APARTHEID, THE JOB LADDER, AND THE

EVOLUTIONARY HYPOTHESIS: EMPIRICAL EVIDENCE

FROM SOUTH AFRICAN MANUFACTURING, 1960-77

by

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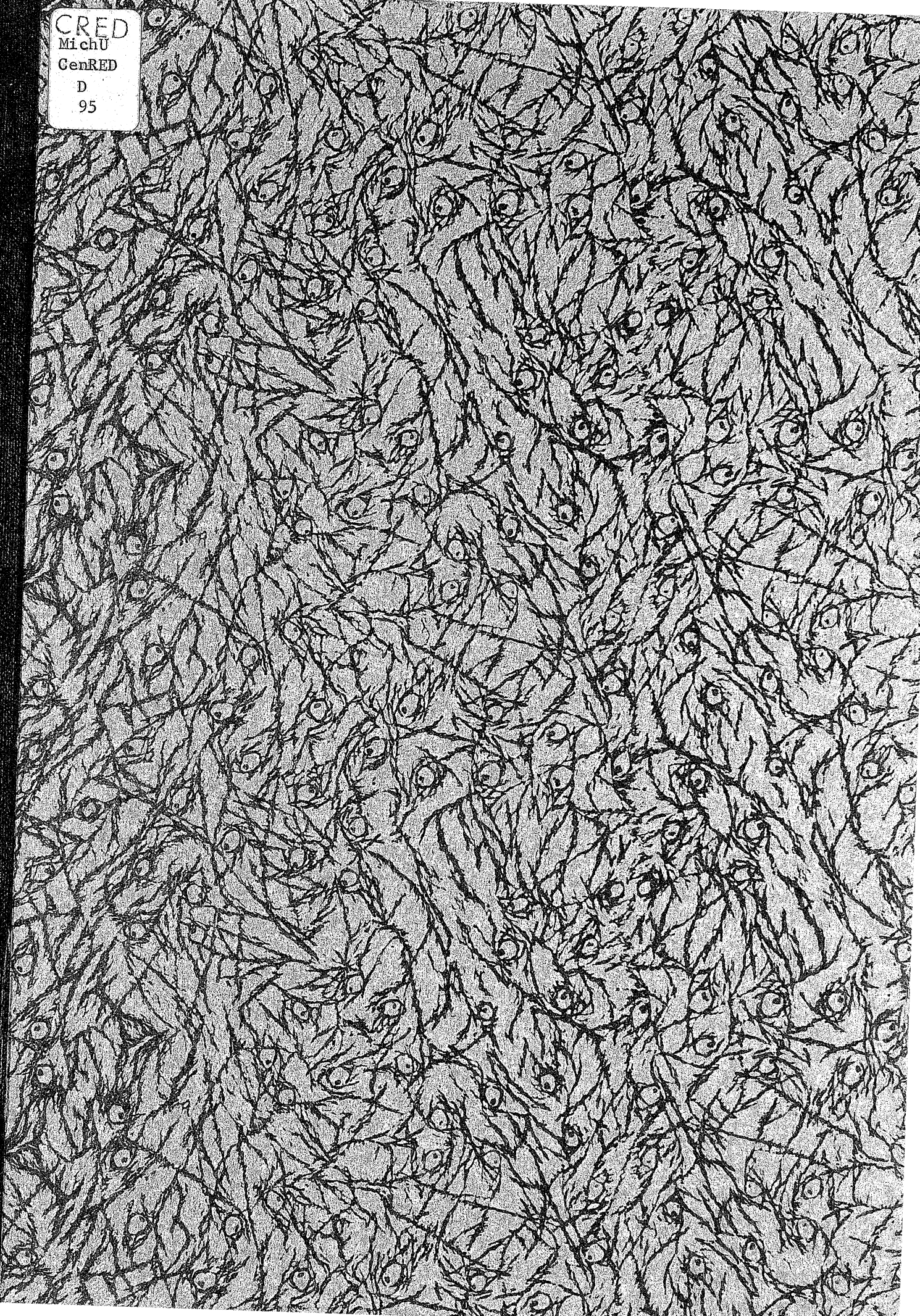Ann Arbor, Michigan 48109

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ABSTRACT

This paper explores various conceptions of the South African "evolutionary
hypothesis", whereby non-white economic opportunities are perceived as rising
over time as a result of innate market forces. It then develops in detail
one of these conceptions, whereby the scarcity of white labor induces a gradual
switchover of jobs from whites to non-whites, permitting the latter to move
up the "job ladder". The evidence from South African manufacturing over 1960-
1977 is then examined. This evidence is largely consistent with the jobs
ladder view, but only a small part of the growth of non-white employment in
manufacturing can be attributed to such switchovers of white jobs to non-whites.

RESUME

Ce document explore différentes opinions relatives à "l'hypothèse
évolutionniste" sud-africaine voulant que les opportunités économiques
offertes à d'autres qu'aux blancs soient perçues comme étant en hausse
au fur et à mesure que le temps passe, ceci en réponse aux pressions
innées du marché. Après cet exposé initial, le rapport precède au
développement détaillé de l'une de ces opinions. Celle-ci avance que
la rareté de la main-d'oeuvre blanche entraîne le déplacement graduel
de la demande pour les blancs vers les gens de couleur, permettant à
ceux-ci de gravir "les échelons de l'emploi". Des données sur l'industrie
sud-africaine de 1960 à 1977 sont ensuite offertes en guise de preuves
à l'appui. Elles semblent parfaitment soutenir la thèse de l'échelle
du travail. Et pourtant, seulement une petite proportion de la croissance
de l'offre d'emplois pour gens de couleur dans le secteur industriel
peut être attribuée à un tel revirement de situation.

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EMPIRICAL EVIDENCE FROM SOUTH AFRICAN MANUFACTURING, 1960-77

I. Introduction

Culture and custom, increasingly reinforced since 1948 by official policy, have created in South Africa a dualistic labor market and a highly inequitable income distribution. Behind the middling figure for South Africa's GDP per capita (US $1550[1]) stand two very different groups. The white minority -- educated, skilled, and privileged -- has attained a standard of living comparable to that of Western Europe and North America; meanwhile, the non-white peoples live at standards comparable to the rest of less developed Africa.[2]

Precise estimates of the degree of income disparity are of course much disputed, but the figures in Table 1 give a rough picture.[3] In 1970, white workers in industry earned nearly seven times as much, on average, as non-whites; and this multiple had increased over the period, 1950-70. The ratio of white to non-white earnings fell dramatically in the 1970s, but it was still more than four in 1977. Moreover, almost all the income accruing to entrepreneurial activity, capital, and land was earned by the white minority. Despite the faster growth of the non-white population in South Africa, its share of the total income showed "relative constancy" over 1925-70; only in the past decade have some seen "rapid growth" in this share (McGrath, 1977; Nattrass, 1977). But by other estimates, the non-white living standard has continued to fall even in the 1970s (Rogers, 1976).

This inequity of income and opportunity is well known, and most of the people of the world are agreed that reduction in this inequity is desirable.

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[1] In 1977 (SADOS, 1978, Tables 1.4 and 21.4), converted at one rand (R) = US $1.15.

[2] In the 1970 census, the 22 million South Africans consisted of 17% whites, 70% Africans, 9% "coloreds" (people of mixed racial origin), and 3% "Asians" (people of Indo-Pakistani origin). Throughout, I shall group these last three together, referring to them as "non-white".

[3] Although it should be noticed that these data refer only to the modern industrial sectors where most whites work and where only the financially better-off non-whites work.

Table 1

Employment and Earnings in South Africa[1], 1950-1977, by Race

Variable	1950	(Decade Change)	1960	(Decade Change)	1970[2]	1970[2]	(Decade Change)[3]	1977
White Labor								
Employment[4]	333.4	(+9%)	363.4	(+40%)	509.1	514.4	(+55%)	559.7
Earnings[5]	499.8		977.6		2,675.1	2,617.4		4,748.3
Average Earnings[6]	1,499.1	(+79%)	2,690.1	(+95%)	5,254.6	5,088.3	(+67%)	8,483.7
Non-White Labor								
Employment[4]	921.9	(+31%)	1,204.9	(+61%)	1,938.1	1,804.7	(+69%)	2,132.3
Earnings[5]	241.4		478.2		1,487.1	1,367.2		3,903.1
Average Earnings[6]	261.9	(+52%)	396.9	(+93%)	767.3	757.6	(+142%)	1,830.5

NOTES: [1] In mining, manufacturing, construction, and transportation only.

