lower panel). The productivity performance is very poor by the standards of industrial countries and, unless improved, presents a severe hurdle to securing satisfactory per capita output growth in the future.

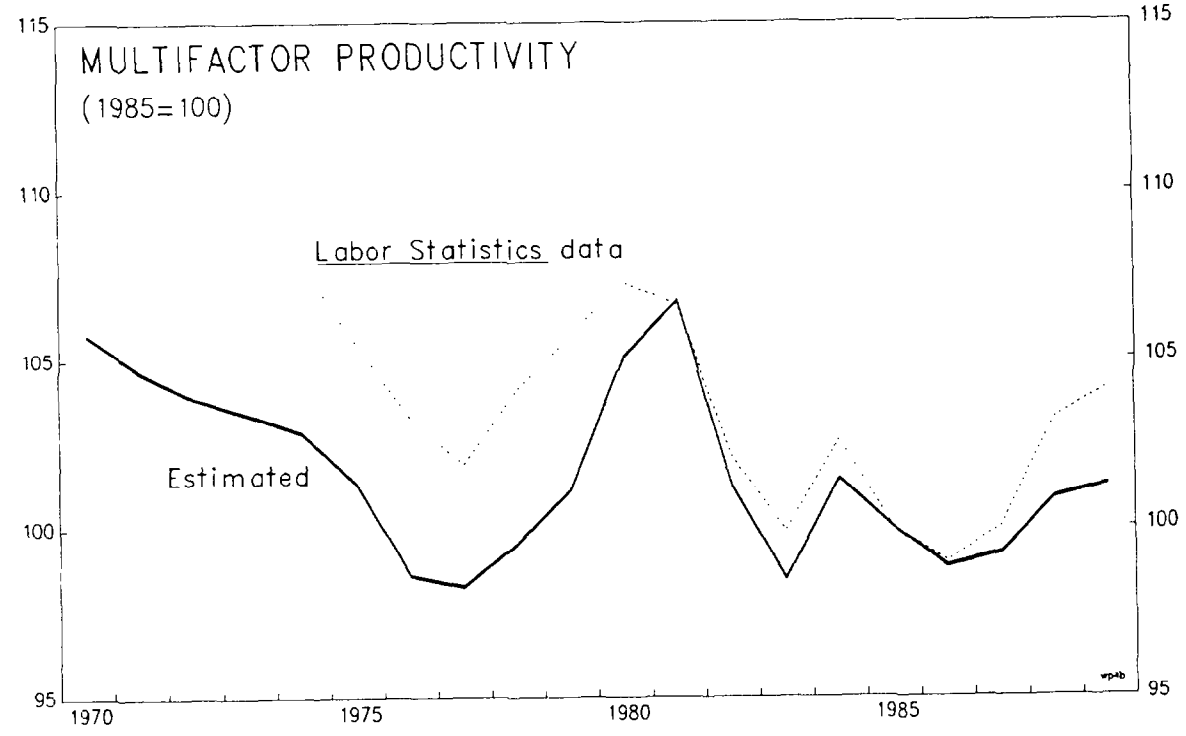
1/ But because of rapid growth of skilled employment, the share of labor earned by the skilled segment of the labor force is estimated to have risen sharply over the sample period.

CHART 4

SOUTH AFRICA

Labor Input and Productivity, Nonprimary Sector





Source: South African Labor Statistics; and staff estimates.

V. Growth and the Distribution of Income

1. Past Trends

The estimates from the previous section can be used to analyze both the underlying reasons for the poor growth performance of the South African economy over the last two decades and the forces behind the changes in the distribution of income between white and nonwhite workers. Regarding the poor growth performance, a decomposition of real nonprimary GDP into its factor contributions fails to identify a single most important cause (Table 1). 1/ Rather, the poor performance reflects a number of factors: a significant slowdown in the rate of increase of the capital stock, inadequate employment growth, and falling multifactor productivity. To some extent, these problems may reflect the legacy of apartheid, which fostered economic rigidities and resulted in international economic sanctions. The reduced access to international capital markets in the second half of the 1980s appears to have had a particularly significant impact on the growth of the capital stock (see also Bayoumi, 1990).

Table 1. A Decomposition of Past Growth in Nonprimary GDP

(Average annual percentage changes)

	1970-74	1975-79	1980-84	1985-89
Whole economy GDP	4.1	2.3	2.7	1.4
Nonprimary GDP	6.2	2.7	3.6	1.4
contributions of:				
Employment	3.1	0.5	1.7	0.5
Labor Skills	1.1	0.8	0.4	0.6
Capital	2.6	1.8	1.3	0.5
Multifactor productivity 1/	-0.6	-0.5	0.1	--
Employment growth	4.7	0.8	2.6	0.7
Skilled	9.0	3.7	4.1	2.7
Unskilled	4.3	0.4	2.4	0.4
Real Investment/GDP 2/	25.8	25.8	26.4	19.9

1/ Residual growth.
2/ In percent.

1/ The decomposition is presented for four successive five-year intervals to smooth out cyclical movements.

Regarding income distribution, the model broadly explains the rising share of nonwhite labor income over the past two decades (Chart 5, upper panel). Two factors in the model account for this rise: the steady erosion of the wage wedge between white and nonwhite workers and the improvement of the skill mix of the nonwhite labor force. The relative importance of these factors was assessed by three counterfactual simulations, the results of which are presented in the lower panel of Chart 5 along with the fitted values from the regression results.

