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by: Arnt Spandau

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A STUDY IN THE DUAL LABOUR MARKET OF A SOUTH AFRICAN PLANT

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1. Introduction

Legal and customary barriers of racial employment patterns prevent South African companies from optimizing labour input relationships. The result of these barriers is imperfections in the internal labour market which manifest themselves as follows :

(i) The marginal rates of substitution of White for Black workers do not equal the ratios of the wage rates of the two factors;[1)]

(ii) Relative to their occupational abilities, Whites are over-represented in high-graded jobs, while Blacks are over-represented in low-graded jobs. During the process of the growth of the firms, there are certain intermediate occupations where the replacement of Whites by Blacks does actually take place. This process of replacement has certain elements of inertia. Abrupt and visible changes would be looked upon as being contrary to the 'South African way of life'.

In the past, Black occupational advance in South African manufacturing industries was cut off, by and large, at the level of operative machine minding. During recent years, Blacks have also advanced into certain clerical, sales, supervisory and control positions. With large employers of Blacks, clerical personnel administration for Non-Whites is largely nowadays done by Blacks themselves.

(iii) In the intermediate occupations, Whites tend to be paid wages in excess of their marginal value product, and Blacks below. Racial pay discrimination also percolates into the areas of fringe benefits, such as health protection, annual leave, and into every-day communication.

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It is the purpose of this paper to examine the factors which prevent the attainment of equilibrium in the labour markets under conditions of South African racial discrimination. The data were collected during the months October and November, 1972, when the writer spent some weeks on the premises of a bottling plant in the Transvaal.[2] In order to preserve the anonymity of those who freely supplied information - managers, workers, and informed outsiders - the plant in question will be called Company X.

The manifestations of racial discrimination in South Africa are manifold, the most often cited ones being legal and trade union restrictions.[3] Yet, fears by management of upsetting customers or existing staff or fears of official disapproval may also lie at the root of discriminatory labour policies.[4]

The great variety of discriminatory practices makes the quantification and measurement of imperfections in the internal labour market a difficult undertaking. Genuine discriminatory practices can best be observed and measured where occupations held by Whites and Blacks do actually overlap. Consequently, most of the evidence presented in this paper was actually collected on the shop floor where Whites and Blacks work side by side. In order to gain additional perspective, comparisons will also be made between conditions as they prevail in South Africa vis-à-vis overseas countries.

Labour market imperfections can be measured in terms of incomes paid to different factors of production. By discounting future income streams one can also assess returns to alternative investments in human capital. In this way, the vocational education of the labour force becomes a major variable. This is more relevant than may appear at first glance, because under conditions of South African wage settings, significant cost reductions usually accompany the "Africanization" of jobs in South African plants. The economies of formal and informal on-the-job training therefore

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present themselves in a different light in South Africa, compared with Western countries.

2. Competitive, External and Internal Markets

Employment and wage rates are set on labour markets. Three separate labour markets will be considered, viz., competitive, internal, and external labour markets.

The competitive labour market defines the conditions that would prevail if market imperfections were absent. In the South African context, 'temporary' and 'personal' kinds of imperfections are the most prominent ones: temporary imperfections refer to the inertia of employment and wage adjustments toward changes in factor price relationships, and personal imperfections result in racial discrimination.

Under conditions of competitive markets, race is not a factor of wage or employment determination. A firm would achieve equilibrium in its hiring pattern when the ratios of the marginal productivities of all workers equalled their relative wage rates. Moreover, the differentials in the marginal productivities of various occupations would correspond to differentials in occupational skills, measured in terms of the costs necessary for their acquisition. Assume that all costs of skill acquisition are borne by the worker. Under equilibrium conditions, the distribution of vocational skills between workers would be such that the discounted future income streams, net of the costs of education, are equal for all occupations, irrespective of the race of the worker.

In contrast to competitive labour markets, both internal and external markets are observable and the behaviour of their parameters can be measured. Doeringer and Piore describe the internal market as "an administrative unit, such as a manufacturing plant, within which the pricing and allocation of labor is governed by a set of administrative rules and procedures."[5] In contrast, they define the

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external labour market as one of "conventional economic theory where pricing, allocating, and training decisions are controlled directly by economic variables."[6]

The internal and external labour markets are linked through ports of entry and exit.[7] In many companies, administrative rules define entry and non-entry jobs, the latter being those which are filled only through internal promotion.[8]

3. Some Socio-Economic Data Concerning the Labour Force of Company X

Of the some 1 400 workers in Company X, just under four-fifths are Black. It is a direct outcome of South Africa's multi-racial labour market that personnel problems experienced by Company X are different from problems experienced by similar plants in other Western countries. Major differences are :

(i) Whereas in Europe the main labour supply problem is found on the level of the machine operator, in South Africa it is found in the supply of middle-management personnel. Here is the boundary between (cheap) Black and (expensive) White labour, and high rates of White absenteeism and labour turnover (particularly of shift workers) constitute a severe organizational problem;[9]

(ii) The organized (White) trade union movement is weak. There is no militancy, and the relationship with management is good. In order to keep the union viable, Company X facilitates recruitment of members on its premises;