[2] Data for 1950, 1960, and 1970 are census data (SADOS, various issués); the second 1970 and the 1977 figures are Department of Statistics compilations (SADOS, 1978, Table 7.6).

[3] The 1970-1977 "decade change" figure is multiplied by 10/7 to make it comparable with the 1950-1960 and 1960-1970 decade change figures.

[4] In thousands of workers.

[5] In millions of U.S. $ (R1 = U.S. $1.40 in 1950, 1960, and 1970; R1 = U.S. $1.15 in 1977).

[6] In U.S. $ per worker per annum.

What divides people, both inside of and outside of South Africa, is the question of what sorts of policies would mitigate most rapidly the economic inequities of apartheid. One group calls for radical government intervention; the other envisions an ongoing endogenous process that will gradually erode the economic excesses of apartheid without need for extensive change in economic policy. This process of erosion of economic privilege is often called the "evolutionary hypothesis".[1]

The purpose of this paper is empirical, to assess the evolutionary hypothesis in the light of the employment, productivity, and wage data available for twenty-one South African manufacturing sectors over the past two decades, specifically 1960-77. But first, it is useful to review briefly the various strands of logic in the hypothesis and to develop in some detail the one I consider most relevant; this is done in Section II. The evidence is finally confronted in Section III.

The evidence is largely consistent with an evolutionary hypothesis that visualizes an improvement in non-white economic position by movement up a "job ladder". But only a small part of the growth of non-white employment in manufacturing can be attributed to the switchover of formerly white jobs to non-whites. Real average earnings, by race, are adjusted to allow for the switchover process, and the movements of the racial rates-for-the-job are estimated. For whites, sector-specific forces seem to dominate. But the convergence of non-white rates-for-the-job between sectors suggests a unification of the non-white labor market in manufacturing.

II. The Evolutionary Hypothesis, the Job Ladder, and the Switchover Rung

The hypothesis that the repression of non-white living standards will gradually disappear as a natural concomitant of South Africa's economic growth has been maintained by many analysts, though not all for the same reasons. Indeed, there are three distinct models of the South African development process from which some sort of evolutionary hypothesis can be derived:

    A. The need for internal markets. While it is difficult for most

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[1] The hypothesis goes by many names. Some: "amelioration"; "normalization"; "liberalization"; "relaxation"; "undermining"; "peaceful change"; "Cape Liberalism"; "the Oppenheimer thesis" (after the South African industrialist who has long espoused it); and "the green bay tree" theory (from Psalm 37).

Keynesian-raised economists to visualize a new, pro-black growth strategy being forced on racist South Africa through an inadequacy of aggregate demand, the theory of secular underconsumptionist tendencies has been revived in the South African context by non-economists and neo-Marxists. According to this theory, South Africa has now moved from an export-oriented producer of primary products to an industrialized economy that must, or should, look predominantly inward for its markets. Why whites oversave and why public policy cannot offset this tendency are two questions left largely unanswered, although it is sometimes argued that only the mass black consumption of basic manufactures can allow South African factories to begin to take advantage of economies of scale. The model is often encountered in discussions of LDC development needs and strategies, and it suffers the same difficulty here: while it may be a _desirable_ strategy -- from at least some viewpoints -- there is nothing in the reasoning that makes it _inevitable_. (Harvey, 1974; Katzen, 1975; Trapido, 1971.)[1]

B. _The liberalizing tendency of capitalist industrialization._ This is more an article of faith than a theory, and it has provided the focal point of the differences between conservative and radical interpretations of the South African economy. The conservative view maintains that "it is in the interest of business men... not only to seek out and employ the least privileged classes... but actually to educate them..." (Hutt, 1964, p. 173). The radical view displays variety but in its purer Marxist stance, for example, argues that the "development of capitalism in South Africa was based upon an abundant supply of cheap black labour.... The whole structure is maintained primarily...through the exercise of state coercion supported by all sections of the white population" (Wolpe, 1970, p. 171). While these statements seem hopelessly conflicted, it is not difficult to develop a model in which elements of both views enter importantly (Porter, 1978). More critically, it has not proven easy to devise empirical tests that might help to resolve the debate.[2]

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[1]There is also a political variant of this, that a "black middle class" is a prerequisite to the internal and external stability and capital flows needed for continued capitalist development (Davies, 1979).

[2]For excellent recent summaries of the issues, see Johnstone, 1970, and Yudelman, 1975.

C. The pragmatic reaction to a growing scarcity of white skilled labor.
The actual economic meaning of the word, apartheid, has never been "apartness"
in the sense of segregation of workplace, but rather a labor hierarchy in
which whites receive better education and training, better jobs, and better
wages. But the very growth of the South African economy -- real GDP rose
at 5% per annum over the period, 1946-75 -- has meant continued shortages
of high-level, white labor since the white population grew at only 2% per
annum (including net immigration) over this period. The result has been
a steadily increased reliance in non-white labor, and this has usually
meant the elevation of non-white labor into jobs formerly done by whites.[1]
As non-whites are moved into more skilled, more highly paid jobs, the system
must provide ever more education and training to non-whites to prepare them
for these jobs. There is no dispute that the "colour bar" is shifting in
this manner; the questions involve the pace and economic impact (Maree, 1975;
Johnstone, 1970; Davies, 1979; Spandau, 1972).

While my predilection is to say "no" to the first and "maybe" to the
second model, I have no idea how to test them. The research described below
will focus on the third of these models, the "pragmatic" version of the
evolutionary hypothesis. Essentially, it represents an attempt to gain
quantified insight into the nature and pace of the shifting "colour bar."

In the years since World War II, a period of rapid industrialization in
South Africa, the overriding problem for growth has been a scarcity of skilled
labor. Apartheid policies, under which only whites are permitted into and
trained for high-level jobs, insure high wages and full employment for whites,
but at the cost of perpetual shortages of skilled labor.[2] Over the period,
1950-70, for example, while real GDP in the manufacturing sector rose at a
rate of 6.4% per annum, technological progress and investment were reducing
labor input requirements (per unit of output) at 2.0% per annum. But this
still meant that the manufacturing sector needed to expand employment at an
annual rate of 4.4%, at a time when the white population was growing at only
1.9% per annum. To some extent, skilled white labor was drawn from other,

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[1] The process will be discussed in greater detail in the next section.

[2] The ratio of skilled to unskilled labor wage rates is, in South Africa,
three times that of other industrialized countries (Schlemmer, 1973).

relatively declining, sectors so that the annual rate of growth of white labor in manufacturing was raised to 2.9%. The remaining gap -- between 2.9% and 4.4% -- was filled by upgrading and greatly expanding the use of non-white labor, which grew at 5.0% per annum over this period as a result.[1]

Custom, employer bias, white unions, the inferior quality of "Bantu education," and governmental insistence have all combined to insure that this massive increase in the use of non-white labor has almost entirely occurred at the lower rungs of the industrial job ladder. There being limits to the extent to which unskilled labor can be substituted for skilled labor, it has been necessary throughout this process to utilize non-white labor at ever higher rungs in the job-skill ladder. The black industrial labor force has been altered in this process from homogeneous, migrant, unskilled, and illiterate to heterogeneous, with a hierarchy of its own, many members of which are skilled and (de facto if not de jure) permanent.

This process, of overriding importance in recent South African economic history, goes on in decentralized, unplanned fashion. If a factory has trouble filling job vacancies at the lowest rung reserved for whites, it negotiates with the white union, offering pay raises and the upgrading of existing white employees in return for the right to convert that rung into a low-paid, non-white job. A concomitant of this "rationalization" through "productivity agreement" may be a job "dilution" or "fragmentation", whereby more than one non-white worker is hired to do what was formerly done by one white.[2]

This process of growth through a steadily ascending switchover rung to divide whites from non-whites on the job ladder has been much noticed and discussed (Schlemmer, 1973; Katzen, 1975; Knight and McGrath, 1977; Legassick, 1977; and Lipton, 1979) but largely at the macroeconomic or case-study level. Here, we quantify the process by examination of the data for sectors within manufacturing, finding the path over time of wage rates, labor use, labor productivity, and job switchover rate that is consistent with the sectoral

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[1] Sources: SARB and SADOS.