Two of the simulations, labelled "Unchanged Apartheid" and "No Wage Wedge" look at the effects of the estimated wedge between white and nonwhite wages on the evolution of the nonwhite labor income share. The "Unchanged Apartheid" simulation traces the evolution of the nonwhite income share assuming that the wedge between white and nonwhite wages had been maintained at its estimated 1970 level throughout the period. The difference between this line and the fitted values shows that, in the absence of a change in market-level discrimination, the proportion of GDP going to nonwhite workers would have been substantially smaller and, indeed, would have actually fallen since 1970. The diminishing wage wedge, according to the simulation, boosted nonwhite income share by about 15 percentage points over the course of the 1970s and 1980s.

The "No Wage Wedge" line shows the estimated share of income earned by nonwhite workers if they had been paid the "fair" wage equal to their underlying marginal product. The difference between this line and the fitted values illustrates the remaining gap in income estimated to come from continuing market discrimination. While not inconsiderable, the simulation indicates that the scope for increasing the income accruing to the less privileged groups in society through further erosion of market discrimination is now relatively limited.

A third simulation, labelled "Unchanged Skills", traces the implied income share of nonwhite labor on the assumption that the proportion of nonwhite workers in the skilled work force was maintained at its 1970 ratio of around 25 percent, rather than rising to nearer 35 percent (see Chart 3). The difference between this line and the fitted values indicates that the improvement in the skill level of the nonwhite labor force was not a particularly important factor in the evolution of the nonwhite labor share over time, although it does appear to have played a more important role in the last two years of the simulation.

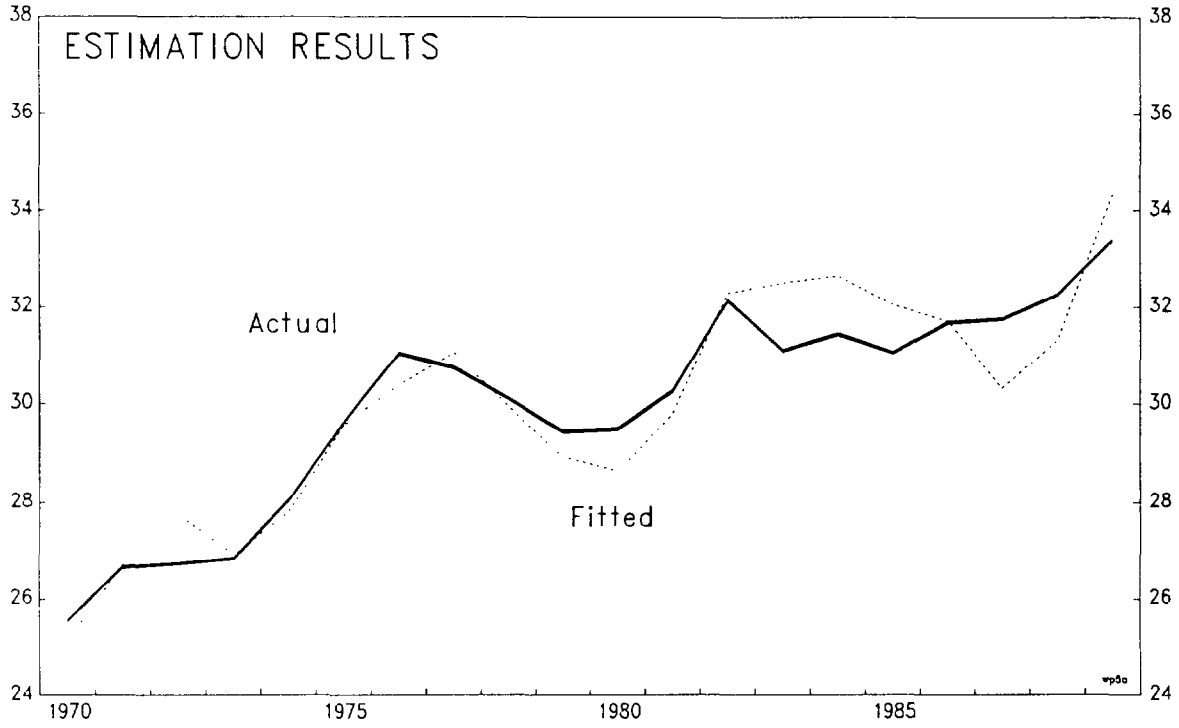
The results from these simulations clearly indicate that most of the improvement in nonwhite income over the last two decades has come from the erosion of the white/nonwhite wage wedge. Indeed, the simulations conclude that, in the absence of the steady erosion of the apartheid wage wedge, the proportion of income earned by nonwhite labor would actually have declined between 1970 and 1989. The explanation for this lies with the skill composition of the work force: nonwhite employment in skilled categories grew at nearly twice the rate for whites, but from such a low starting base that, in absolute terms, the number of skilled white workers increased by

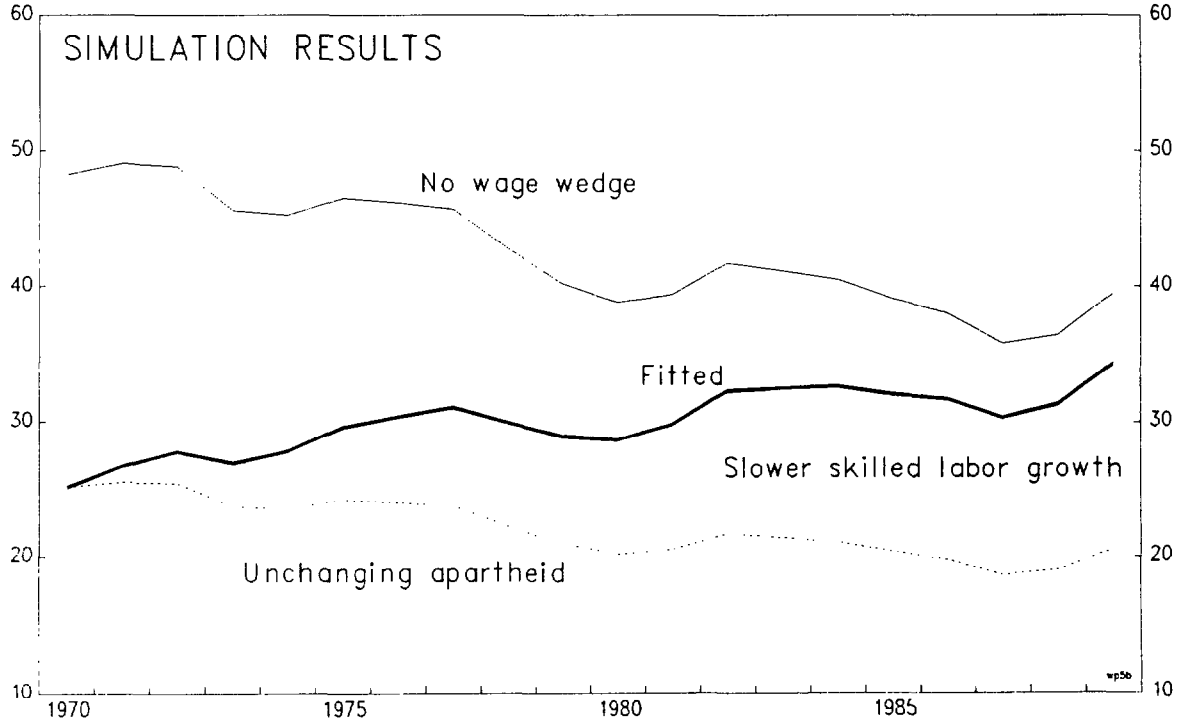
CHART 5

SOUTH AFRICA

Nonwhite, Nonprimary Sector Labor Income

(Percent nonprimary GDP)





Source: Staff estimates.

substantially more than the number of skilled nonwhite workers. Thus, given that skilled workers are estimated to have 6-7 times the marginal product of unskilled workers, this absolute increase acted to support the relative income share of white workers. The simulations also conclude that, because the wage wedge is now comparatively small, the scope for further improvements in nonwhite wages from the erosion of the remaining market effects of apartheid is relatively limited. Instead, it appears likely that education and access to skilled jobs will be increasingly important elements in the future evolution of the distribution of income within South Africa, and, indeed, of the overall rate of growth of the economy. These issues are addressed in the following section.

2. Future Trends

This section uses the estimates from the supply side model to illustrate some possible future paths for the South African economy, both in terms of the underlying potential rate of growth of output and the implied distribution of income. The analysis takes the form of three scenarios, which are presented over a medium-term horizon (10 years), starting in 1991. It should be stressed that none of the scenarios, including the baseline, should be interpreted as a forecast in the sense of representing the most likely outcome. Rather, the scenarios are devices for illustrating the different possible outcomes which might occur under specified circumstances. Given the supply side nature of the model, the scenarios also take no account of adjustment dynamics or the cyclical position of the economy.

Scenario 1, the baseline, assumes a smooth adjustment to a nonracial society. The investment-output ratio is projected to return to the level of the early 1980s, multifactor productivity rises modestly, nonwhite skilled workers are absorbed rapidly into the labor force and rises in unskilled real wages are sufficiently restrained to allow for a steady reduction in nonwhite unemployment. As a consequence, GDP is projected to rise at 3 1/2 percent per annum, somewhat above the underlying growth rate of the population, while the relative position of nonwhite labor improves steadily. In scenarios 2 and 3, the implications for growth and the distribution of income of changing the assumptions relating to the labor market are examined. Scenario 2 illustrates the effects of trying to bring about a more rapid change in the distribution of income through more rapid real wage increases. Scenario 3 considers the consequences of a slower expansion in the skilled labor force; in other words, the consequences of a skills bottleneck.

a. Scenario 1: the baseline

The baseline scenario looks at the effects of a smooth adjustment to a nonracial society in South Africa. In order to construct such a scenario, it is necessary to project the future path of the capital stock (or, equivalently, the investment-GDP ratio), multifactor productivity, skilled and unskilled employment, and the rate of decline of the remaining wedge between white and nonwhite wages. These assumptions are discussed in turn.