[2] Sometimes, the dilution is in title only, in order to justify a lower wage or to denigrate the job's status.

data collected in the manufacturing censuses. There are census data on changes in employment, by race, but they cannot in themselves indicate whether the changes result from productivity increases, output increases, or from job switchovers. And there are census data on average wage payments, by race, but they do not in themselves indicate whether the changes result from increases in the general wage scale or from changes in the labor force composition owing to switchovers. The wage rate and switchover "estimates" cannot be gotten precisely from the data -- nor, of course, does any sector's entire job structure switch so neatly as I will assume (Knight and McGrath, 1977; Lipton, 1979) -- but the estimates that I will derive will be <u>consistent</u> with the actual data and will provide a stereotypical and quantified dynamic picture of the employment and wage process within each manufacturing sector.

This study makes use of certain identities which, together with a simple theory of the employment process, are sufficient to generate ranges of estimates. Consider that, in any sector, there are N kinds of jobs that need to be performed, and, in the ith job at any time t, there would be $\ell_i \, Q^t/P^t$ white workers, where ℓ_i is the ratio of white laborers needed in the ith job to the total sectoral output in the base period (when t = 1), Q^t is the real sectoral output in t, and P^t is a productivity index; note that the absence of an i subscript to P^t means that it is assumed that productivity advances economize equi-proportionately on the need for labor in all jobs. At time t, the switchover job is that at the s_t level, whites doing the jobs on higher rungs ($s_t < i < N$) and non-whites doing the jobs on lower rungs ($1 < i < s_t$). Accordingly, the number of white workers is given by

$$L_W^t = \frac{Q^t}{P^t} \sum_{i=s_t}^{N} \ell_i \quad , \tag{1}$$

and the number of non-white workers is given by

$$L_B^t = \frac{Q^t}{P^t} \sum_{i=1}^{s_t} \phi \ell_i \quad , \tag{2}$$

where ϕ is the number of non-white workers it "requires" to do the work of one white worker. That $\phi \geq 1$ could reflect productivity differentials, owing to the fact that non-whites have less education, less incentive, and less industrial experience, or it could reflect job fragmentation whereby at the

switchover rungs individual white jobs are diluted and passed on to more than one non-white worker for reasons other than productivity. For simplicity throughout, I assume the same value of ϕ applies to different rungs on the ladder.

By differencing equations (1) and (2) between years t and (t-1), we get

$$\sum_{i=s_{t-1}}^{s_t} \ell_i = \frac{P^{t-1} L_W^{t-1}}{Q^{t-1}} - \frac{P^t L_W^t}{Q^t} \text{ , and} \qquad (3)$$

$$\phi \sum_{i=s_{t-1}}^{s_t} \ell_i = \frac{P^t L_B^t}{Q^t} - \frac{P^{t-1} L_B^{t-1}}{Q^{t-1}} \text{ .} \qquad (4)$$

With data for T periods for each of L_W^t, L_B^t, and Q^t, and an assumption about ϕ, equations (3) and (4) provide 2(T-1) equations in the 2(T-1) unknowns,

$$\sum_{i=s_1}^{s_2} \ell_i, \ \sum_{i=s_2}^{s_3} \ell_i, \dots, \ \sum_{i=s_{T-1}}^{s_T} \ell_i, \ P^2, \ P^3, \dots, \ P^T \text{ .}^1 \quad \text{Inspection of equations (3)}$$

and (4) indicates that they can be solved recursively to yield

$$P^t = P^{t-1} \frac{Q^t}{Q^{t-1}} \frac{\phi L_W^{t-1} + L_B^{t-1}}{\phi L_W^t + L_B^t} \text{ , and} \qquad (5)$$

$$\sum_{i=s_{t-1}}^{s_t} \ell_i = \frac{P^{t-1}}{Q^{t-1}} \frac{L_B^t L_W^{t-1} - L_B^{t-1} L_W^t}{\phi L_W^t + L_B^t} \text{ .} \qquad (6)$$

Define $P^1 = 1$ and assume a value for ϕ. Then solve for P^2 and $\sum_{i=s_1}^{s_2} \ell_i$, using the actual data for Q^1, L_W^1, L_B^1, Q^2, L_W^2, and L_B^2. The process is repeated to

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[1] One P^t is arbitrary, and we chose $P^1 = 1$.

derive P^3 and $\sum\limits_{i=s_2}^{s_3} \ell_i$; and so forth. In the end, we have a stereotypical, quantified story (over the T years) of labor use in the sector, its productivity history, and the pace at which jobs were switched over from whites to non-whites. Specifically, it is then possible to divide the growth of non-white labor up into three parts, that caused[1] by productivity growth (a negative component), that caused by output growth (labor "widening"), and that caused by movement in the racial switchover rung. And the same threefold division is, of course, possible for the growth of white labor, where the switchover component is now a negative force. Precise equations can be written, with the three terms of each representing the growth due to productivity, output, and switchover, respectively,

$$\Delta L_B = - \left(\frac{Q^{t-1} + Q^t}{2Q^{t-1}}\right) \left(\frac{P^t - P^{t-1}}{P^t}\right) L_B^{t-1}$$

$$+ \left(\frac{P^{t-1} + P^t}{2P^t}\right) \left(\frac{Q^t - Q^{t-1}}{Q^{t-1}}\right) L_B^{t-1}$$

$$+ \frac{Q^t}{P^t} \phi \sum_{i=s_{t-1}}^{s_t} \ell_i \; , \text{ and} \tag{7}$$

$$\Delta L_W = - \left(\frac{Q^{t-1} + Q^t}{2Q^{t-1}}\right) \left(\frac{P^t - P^{t-1}}{P^t}\right) L_W^{t-1}$$

$$+ \left(\frac{P^{t-1} + P^t}{2P^t}\right) \left(\frac{Q^t - Q^{t-1}}{Q^{t-1}}\right) L_W^{t-1}$$

$$- \frac{Q^t}{P^t} \sum_{i=s_{t-1}}^{s_t} \ell_i \; , \tag{8}$$

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[1] Note that we are considering only the solution to the larger, implicit general-equilibrium system that must be at work. Thus, we can speak of labor changes as being "caused" by changes in productivity, output, and the switchover rate when in fact they are all endogenous variables in that general-equilibrium system.

with Δ representing the difference between (t-1) and t.[1]

The same sort of process can be reconstructed with the census wage data. An earnings identity can be written for whites and for non-whites for each time period. For non-white labor, we have earnings identities for each of t and (t-1):

$$E_B^t \, L_B^t = \sum_{i=1}^{s_t} E_{Bi}^t \, \phi \, \ell_i \, \frac{Q^t}{P^t} \, , \text{ and} \qquad (9)$$

$$E_B^{t-1} \, L_B^{t-1} = \sum_{i=1}^{s_{t-1}} E_{Bi}^{t-1} \, \phi \, \ell_i \, \frac{Q^{t-1}}{P^{t-1}} \, , \qquad (10)$$

where E_{Bi}^t is the real earnings rate of non-white workers on the ith job rung at time t, and E_B^t is the _average_ real earnings rate of all non-white labor at t. The values of E_B^t are recorded, for each sector and year, in South Africa's official statistics; the values of E_{Bi}^t are not. Accordingly, if we are to make use of identities (9) and (10), we must eliminate the variables involving E_{Bi} from them. Assume

$$E_{Bi}^t = \alpha_B^t \, E_{Bi}^{t-1} \qquad \text{for all i} \quad , \text{ and} \qquad (11)$$

$$E_{Bs}^t = E_{Bi}^t \qquad \text{for all } s_{t-1} < i < s_t. \qquad (12)$$

The first of these assumptions is that _all_ non-white real wage rates rise (or fall) at the same rate in any year. This is almost certainly not true in any given year, but to the extent that some non-white wages progress more rapidly, others must progress less rapidly, if we think of α_B^t (minus one) as the average rate of increase of non-white earnings rates. So the assumption will not bias our results as long as we are concerned with non-white workers as a _group_. The second of the assumptions merely requires that the rate of switchover - i.e. the number of jobs in the range from s_{t-1} to s_t - be sufficiently small that we can think of the earnings rate at the switchover

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[1]The form of equations (7) and (8) is to some extent arbitrary and has been selected so as to eliminate interaction terms. Quantitatively, the precise form makes little difference.

rungs as being a single value in year t, namely, E_{Bs}^{t}. Substituting equations (10) - (12) into (9), we derive

$$\alpha_B^t = \frac{Q^{t-1}}{P^{t-1} E_B^{t-1} L_B^{t-1}} \left\{ \frac{P^t E_B^t L_B^t}{Q^t} - E_{Bs}^t \phi \sum_{i=s_{t-1}}^{s_t} \ell_i \right\} > \quad (13)$$

which involves known data (Q, E_B, and L_B for t and (t-1)), previously estimated values (P and $\Sigma\ell_i$), and two still unknown values (α_B^t and E_{Bs}^t).[1] A similar equation can be derived for white labor, yielding an estimate of α_W^t in terms of E_{Ws}^t, where those variables are analogously defined:[2]

$$\alpha_W^t = \frac{Q^{t-1}}{P^{t-1} E_W^{t-1} L_W^{t-1}} \left\{ \frac{P^t E_W^t L_W^t}{Q^t} + E_{Ws}^t \sum_{i=s_{t-1}}^{s_t} \ell_i \right\}. \quad (14)$$

Before proceeding, we should note that the α's of equations (13) and (14) are the estimated ratios of real earnings in t to those in (t-1) for each job level. They will <u>not</u> be equal to the simple ratio of E_X^t to E_X^{t-1} (X = W,B) because of job switchovers. <u>Both</u> α_W^t and α_B^t will be <u>less</u> than E_W^t/E_W^{t-1} and E_B^t/E_B^{t-1}, respectively, because whites are continually moving out of some of their low-wage jobs and non-whites are continually moving into some new (for them) high-wage jobs.

If there were data, by sector and by year, for either the real switchover wage rates, E_{Ws}^t and E_{Bs}^t, or the growth rates of earnings for white and non-white jobs, ($\alpha_W^t - 1$) and ($\alpha_B^t - 1$), then we could calculate the other pair. But we do not know either. What we do know is that the average non-white wage is less than the non-white switchover wage, that the white switchover wage is less than the average white wage, and that the non-white switchover job cost is most unlikely to be above the previous white switchover job cost. In symbols,

$$\phi E_B^t < \phi E_{Bs}^t \leq E_{Ws}^t < E_W^t. \quad (15)$$

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[1] An assumption about the value of ϕ is still needed.

[2] Note that the analogy requires a change of sign before the final term since the switchover jobs go <u>from</u> whites <u>to</u> non-whites.

To build our stereotypical picture of the employment wage paths, we will choose switchover wages in these ranges arbitrarily and then explore the sensitivity of the results to the arbitrariness of the choice. Specifically, we make two assumptions:

$$E_{Bs}^t = \frac{\sigma}{\phi} E_{Ws}^t \quad \text{for all } t \quad , \text{ and} \tag{16}$$

$$\frac{E_{Bs}^t}{E_B^t} = \frac{E_W^t}{E_{Ws}^t} \quad \text{for all } t \quad . \tag{17}$$

In the first assumption, σ represents the fraction of the white switchover job cost that the capitalists continue to pay when the job is switched from a white worker to ϕ non-white workers. Our test of sensitivity will involve using different values of σ in the range, $0 < \sigma \leq 1$. The second assumption is simply a proportionality assertion about the relationships of the mean and the extreme in the white and non-white wage distributions. With (16) and (17), we derive

$$E_{Ws}^t = \sqrt{\frac{\phi}{\sigma} E_B^t E_W^t} \quad , \text{ and} \tag{18}$$

$$E_{Bs}^t = \sqrt{\frac{\sigma}{\phi} E_B^t E_W^t} \quad . \tag{19}$$

Substituting (18) and (19) into (13) and (14), we get finally,

$$\alpha_B^t = \frac{Q^{t-1}}{P^{t-1} E_B^{t-1} E_W^{t-1}} \left\{ \frac{P^t E_B^t L_B^t}{Q^t} - \sqrt{\sigma \phi E_B^t E_W^t} \sum_{i=s_{t-1}}^{s_t} \ell_i \right\}, \text{ and} \tag{20}$$

$$\alpha_W^t = \frac{Q^{t-1}}{P^{t-1} E_B^{t-1} E_W^{t-1}} \left\{ \frac{P^t E_W^t L_W^t}{Q^t} + \sqrt{\frac{\phi}{\sigma} E_B^t E_W^t} \sum_{i=s_{t-1}}^{s_t} \ell_i \right\}, \tag{21}$$

where the $(\Sigma \ell_i)$ series is already calculated from (6), and the P_t series from (5).

To summarize, in the empirical work of Section III, we will examine the actual employment, wage, and output data of South African manufacturing as if it were generated by this stylized movement of non-white labor up the job ladder. We will not, thereby, be testing either the job ladder or the evolutionary hypotheses, but rather will be assuming they are correct and uncovering quantitative information about their structure and, most importantly, their rate. In addition to the job ladder approach itself, we have had to make four assumptions about the wage structure and its movement over time -- in equations (11), (12), (16), and (17).

We will need, for the empirical work, to assume values for the parameters, ϕ and σ. Both, of course, have varied from plant to plant, job to job, and year to year, but we will test the sensitivity of our results to these values by conducting all our work at extremes for these parameters. When $\phi = \sigma = 1$, it means that, at the switchover rung, one non-white worker replaces one white worker and receives the same pay. When $\phi = 2$ and $\sigma = 1/2$, it means that, at the switchover rung, two non-white workers are "required" for each white replaced and they are each paid only one fourth of what the white worker received for that job.[1]

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[1]In-between cases, for example, where $\phi = 1$ and $\sigma = 1/2$ or where $\phi = 2$ and $\sigma = 1$, are not reported as they always emerge as interpolations.

III. <u>Evidence</u>

The data for South African manufacturing over 1960-1977, in total and by sector, are broadly consistent with the job-ladder and switchover-rung hypothesis. As Table 2 (columns 2 and 3) shows, non-white employment grew more rapidly than white employment in all but one sector.[1] Moreover, this transfer of job rungs from whites to non-whites took place without absolute declines in white employment in all but five sectors. Indeed, the five exceptions reinforce the general story of a movement of white labor to higher paid, higher rung positions in the economy as these sectors i) are particularly intensive in their use of unskilled labor, ii) were low-wage for whites at the start of the period[2], and iii) grew slowly during the seventeen years.[3]

Although fuller interpretation of the earnings data must await (later in this section) a breakdown of the increases into movements of real wage rates on rungs and movements up rungs, we should note here that real earnings of both races generally rose in this period. Indeed, there is prima facie evidence of the wage-gap erosion expected through the evolutionary hypothesis. The question in the 1970s was no longer whether the erosion was occurring but whether it was fast enough to constitute a politically viable path for the future. For those who find it instructive to ask the question, if the 1960-1977 relative real earnings rate growth were to continue when would equality of racial earnings be achieved, the answer for total manufacturing is 2152 A.D.[4] This date differs from sector to sector, and it should be

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[1]"Professional equipment, etc." But this sector is especially heterogeneous and began with small total employment (3 thousand in 1970, the first year for which separate data are available for this sector). The employment and average real wage data, by race, for 1960 (when available) and for 1977, are given in Table A-1 and A-2 of the Appendix. Data problems and manipulations are discussed there.

[2]See Table A-1. Average white wages in tobacco, clothing, footwear, wood and cork, and furniture were nearly one fifth below average white earnings in all manufacturing in 1960.

[3]See column 6 of Table 2.

[4]T equals 175 in the equation, $952(1.73)^{T/17} = 3866 (1.51)^{T/17}$.

Table 2

Growth Rate[1] of Employment, Real Earnings, Output, and Labor Productivity in South African Manufacturing, 1960-1977

Sector (1)	Employment		Average Annual Real Earnings		Real Output[2] (6)	Labor Productivity[3]	
	White (2)	Non-White (3)	White (4)	Non-White (5)		$\phi = 1$ (7)	$\phi = 2$ (8)
Manufacturing - Total	+ 65%	+109%	+51%	+ 73%	+161%	+ 32%	+ 37%
Food	28%	77%	62%	68%	105%	22%	27%
Beverages	40	76	37	95	273	112	121
Tobacco	- 21	- 6	87	74	88	111	117
Textiles	56	158	47	42	159	6	10
Clothing	- 62	61	77	- 1	128	63	83
Leather	26	58	48	18	29	- 17	- 15
Footwear[4]	- 69	- 10	71	8	46	81	98
Wood and Cork	- 10	71	53	110	54	- 4	0
Furniture	- 11	88	44	40	88	13	23
Paper	31	96	26	76	211	74	85
Printing	39	127	36	37	262	111	128
Chemicals	59	71	56	142	304	141	144
Rubber	36	129	69	67	135	20	30
Plastic Products[5]	15	24	6	46	6	- 14	- 13
Non-Metallic Mineral Products	34	50	52	114	93	31	32
Basic Metal	114	148	42	114	233	42	46
Metal Products	50	95	35	74	141	33	38
Machinery	130	227	38	99	27	- 55	- 52
Electrical Machinery	92	146	54	91	102	- 9	- 5
Transport Equipment	172	254	60	58	148	- 22	- 19
Professional Equipment, etc.[5]	137	74	- 7	56	60	- 17	- 3

Table 2

SOURCE: Tables for columns   (2)   -   (5);
                     South African Statistics, 1978 for column
                     (6); Tables and text equation (5)
                     for columns (7) and (8).