It is assumed that the investment-output ratio rises rapidly from its level of under 20 percent of GDP in 1990 to 26 percent of GDP, implying a return to the investment performance experienced in the early 1980s, prior to the imposition of international financial sanctions. This translates, after allowance for historical rates of depreciation, into a rate of growth of the capital stock of some 3 percent per annum. Such a recovery in investment requires a considerable mobilization of saving, both domestic and international. However, in the improved climate implied by the ending of apartheid and international sanctions, it appears by no means unachievable. For example, if the present current account surplus were to swing into a manageable deficit (say, around 2 percent of GDP) then a modest rise in domestic saving would be sufficient to achieve the desired investment ratio. 1/ The lifting of sanctions is also assumed to improve access to international technology, which in turn is assumed to produce a rise in multifactor productivity of 1/2 percent per annum. While this is higher than South Africa has achieved in the past (as discussed above), it is still relatively modest by international standards.

In the domestic labor market it is assumed that for white workers employment expands by slightly under 1 percent per annum, or equal to the projected rate of growth of whites in the labor force, while nonwhite employment expands at 3 1/2 percent per annum, some 1/2 percent per annum faster than the underlying growth of nonwhites in the labor force. 2/ As a result, aggregate employment expands at 3 percent per annum. These projections are broadly consistent with continuing full employment for white workers (which, in the light of their generally high level of skills, appears reasonable), and a modest fall in the level of unemployment for nonwhite workers. Regarding the skill composition of the labor force, it is assumed that the overall proportion of skilled workers in the economy remains constant at the 1990 level of 14 percent. Nevertheless, given the relatively slow growth of the white labor force, this projection is consistent with a steady increase in the skill level of both racial groups in the labor force. Specifically, it is assumed that white skilled employment grows at 1 1/2 percent per annum while nonwhite skilled employment grows at 5 percent per annum. As a consequence, over the next 10-year projection period, some 200,000 nonwhite workers obtain skilled jobs, raising the share of nonwhites in skilled occupations to nearly 50 percent. Finally, it is assumed that over the course of the projection the wage wedge between white and nonwhite workers of the same skill level is fully eliminated.

Combining these projections for factor inputs and productivity growth with the estimated production function implies a rate of growth of GDP of 3 1/2 percent per annum and an average rise in real wages of 1/2 percent per

---

1/ Nevertheless, even a modest rise in domestic savings might require a degree of fiscal stringency that could be at odds with the need to redress social imbalances through higher government spending. See IMF (1992).

2/ Demographic projections were based on Sadie (1988).

annum (see Table 2). In addition, the assumption of no change in the skill-mix of the labor force implies that skilled and unskilled real wages grow at the same rate. For nonwhite workers, however, the final elimination of the wage wedge implies that their real wages rise at 1 3/4 percent per annum, while white workers experience real wage growth of a little below 1/2 percent per annum (Chart 6).

The implications for the distribution of income are also illustrated in Chart 6. Nonwhite labor income is fuelled by a combination of relative rapid employment growth (especially relative to that of the 1980s) and the elimination of all market based discrimination in wages. As a result, labor income accruing to nonwhite workers in the nonprimary sector of the economy expands to 40 percent of nonprimary GDP by the end of the scenario, compared to 26 percent for white labor. However, to put things in perspective it should be noted that even at this stage average wages earned by nonwhites still only represent 44 percent of average wages earned by whites, while it is probable that whites would continue to receive the vast majority of the 34 percent of output paid to capital.

Table 2. Baseline scenario

(Average annual percentage change)

	1981-1990	1991-2000
Nonprimary GDP	1.6	3.5
contributions of:		
Labor	1.2	1.9
Capital	0.9	1.1
Multifactor productivity	-0.4	0.5
Employment	1.0	2.9
Whites	0.6	0.9
Nonwhites	1.2	3.6
Real wages	1.4	0.6
Whites	0.5	0.4
Nonwhites	2.9	1.7
Real investment/GDP 1/	19.6	26.0
Nonwhite unemployment rate 1/	41.7	36.5

1/ Whole economy, end period.

b. Scenario 2: Faster Wage Growth for Unskilled Workers

Scenario 2 examines the consequences of attempting to bring about a more rapid change in the distribution of income through higher wage demands by unskilled workers, leading to a narrowing the wage differential between skilled and unskilled workers who, in the baseline, are predominantly nonwhite workers. Specifically, the baseline simulation was repeated except for the assumption that the real wages of unskilled workers rise by 1/2 percent per annum faster than those of skilled workers. Given the need for such workers in the economy, skilled workers are assumed to continue to be fully employed. However, because of the assumed relative wage increase, the demand for unskilled workers falls relative to the baseline. This assumption that there is a dual labor market, in which skilled workers are fully employed while the overall level of employment of unskilled workers is determined by the projected wage rate, corresponds to the dual sector development model (Lewis, 1956) and has been used in other analyses of South Africa. 1/

Table 3 and Chart 7 report the results from this scenario both in terms of absolute values and in terms of differences from the baseline. The narrowing of skill differentials leads to a significant reduction in the demand for unskilled workers; unskilled employment growth falls by 1 percent per annum compared to the baseline, from 3 percent to 2 percent. This slowdown in unskilled employment in turn lowers the growth of factor inputs and hence the rate of growth of output, which falls from 3 1/2 percent in the baseline to 3 percent in this scenario.

The consequences for the distribution of income depend upon how this slower growth of unskilled employment is distributed between the different racial groups. However, because nonwhite labor supplies most of the new unskilled jobs in the baseline and because white workers will continue to enjoy the benefits of their better education gained in the 1980s, it appears plausible that the slowdown in unskilled job creation will particularly affect the nonwhite segment of society. By way of illustration, the scenario assumes that employment of unskilled whites declines by 0.3 percent per annum compared to an assumed rise of 0.6 percent per annum in the baseline. On these assumptions, the growth of unskilled employment among nonwhites falls substantially, from 3 1/2 percent in the baseline to 2 percent in this scenario.