NOTES: [1]The growth rate is the 1977 value divided by the
            1960 value, with one then subtracted, expressed as
            a percentage.

            [2]See Appendix for detail on the output index.

            [3]See text for explanation of ϕ.

            [4]Growth rates for footwear are for 1964-1977.

            [5]Growth rates for plastic products and professional
            equipment, etc., are for 1970-1977.

noticed that no narrowing of the gap occurred during 1960-1977 in seven of the twenty-one manufacturing sectors.

The pattern of earnings growth by sector is shown in Figure 1.[1] For both whites and non-whites, earnings growth was generally more rapid the lower the initial average rate of earnings. One is tempted to nod at this pattern, since it is not uncommon -- as growth proceeds, skilled labor eventually becomes relatively more abundant than unskilled labor and wage convergence intensifies. But the South African patterns cannot reflect this fact of industrial maturity. There, the patterns indicate convergence <u>within</u> the skilled labor earnings (i.e. whites) and convergence <u>within</u> the unskilled labor earnings (i.e. non-whites). It is not immediately apparent why the less skilled of the skilled members should experience more rapid earnings increases than the more skilled of the skilled workers; nor why the less skilled of the unskilled should experience more rapid earnings increases than the more skilled of the unskilled, especially when the pool of very unskilled black labor in South Africa is often termed "unlimited" with its reservation wage - the standard of living in the "homelands" - actually declining over time. We shall return to this shortly.

Finally, Table 2 reports estimates of productivity growth for the sectors of manufacturing (columns 7 and 8); equation (5) is applied to each of the years, 1961 through 1977, with a job fragmentation coefficient (ϕ) of one and two. These are estimates of average labor productivity change, and hence they incorporate the influences of altered capital intensity, both physical and human, as well as technical progress. There are several interesting things to note in these productivity estimates. One, they are not sensitive to the ϕ assumption used.[2] Two, productivity growth was not hampered by more rapid rates of job switchover. This result is made comprehensible by recognizing that job switchover provided two conflicting forces on economic efficiency

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[1]Professional equipment, etc. is omitted from this figure and from further discussion since its employment changes are inconsistent with the job-ladder hypothesis being explored.

[2]It may at first seem surprising that greater job fragmentation implies higher labor productivity growth. This is a statistical necessity. If the rate of growth of the effective labor force is smaller then that of the actual labor force (i.e. $\phi > 1$), then the actual output growth could only have been achieved if the rate of growth of effective-labor productivity had been higher.
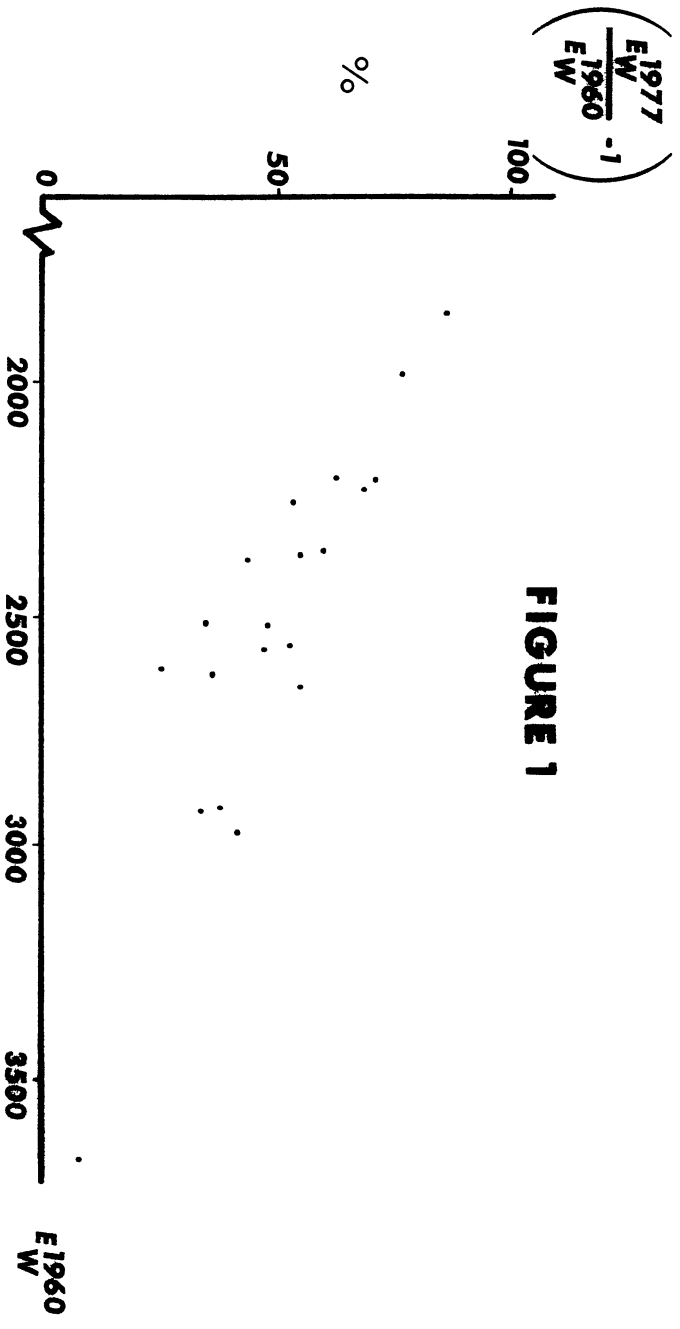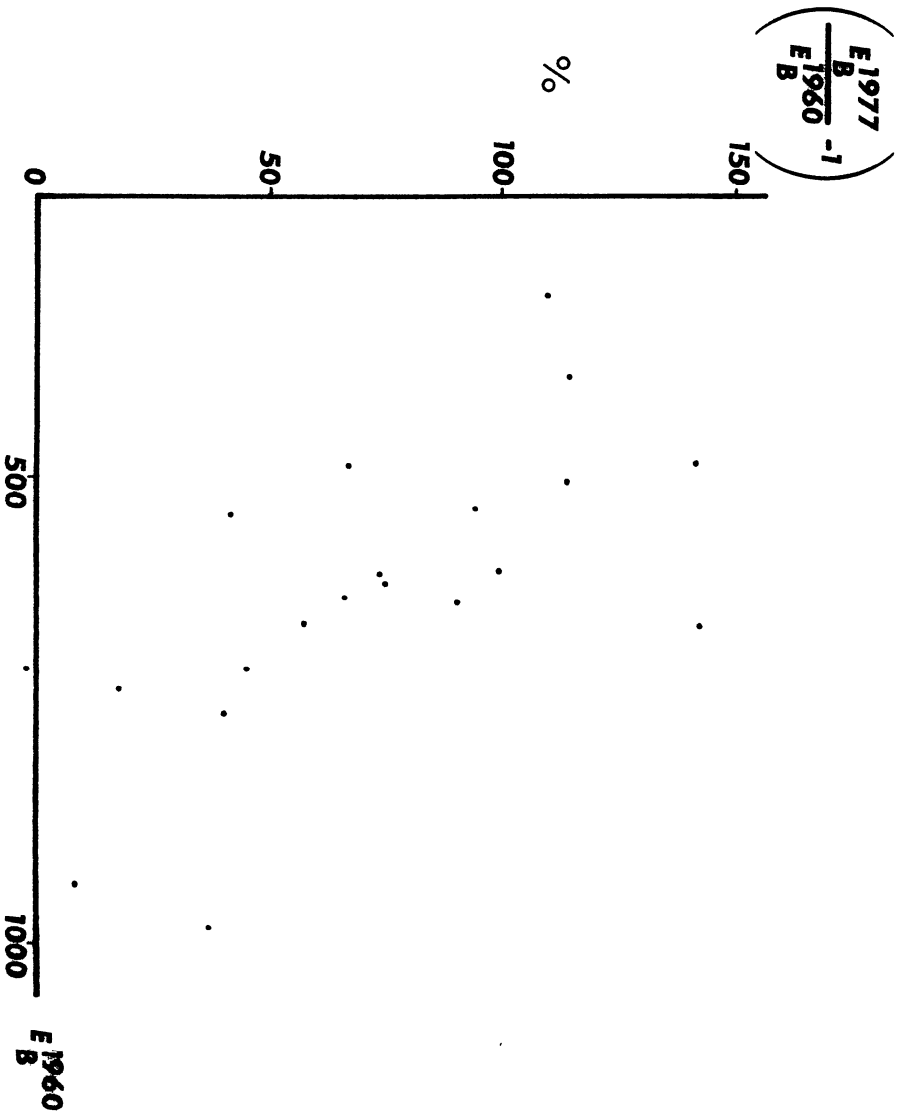
FIGURE 1

$\left(\dfrac{E_W^{1977}}{E_W^{1960}} - 1\right)$ %

$\left(\dfrac{E_B^{1977}}{E_B^{1960}} - 1\right)$ %

E_W^{1960}

E_B^{1960}

and hence on productivity. On the one hand, the most talented non-whites are elevated toward the positions they would have held in a world without discrimination; but, on the other hand, the least talented whites are promoted into jobs they are even less qualified to do. The third point of interest is the large number of productivity declines (in six or seven sectors), probably due not to the skill or racial composition of the labor force but rather to the nature of the sector - most declines occur in late-stage, capital and technology intensive, tariff protected sectors.

By application, year by year, of equations (7) and (8), we can divide the actual changes in white and non-white employment into three compartments, those due to productivity change, those due to output change, and those due to job switchover. The results of these divisions are shown in Table 3 (for $\phi = 1$) and 4 (for $\phi = 2$). Look first at the figures for total manufacturing. Of the half million increase in non-white manufacturing employment over 1960-1977, roughly one-tenth was due to job switchovers.[1] For every non-white job gained through switchover of a previously white job, twelve were gained from output expansion (and three were lost from productivity growth). Of course, switchover means not only the gain of a job but also the gain of a better job, so each switchover is more important for non-white welfare. But the fact remains that only a small part of the growth of South African non-white employment in total manufacturing is due to the rise up the job ladder.

As one disaggregates the data, the portion of the employment increase of non-whites attributed to switchover will increase. The sum of switchovers for the twenty sectors shown in Tables 3 and 4 is 12-21% of the total employment increase.[2] Still, for every switchover job gained by non-whites some six to nine jobs are gained through output expansion.

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[1]Precisely, 8.1% if $\phi = 1$ and 13.1% if $\phi = 2$. The estimated percentage rises as higher values of ϕ are assumed.

[2]I.e. 58.6 of 465.5 and 94.7 of 462.3 (thousands). Further disaggregation is not possible as the needed data are not released by the South African Department of Statistics. Higher values of ϕ would also raise the estimate of non-white jobs gained through switchover (and lower the estimate of white jobs lost through switchover), but an average job dilution above two-to-one is hard to conceive.

Table 3

Job Switchover, Output, and Productivity Effects on Changes in Employment[1], by Race,

in South African Manufacturing, 1960-1977 for $\phi = 1$[2]

Sector	Change in Non-White Employment				Change in White Employment			
	Switchover	Output	Productivity	Total[3]	Switchover	Output	Productivity	Total[3]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Manufacturing - Total	+42.6	+646.3	-165.8	+523.1	-42.6	+213.9	-57.3	+113.9
Food	5.1	72.3	-17.7	59.7	-5.1	13.5	-3.6	4.8
Beverages	1.0	20.9	-12.4	9.6	-1.0	5.7	-3.3	1.4
Tobacco	0.1	1.7	-2.1	-0.2	-0.1	0.7	-0.9	-0.3
Textiles	3.3	49.8	1.6	54.7	-3.3	6.2	-0.2	2.7
Clothing	11.8	62.5	-35.0	39.3	-11.8	9.2	-5.9	-8.4
Leather	0.1	1.5	1.0	2.7	-0.2	0.2	0.1	0.2
Footwear[4]	2.5	8.8	-13.2	-1.9	-2.5	1.1	-0.9	-2.4
Wood and Cork	2.4	12.0	5.7	20.1	-2.4	2.0	-0.0	-0.4
Furniture	2.8	13.0	-3.8	12.0	-2.8	2.7	-0.3	-0.4
Paper	2.1	22.2	-10.7	13.6	-2.1	7.4	-3.6	1.7
Printing	3.6	13.6	-7.6	9.5	-3.6	19.8	-11.4	4.9
Chemicals	1.0	50.6	-31.5	20.1	-1.0	24.2	-15.1	8.1
Rubber	1.8	10.2	-2.2	9.8	-1.8	4.3	-1.0	1.5
Plastic Products[5]	0.1	0.2	2.7	3.1	-0.1	0.1	0.5	0.5
Non-Metallic Mineral Products	1.3	36.5	-13.1	24.7	-1.3	6.9	-2.7	2.9
Basic Metal	2.0	48.0	-15.2	34.8	-2.0	29.9	-9.2	18.7
Metal Products	5.2	61.2	-20.2	46.2	-5.2	21.8	-6.7	10.0
Machinery	6.4	0.2	30.4	36.9	-6.4	1.9	21.5	17.0
Electrical Machinery	2.4	9.2	11.2	22.9	-2.4	7.6	5.2	10.5
Transport Equipment	3.6	34.0	7.1	44.7	-3.6	22.9	1.8	21.1
Sum of Above Sectors[6]	+58.6	+531.2	-125.0	+465.5	-58.7	+188.1	-35.7	+94.1

Table 4

Job Switchover, Output, and Productivity Effects on Changes in Employment[1], by Race,

in South African Manufacturing, 1960–1977 for $\phi = 2$[2]

Sector (1)	Change in Non-White Employment				Change in White Employment			
	Switchover (2)	Output (3)	Productivity (4)	Total[3] (5)	Switchover (6)	Output (7)	Productivity (8)	Total[3] (9)
Manufacturing – Total	+68.3	+645.1	−190.4	+523.1	−34.2	+213.5	−65.4	+113.9
Food	8.8	72.2	−21.3	59.7	−4.4	13.5	−4.3	4.8
Beverages	1.7	20.9	−13.0	9.6	−0.8	5.7	−3.5	1.4
Tobacco	0.2	1.7	−2.1	−0.2	−0.1	0.7	−0.9	−0.3
Textiles	6.0	49.7	−1.0	54.7	−3.0	6.2	−0.4	2.7
Clothing	21.1	62.2	−44.0	39.3	−10.6	9.1	−7.0	−8.4
Leather	0.3	1.5	0.9	2.7	−0.1	0.2	0.1	0.2
Footwear[4]	4.5	8.7	−15.1	−1.9	−2.3	1.1	−1.2	−2.4
Wood and Cork	4.3	12.0	3.8	20.1	−2.2	2.0	−0.2	−0.4
Furniture	4.7	13.0	−5.7	12.0	−2.3	2.7	−0.7	−0.4
Paper	3.3	22.2	−11.9	13.6	−1.6	7.4	−4.0	1.7
Printing	4.5	13.6	−8.6	9.5	−2.4	20.0	−12.6	4.9
Chemicals	1.5	50.5	−31.9	20.1	−0.8	24.2	−15.3	8.1
Rubber	2.8	10.2	−3.2	9.8	−1.4	4.3	−1.4	1.5
Plastic Products[5]	0.2	0.2	2.7	3.1	−0.1	0.1	0.4	0.5
Non-Metallic Mineral Products	2.2	36.4	−13.9	24.7	−1.1	6.9	−2.9	2.9
Basic Metal	2.8	48.0	−16.0	34.8	−1.4	29.8	−9.8	18.7
Metal Products	8.1	61.2	−23.1	46.2	−4.0	21.8	−7.8	10.0
Machinery	9.0	0.1	27.9	36.9	−4.5	1.8	19.7	17.0
Electrical Machinery	3.5	9.1	10.3	22.9	−1.7	7.5	4.6	10.5
Transport Equipment	5.2	33.7	5.8	44.7	−2.6	22.8	1.0	21.1
Sum of Above Sectors[6]	+94.7	+526.1	−159.4	+462.3	−47.4	+187.8	−46.2	+94.1

Tables 3 and 4

NOTES: [1]Employment figures in thousands of workers.

[2]For explanation of ϕ, see text.

[3]For change in totals, see Tables A-1 and A-2.

[4]For footwear, 1964-1977.

[5]For plastic products, 1970-1977.