For nonwhites, the effects of slower employment growth more than offset the effects of higher wages. As a result, although those nonwhite workers with unskilled jobs are significantly better off, the welfare of the nonwhite community as a whole is reduced compared to the baseline. Specifically, overall income growth is estimated to be slower, the proportion of GDP earned by nonwhite workers is lower, and nonwhite

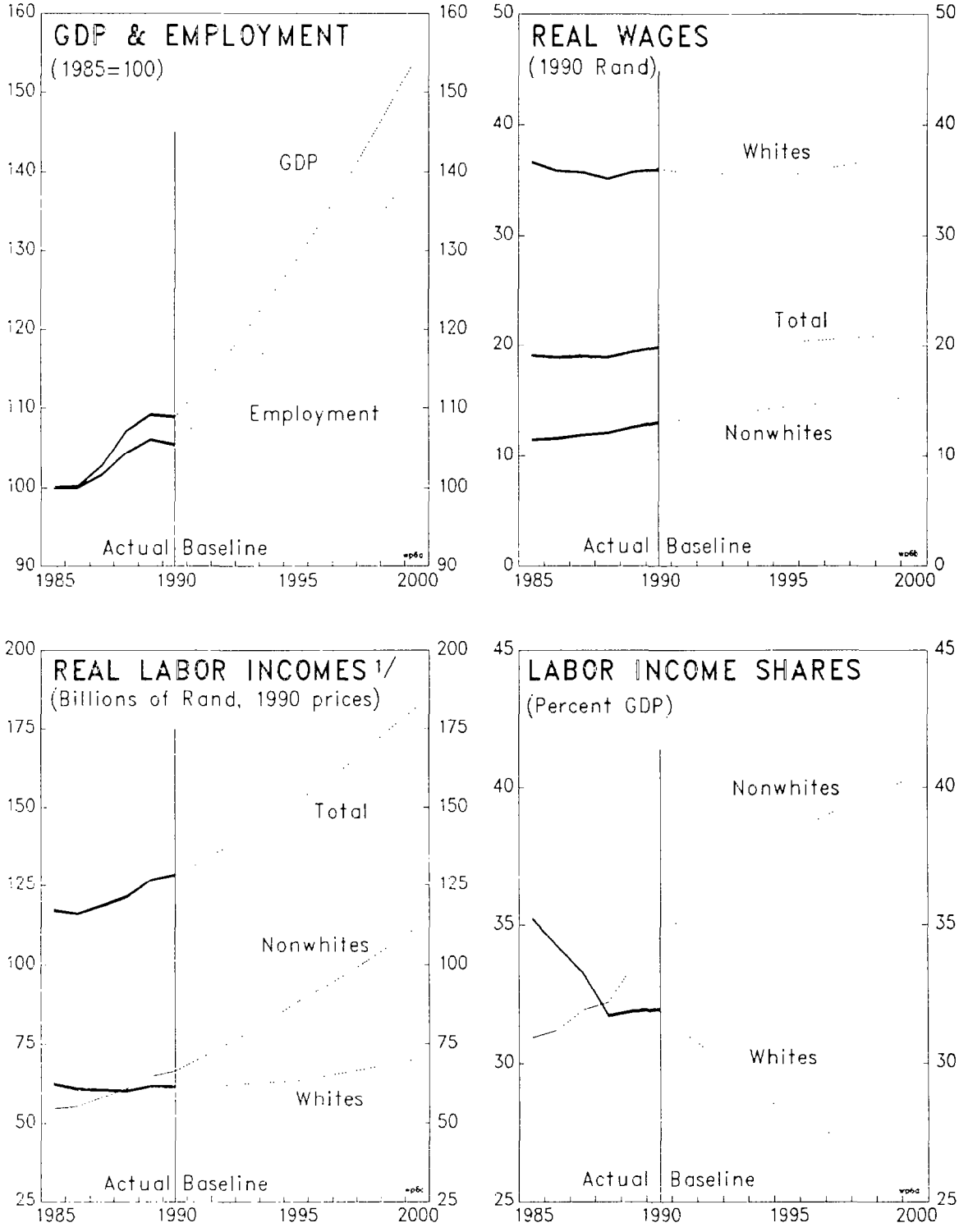
---

1/ For example Porter (1978), Lundahl (1982), Findlay and Lundahl (1987) and Bayoumi (1990).

CHART 6

SOUTH AFRICA

Baseline Projection for the Nonprimary Sector



Source: Staff estimates.