[6]The sum of the total actual change in employment
for the twenty sectors (columns 5 and 9) do not
equal the change in the total manufacturing
because of omitted sectors (professional equip-
ment, etc. and other) and omitted years (1960-64
for footwear and 1960-1970 for plastic products).

The estimates of Tables 3 and 4 suggest not only a job ladder within sectors but also what might be called a sector ladder. In textiles, clothing, leather, footwear, and wood and cork, the switchover process was essentially completed, with only a few percent of the jobs at the highest supervisory levels, remaining in white hands. Total white employment actually fell in these sectors. In essence, these entire sectors switched over in this period. Here, the implicit social negotiation between white capital and white labor transcends the individual sector, but the outcome is not surprising. White capital has the most to gain in such sectors from switching the relatively unskilled labor force over to non-whites and white labor has the least to lose by switching out of such relatively low-paid sectors.

In Section II, a method was developed for separating the rate of increase of average earnings by race into two parts, that due to increased wage rates for the jobs held by people of that race and that due to the upgrading of the average job level as a result of switchover. The rate of increase of wage rates for the current (time t) structure of job holdings was labeled $(\alpha_x^t -1)$, where x = W, B; it is always lower than the increase in average earnings by race because both white and non-white average earnings are boosted by the switchover process. The estimates of the cumulative rate of increase of these wage rates for the jobs, $(\prod_{t=1961}^{1977} \alpha_x^t) -1$, are shown in Table 5, along-side of the cumulative rate of increase of average earnings. They are shown there only for $\phi = \sigma = 1$ since a quite similar pattern emerges for other plausible combinations of ϕ and σ.

The differences between the two concepts of wage increases are sometimes large (e.g. footwear) and sometimes slight (e.g. non-metallic mineral products). By plotting the cumulated estimates of the α's against the 1960 average real earnings rate, as in Figure 2, a pattern emerges. For whites the increases in the rate for the job seems to move for sector-specific reasons, quite independently of the 1960 earnings level. The strong downward tilt of Figure 1 has disappeared. The reason why low-white-wage (in 1960) sector's earnings rose so rapidly over 1960-1977 was that whites moved up the job ladder or out of the sector. There is little evidence of convergence of white wage rates in this period.
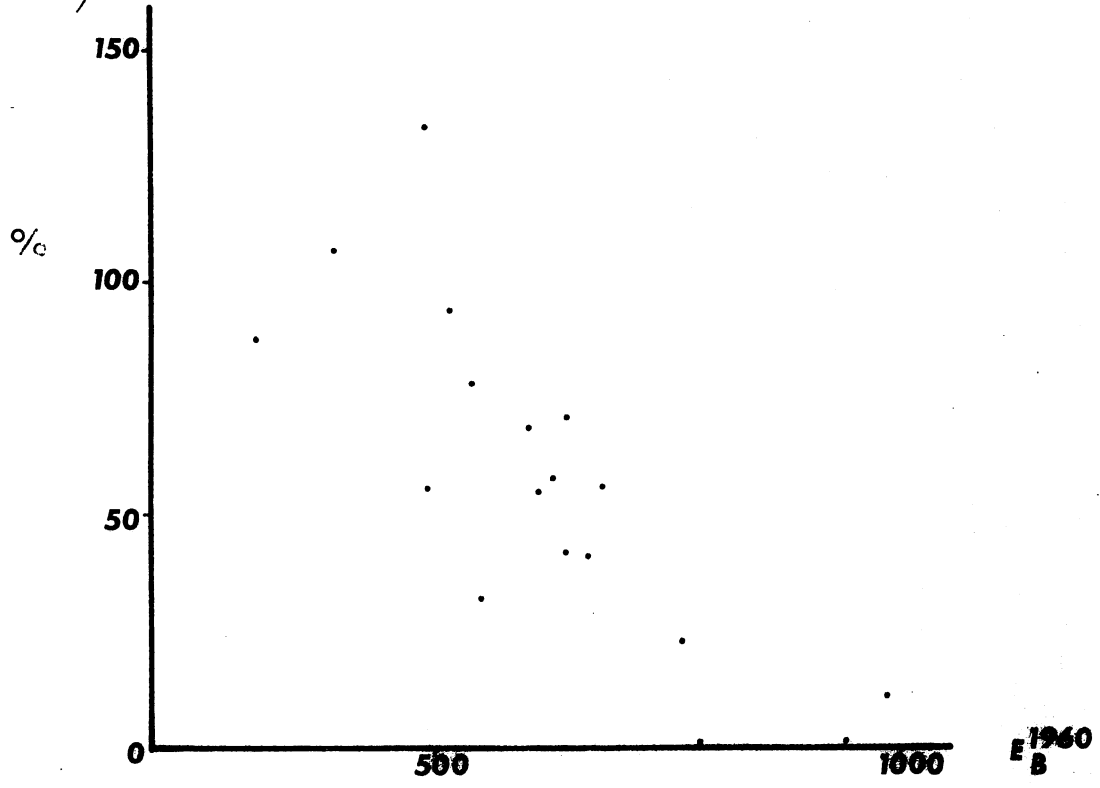
FIGURE 2
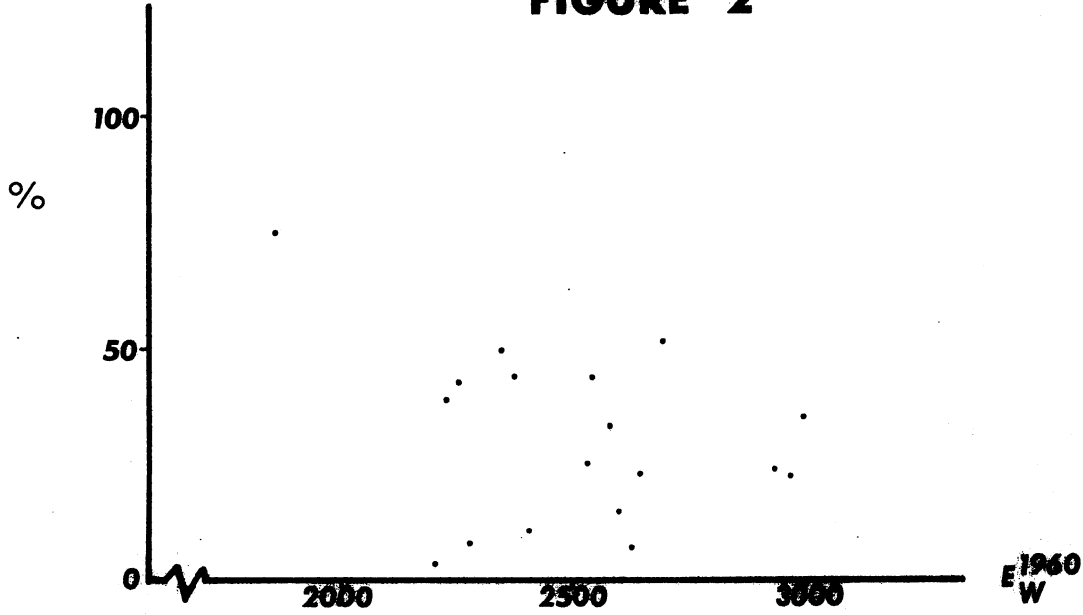
Table 5

Growth Rate of Wage Rates of White and Non-White Jobs

in South African Manufacturing, 1960-1977

Sector (1)	White Jobs		Non-White Jobs	
	for $\phi = \sigma = 1$[1] (2)	Actual[2] (3)	for $\phi = \sigma = 1$[1] (4)	Actual[3] (5)
Manufacturing - Total	.375	.515	.611	.730
Food	.393	.625	.569	.678
Beverages	.210	.372	.795	.949
Tobacco	.734	.871	.568	.735
Textiles	.144	.473	.326	.417
Clothing	-.068	.769	- .146	- .010
Leather	.324	.482	.144	.178
Footwear[4]	.038	.705	.018	.083
Wood and Cork	.078	.534	.888	1.098
Furniture	.096	.437	.262	.398
Paper	.077	.258	.584	.757
Printing	.253	.362	.136	.374
Chemicals	.514	.557	1.342	1.423
Rubber	.410	.687	.420	.667
Plastic Products[5]	.057	.094	.423	.462
Non-Metallic Mineral Products	.439	.522	1.090	1.144
Basic Metal	.351	.423	.954	1.144
Metal Products	.212	.348	.592	.741
Machinery	.239	.379	.691	.990
Electrical Machinery	.430	.545	.713	.910
Transport Equipment	.485	.604	.437	.584

NOTES: [1] This rate is $\left(\prod_{t=1961}^{1977} \alpha_x^t \right) - 1$, with x = W,B. For derivation of α_x^t, see Section II.