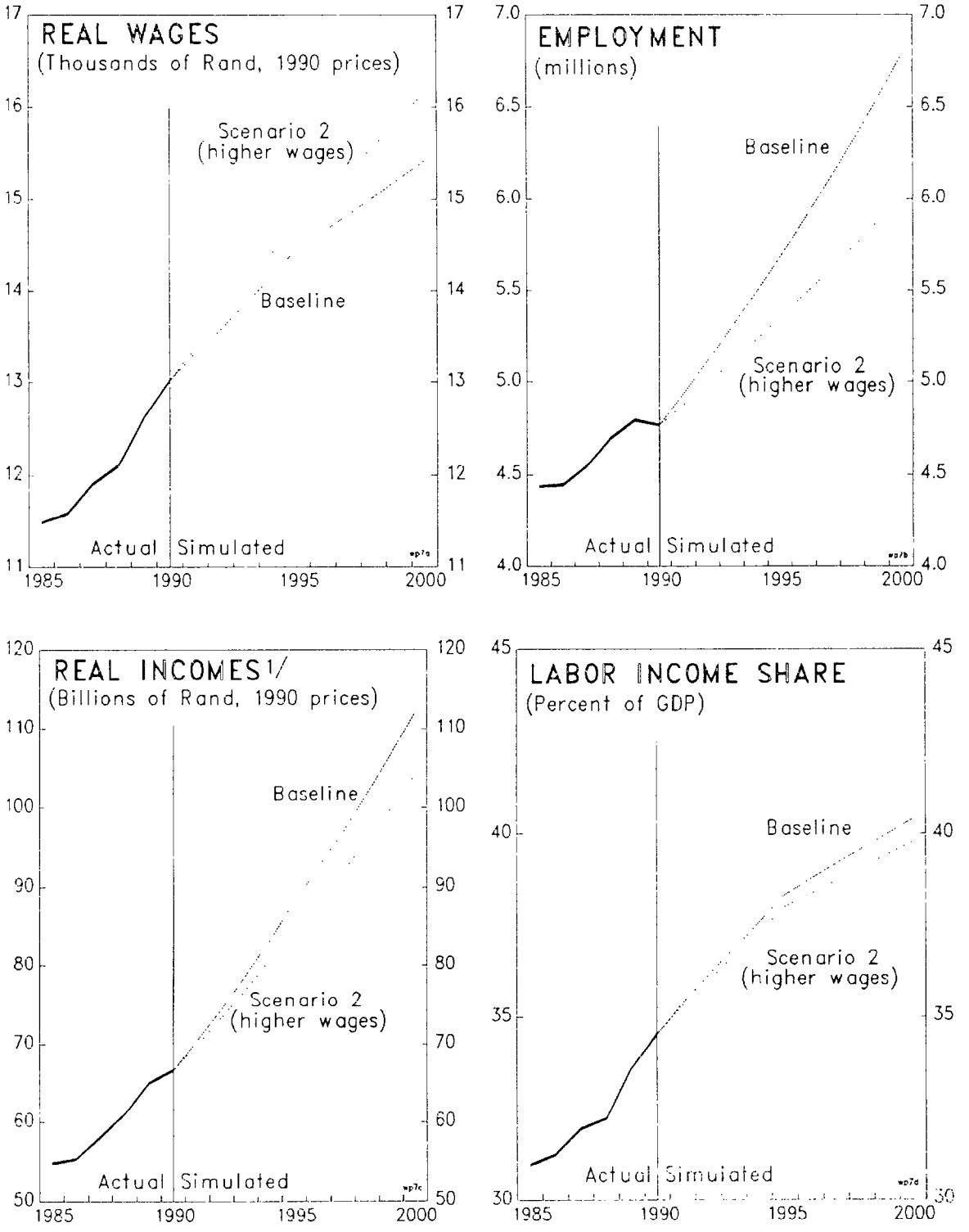
1/ Employment multiplied by wages deflated by the GDP deflator.

CHART 7

SOUTH AFRICA

Nonwhite, Nonprimary Sector Income:

High Wage Scenario



Source: Staff estimates.

1/ Employment multiplied by wages deflated by the GDP deflator.

unemployment rises in this scenario, rather than falling, as it did in the baseline scenario.

The basic reason that higher wage growth lowers the welfare of the nonwhite segment of the workforce is the high elasticity of substitution between skilled and unskilled labor that measures the amount by which a 1 percent change in relative wages changes the relative demand for the two types of labor. Given the estimated elasticity of substitution of 2.8, any narrowing of differentials between skilled and unskilled workers will have a more than proportionate effect on employment, and hence lower the total labor income earned by unskilled workers. 1/ This effect is exacerbated by two other factors: the reduction in employment is assumed to fall particularly hard on the nonwhite segment of the labor force, and, since unskilled employment is demand determined, the reduction in employment reduces the overall level of output, and shrinks the "pie" from which all are paid.

Table 3. Alternative Medium-Term Scenarios

(Average annual percentage growth)

	Scenario 2: High unskilled wage growth		Scenario 3: Skills bottleneck	
	Actual	Difference from baseline	Actual	Difference from baseline
Nonprimary sector:				
GDP	3.0	-0.6	3.3	-0.3
Employment	1.8	-1.1	2.9	--
whites	0.3	-0.6	0.9	--
nonwhites	2.3	-1.3	3.6	--
Real wages	1.1	0.5	0.3	-0.3
whites	0.7	0.3	0.7	0.3
nonwhites	2.2	0.5	1.0	-0.7
Nonwhite unemployment rate 1/	43.6	7.1	36.5	--

1/ Percent, end scenario.

1/ While the estimate of this elasticity is poorly determined, the additional evidence discussed in Section IV leads us to believe that a relatively high estimate is correct.

c. Scenario 3: Slower Skilled Labor Growth

This scenario examines the effects of bottlenecks in the supply of nonwhite skilled labor on growth and income distribution. In particular, the scenario questions the perhaps optimistic assumption in the baseline (given the schools boycott of the 1980s and the current relatively low education attainment of nonwhites), that the nonwhite skilled labor force will grow by 5 percent per annum. Instead, it is assumed that this segment of the workforce increases at 2 1/2 percent per annum. Overall nonwhite employment growth is projected to be the same as in the baseline, which implies a slightly faster rate of growth of unskilled employment.