[2] Repeated from Table 2, column 4.

[3] Repeated from Table 2, column 5.

[4] 1964 - 1977.

[5] 1970 - 1977.

For non-whites, on the other hand, the strong downward slope persists –
indeed, is clearer in the sense of a higher correlation coefficient – after
the effects of job-ladder restructuring through switchover are removed.
Non-white wage rates for the job converged in this period. The data and
the methods developed here of course cannot explain why, but one can
speculate. Sector-specific causes of wage rate movements – such as changing
capital intensity, skill needs, or technology – which dominate the white
wage rate movements are in turn dominated for non-whites by some extra-sector
consideration. My guess is that it is a gradually unifying labor market
for non-whites. As the carefully and effectively segmented black labor
market gives way to one in which blacks are more mobile from job to job
and from sector to sector, wage differentials among similar jobs in different
sectors must erode. In any case, these differentials certainly did erode for
non-whites in the 1960-1977 period in South African manufacturing.[1]

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[1]Speculation about causes is constrained by the unavailability of data by
greater disaggregation, by region, by sub-sector, or by size of firm.

APPENDIX

Data

All the data for this study are published in SADOS and earlier issues
of this biennial report.

The data for the following sectors are listed in two different series,
one from 1960 to 1970 and the other from 1970 to 1977, so that the figures
in the latter series needed adjustment to fit with the 1960-70 series. This
adjustment was made by a simple ratio procedure; e.g. for white employment,
"manufacturing-total":

$$1970 \quad 264,541 \quad \text{(old series)}$$
$$1970 \quad 254,327 \quad \text{(new series)}$$
$$1971 \quad 255,200 \quad \text{(new series)}$$

The adjusted (i.e. old series comparable) figure for 1971 is 265,449 (=264,541 x
255,200 ÷ 254,327). These adjustments were made to the employment and earnings
data in the following sectors:

Manufacturing-Total
Food
Textile
Clothing
Leather
Footwear
Furniture
Chemicals
Rubber
Basic Metal
Metal Products
Machinery
Electrical Machinery
Transport Equipment

The data in the "Footwear" sector commences in 1964, in the "Plastics
Products" and "Professional Equipment, etc." sectors in 1970; all other
sectors have data from 1960 to 1977. Because of these different starting
dates and/or because the "other" sector was neglected throughout, the
"manufacturing-total" sector is not the sum of the 21 sectoral components
shown.

The earnings data for both the white and non-white groups has been
inflated (or deflated) by the Consumer Price Index as given in the SARB.

The full series which was used is a splicing of three series, the first with
1958 = 100, the second with 1963 = 100, and the third with 1970 = 100. The
resultant deflator by which the earnings data were divided:

1960	76.1
1961	77.6
1962	78.7
1963	79.7
1964	81.8
1965	85.1
1966	88.2
1967	91.2
1968	93.1
1969	96.1
1970	100
1971	105.7
1972	112.6
1973	123.3
1974	137.6
1975	156.2
1976	173.6
1977	193.2

The output indices are derived from the table entitled "Index of the
Physical Volume of Manufacturing Production". The figures given in the 1963
table have been spliced to fit the base of the 1978 table. The following
sectors have been combined to make them comparable with the sectors for which
employment data are given.

1. "Chemicals" with weight 3.6 combined with "Other Chemical
   Products" with weight 8.1;
2. "Non-Metallic Mineral Products" with weight 4.6 combined with
   "Glass and Glass Products" with weight 1.0;
3. "Non-Ferrous Metal Basic Industries" with weight 1.4 combined
   with "Iron and Steel Basic Industries" with weight 9.2;
4. "Transport Equipment" with weight 1.2 combined with "Motor
   Vehicles, Parts and Accessories" with weight 3.9.

The basic employment and real earnings data used in this study is
reported for the beginning and end years, 1960 and 1977, in Tables A-1 and
A-2.

Table A-1

Employment and Real Earnings of Labor in South African Manufacturing, 1960

Sector (1)	Employment (thousands)			Average Annual Real Earnings (Rands)[1]		
	White (2)	Non-White (3)	Proportion Non-White (4)	White (5)	Non-White (6)	Ratio: $\frac{\text{Non-White}}{\text{White}}$ (7)
Manufacturing - Total	174.1	479.2	0.73	2552	550	0.22
Food	17.3	77.4	0.82	2202	485	0.22
Beverages	3.5	11.7	0.77	2625	529	0.20
Tobacco	1.4	3.2	0.70	1859	606	0.33
Textiles	4.9	34.7	0.88	2583	539	0.21
Clothing	13.7	64.2	0.82	1984	713	0.36
Leather	0.6	4.2	0.88	2521	728	0.29
Footwear[2]	3.5	18.6	0.84	2206	940	0.43
Wood and Cork	4.0	28.3	0.88	2257	305	0.14
Furniture	3.7	13.6	0.79	2387	755	0.32
Paper	5.4	14.1	0.72	2616	669	0.26
Printing	12.7	7.5	0.37	2513	977	0.39
Chemicals	13.8	28.2	0.67	2667	480	0.18
Rubber	4.2	7.6	0.64	2226	631	0.28
Plastic Products[3]	3.0	12.6	0.81	3684	705	0.19
Non-Metallic Mineral Products	8.6	49.3	0.85	2568	392	0.15
Basic Metal	16.4	23.5	0.59	2986	514	0.17
Metal Products	19.9	48.5	0.71	2937	614	0.21
Machinery	13.1	16.3	0.55	2907	600	0.21
Electrical Machinery	11.4	15.6	0.58	2379	632	0.27
Transport Equipment	12.3	17.6	0.59	2358	658	0.28
Professional Equipment, etc.[3]	0.9	2.1	0.70	3902	671	0.17

Table A-1

SOURCE: SADOS.

NOTES: [1]The total wage bill divided by the number of workers
             and by the South African consumer price indexes
             (1970 = 100).

             [2]The data for footwear are for 1964, the earliest year
             for which separate data for this sector are given.

             [3]The data for plastic products and for professional
             equipment, etc. are for 1970, the earliest year for
             which separate data for these sectors are first given.

Table A-2

Employment and Real Earnings of Labor in South African Manufacturing, 1977

Sector (1)	Employment (thousands)			Average Annual Real Earnings (Rands)[1]		
	White (2)	Non-White (3)	Proportion Non-White (4)	White (5)	Non-White (6)	Ratio: $\frac{\text{Non-White}}{\text{White}}$ (7)
Manufacturing - Total [2]	288.0	1002.2	0.78	3866	952	0.25
Food[2]	22.1	137.1	0.86	3578	813	0.23
Beverages	4.9	20.6	0.81	3602	1031	0.29
Tobacco	1.1	3.0	0.73	3479	1051	0.30
Textiles[2]	7.6	89.4	0.92	3806	763	0.20
Clothing[2]	5.3	103.5	0.95	3510	706	0.20
Leather[2]	0.8	6.7	0.90	3737	858	0.23
Footwear[2]	1.1	16.7	0.94	3763	1018	0.27
Wood and Cork	3.6	48.4	0.93	3462	640	0.18
Furniture[2]	3.3	25.6	0.89	3430	1055	0.31
Paper	7.1	27.7	0.80	3291	1176	0.36
Printing	17.6	17.0	0.49	3423	1343	0.39
Chemicals[2]	21.9	48.3	0.69	4153	1164	0.28
Rubber[2]	5.7	17.4	0.75	3755	1053	0.28
Plastic Products	3.5	15.7	0.82	4029	1031	0.26
Non-Metallic Mineral Products	11.5	14.0	0.87	3909	840	0.21
Basic Metal[2]	35.1	58.3	0.62	4249	1102	0.26
Metal Products[2]	29.9	94.6	0.76	3959	1069	0.27
Machinery[2]	30.1	53.2	0.64	4008	1195	0.30
Electrical Machinery[2]	21.9	38.3	0.64	3674	1207	0.33
Transport Equipment[2]	33.4	62.3	0.65	3782	1042	0.28
Professional Equipment, etc.	2.2	3.7	0.63	3631	1046	0.29

Table A-2

SOURCE: SADOS.

NOTES: [1]Same as Table A-1.

[2]For several sectors, the basis for calculating
employment was changed in 1970. The employment
data reported here for these sectors are not the
actual 1977 figures, but these figures adjusted
to make them comparable to the 1960 data (or later
years for the sectors cited under notes 1 and 2
of Table A-1).

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