The presumed bottleneck in the availability of skilled labor reduces the potential rate of growth of the economy by 1/4 percent per annum, to 3 1/4 percent (see Table 3). As a result of this slower overall growth, aggregate real wage growth falls to 0.3 percent per year. In addition, since the proportion of skilled workers in the labor force falls in this scenario, skill shortages drive up skilled wages relative to unskilled wages.

All of these effects, the lower growth in nonwhite skilled labor, the lower growth of aggregate real output and the widening of the wage differential between skilled and unskilled workers, have a detrimental effect on the income of the nonwhite segment of the labor force (Chart 8). By the end of the simulation, nonwhite real incomes are about 7 percent lower than in the baseline, while the proportion of GDP earned by nonwhite labor is some 1 1/2 percent lower. These differences are significantly larger than those projected in scenario 2 (as a comparison of the relevant panels of Charts 7 and 8 will make clear), again underscoring that education and access to skilled employment is a crucial element in redistributing income towards the less advantaged groups in South African society over the next decade.

VI. Conclusions

This paper uses estimates of a production function for the South African economy to look at the process of growth and the distribution of income in South Africa. Particular attention has been paid to the specification of labor inputs in order to take account of some of the key characteristics of the apartheid system. The results were then used to analyze both past trends in the South African economy, and medium-term prospects.

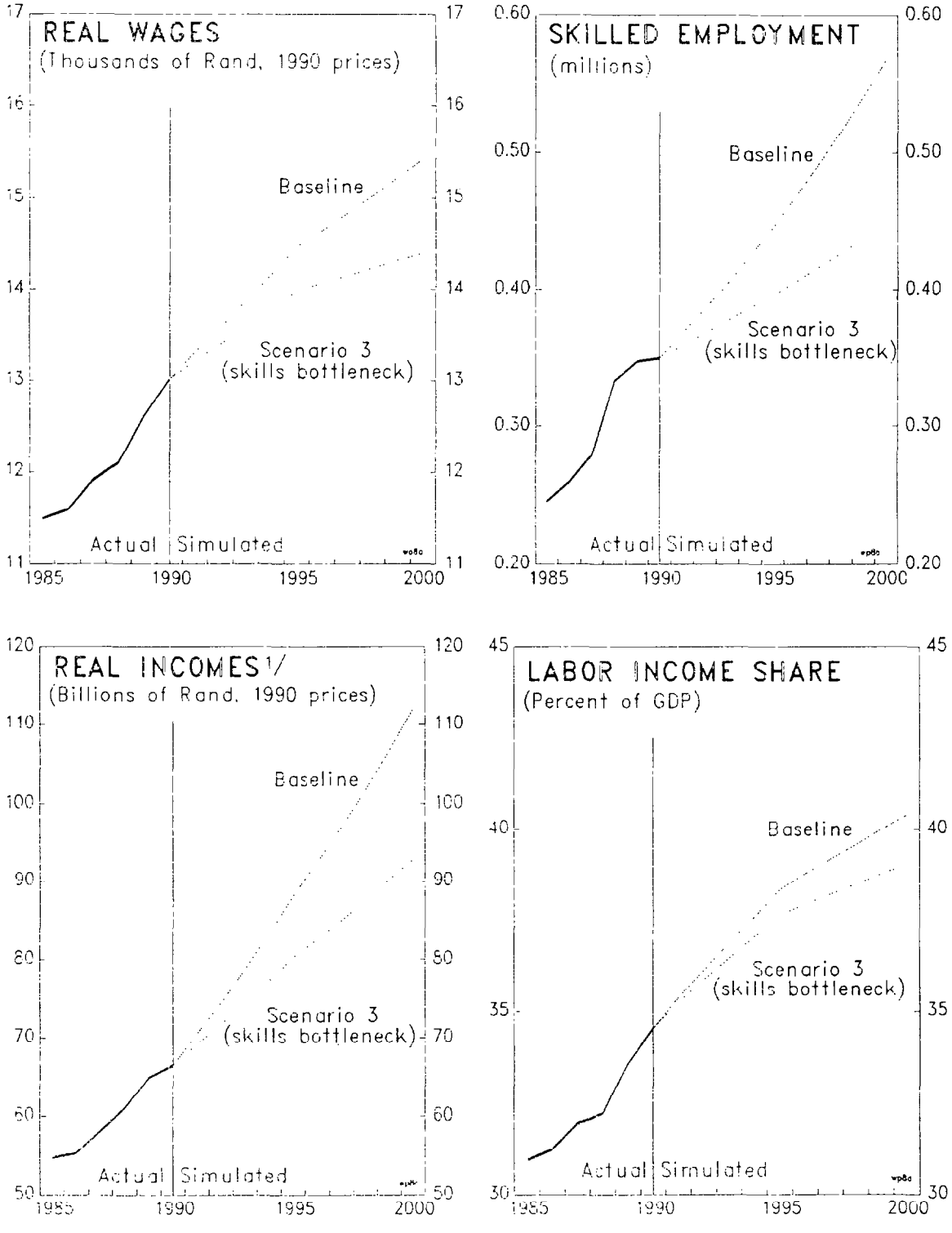
As far as past trends are concerned, the analysis concludes that the slowdown experienced by the South African economy over the last two decades does not have any single proximate cause, but is rather the consequence of inadequate performance in a number of areas. These include a slowdown in the rate of growth of the capital stock, low growth in employment and stagnant multifactor productivity. Turning to the distribution of income, the comparatively rapid growth in real wages of the nonwhite segment of the

CHART 8

SOUTH AFRICA

Nonwhite, Nonprimary Sector Income:

Skills Bottleneck



Source: Staff estimates.

1/ Employment multiplied by wages deflated by the GDP deflator.

population in the 1970s and 1980s appears to reflect largely the erosion of the gap between the wages paid to white and nonwhite workers performing similar functions. However, by 1990, the potential for further gains for the nonwhite population from this source appears to be relatively limited.

Looking to the future, a smooth transition to a nonracial society involving a return to the levels of investment seen in the early 1980s and robust employment growth could produce an underlying rate of growth of output of 3 1/2 percent per annum, and allow a steady improvement in living standards for the nonwhite section of the population. However, the results from the model indicate that attempts to speed up the improvement in the distribution of income through a more rapid rise in the wages of unskilled workers are likely to be self defeating. The main effect would be a slowdown in the growth of output and employment, which would bear particularly heavily on the nonwhite population.

Further analysis indicates that one of the key factors in the future evolution of growth and income distribution in South Africa over the next decade will be the ability of nonwhite workers to enter into skilled employment. The emergence of a skills bottleneck would significantly reduce both the underlying rate of growth of output and the rate of improvement in the living standards of the nonwhite segment of the population. This result underscores the importance of moving rapidly to rectify the past backlogs in education and training of the nonwhite workforce caused by apartheid restrictions.

Data Sources and Definitions

This appendix contains a brief description of the data used in the estimation.

Data on skill levels by racial groups for the nonprimary sector plus mining are available from the manpower surveys, which measure the number of workers in 28 occupations by racial group. These occupations are then aggregated into three types of occupations, high level, middle level and half/unskilled. High level occupations are essentially professional jobs: they include managers, engineers, lawyers, nurses and educationalists. The later two occupations make up some 40 percent of the total, and are particularly important for the nonwhite racial groups. Middle level occupations represent clerical or skilled manual jobs, while half/unskilled jobs are not differentiated. In the estimation, the skilled workers were those in the high level occupations while the unskilled workers were an aggregate of the middle and half/unskilled job categories. This appeared to be the most reasonable division given the need of a modern economy for highly trained individuals. One concern, however, is that the mix of employment within these occupations may not be the same across racial groups; in particular, white workers may tend to have more skilled jobs within the broad skilled and unskilled job categories, which may cause biases in the estimation.

The surveys were carried out every other year from 1965 to 1987, after which they moved onto an annual basis; from 1965-1987 the data for even numbered years were linearly interpolated.

Annual data on renumeration of labor by racial group for the nonprimary sector between 1970 and 1989 were obtained from South African Statistics, Section 7, 1990, and earlier issues. The data give employment, total wages and salaries and wage rates by racial group. Standardized employment series, which were used in some of the calculations, were also obtained from South African Statistics, while the national accounts data come from a tape supplied by the Reserve Bank.

References

Bayoumi, Tamim, "Output, Employment and Financial Sanctions in South Africa", International Monetary Fund Working Paper WP/90/113, (December 1990).

Findlay, R and M Lundahl "Racial Discrimination, Dualistic Labor Markets and Foreign Investment", Journal of Development Economics (1987).

Hofmeyr, J. "Black Wages: the Post-War Experience" in The Political Economy of South Africa ed N. Nattrass and E. Ardington, Oxford University Press (Cape Town 1990).

International Monetary Fund, "Economic Policies for a New South Africa," forthcoming Occasional Paper (1992).

Iyengar, M. and R. Porter, "South Africa Without Apartheid: Estimates from General Equilibrium Simulations", Journal of International Development, Vol 2:1, (1990).

Knight, J. and M. McGrath "The Erosion of Apartheid in the South African Labor Market: Measures and Mechanisms", Discussion Paper No. 35, Institute of Economics and Statistics, (September 1987).

Lewis, W., "Economic Development with Unlimited Supplies of Labour," Manchester School, Vol. 22 (1954).

Lundahl, M. "The Rational of Apartheid", American Economic Review, Vol 72:5 (1982).

McGrath, M. "Economic Growth, Income Distribution and Social Change" in The Political Economy of South Africa ed N. Nattrass and E. Ardington, Oxford University Press (Cape Town 1990).

Porter, R. "Redressing Inequality in the Post Apartheid South African Economy," Mimeo., University of Michigan (1991).

Porter, R. "A Model of a South African-Type Economy", American Economic Review, 68:5 (1978).

Terreblanche, S. and N. Nattrass "A Periodization of the Political Economy since 1910" in The Political Economy of South Africa ed N. Nattrass and E. Ardington, Oxford University Press (Cape Town 1990).

Sadie, J., "A Reconstruction and Projection of Demographic Movements in the RSA and TBC Countries", Bureau of Market Research, University of South Africa (1988).

Van den Berg, S., "On Interracial Income Distribution in South Africa to the End of Century," The South African Journal of Economics, Vol. 57, No. 1 (1989).