(iii). By contrast, race relations constitute a major problem. Conservative attitudes of Whites towards Blacks, poor leadership at first-line supervisory level, and poor communication between workers of different races (caused not only by racial discrimination but also by the language barrier[10] - are conditions likely to nourish potential labour conflict. Black trade unions are not officially recognized, but Blacks may form a

Works Committee which would meet under White chairmanship and which could discuss labour grievances. Recent South African labour history has shown that Works Committees are a poor substitute for organized trade unionism.[11]

(iv) The South African in-plant wage structure is widely differentiated even for similar jobs, whereas the relative wages in racially homogeneous countries are more condensed. This makes the substitution of Black for White labour a more economic proposition than would be the case otherwise.

(v) The educational qualifications and skills of the labour force are low, in fact, more than one-half of Company X's Black employees are classified as unskilled. Many of these persons are illiterate.

In contrast to Whites, Blacks are readily available at wage rates laid down by successive Industrial Council Agreements. For Company X, there is, however, a strict legislative barrier against the increase in the number of Black workers, because the plant operates in an area which is 'proclaimed' under the Physical Planning and Utilization of Resources Act, 1967. In terms of Sec. 3(1) of this Act, the firm requires the prior written approval of the Minister of Planning if it wishes to increase its Bantu labour force.[12] This constraint has limited the growth of Company X during recent years.

There are two types of Black labourers, those who are permanent local residents, and those who are migrants. The migrant labour force, which predominantly is recruited in the Pietersburg area where large unemployment prevails, is generally considered more reliable than local labour.[13] Of the total Black labour force, about 40 per cent are migrants.

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Living conditions for urban Blacks in South Africa are close to the Ricardian 'physical subsistence level', with only a few 'cultural' amenities. Most of the Black workers employed by Company X reside in Tembisa, a rapidly growing township administered by the Germiston municipality. At the end of 1971, the population size of Tembisa was about 100 000 persons of whom some 30 000 were migrants, described by one observer as "temporary sojourners with no rights to remain or live with their families in town."[14] Migrants dwell either in three-bedroomed houses which accommodate nine men each, or in huge hostels which each house some 4 000 men. In these hostels, two to six men share a room. There are canteens which provide workers with breakfast and after-work meals for a small charge.[15]

Due to the relatively abundant availability of employment opportunities on the highly industrialized East Rand (an industrial area of some 10 000 square kilometres), the average annual household income was R1 130 in 1970, a figure which exceeded the secondary poverty datum line by approximately R375.[16] Nevertheless, the expenditure pattern shows signs of poverty. A high portion of the income (about 37 per cent) is spent on food, and here again mainly on grain products, mealie-meal, and White bread. There is no electricity in Tembisa. Battery-operated radiograms and hand-sewing machines are considered luxury items.

Standards of education among the inhabitants of Tembisa are low. The mean education of income earners is Standard 2,2; this corresponds to little more than four years of schooling. That education correlates positively with skill and income, is shown in Table 1.

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Table 1

Tembisa: Average Annual Income of Male Earners by Skill and Education, 1970[17)]

	Per cent of Sample	Median Level of Education	Average annual Income, Rand
Unskilled	72,9	Std. 1,6	632,62
Semi-skilled	15,4	Std. 4,6	793,27
Skilled	5,5	Std. 6	837,42
Administrative and clerical	6,2	Std. 6	948,53

It can be seen that but for minor exceptions, the standard of education remains below matric level, and the annual income in 1970 below R1 000 per employed person. It is also evident that the industrial complex of the East Rand relies mainly on a Black labour force which is unskilled and badly educated.

Because of the high rate of migrancy, the ties to the work group are not usually close. But in South African manufacturing industries, lack of work commitment will be penalized through strict administrative rules.[18)] The punishment for lateness and absenteeism is usually severe. The penalty for insubordination is discharge, which, if inflicted upon a migrant worker, may cause him to lose his work permit. In general, the Black work force is described as being 'easy to handle', mainly because of the fact that workable collective bargaining methods have never been allowed to develop. More often than not, the White personnel in the staffing offices for Non-Whites is not of the highest calibre.

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4. Production Processes on the Plant of Company X

One of the many ways in which methods of manufacturing production can be classified is: (i) small-batch and 'unit' production, where craftsmen predominate; (ii) large-batch and 'mass' production, where most workers are semi-skilled; and (iii) continuous or 'process' production where the use of automatic machinery prevails.[19] At Company X, all three types of production are employed. Small-batch production occurs in the maintenance workshop where single-purpose machinery, designed by company engineers, is built from time to time. Continuous or process production prevails in the making of the beverage, and this type of production, together with large-batch or mass production, takes place also in the Bottling Hall.

Being tightly trade-unionized, the maintenance shop shows practically no intrusion by Blacks, other than the low capacity artisan-hands. In the brewing departments some control-jobs have been Africanized, but this process had in fact only just started when the research was undertaken. By contrast, a considerable number of jobs in the Bottling Hall, formerly held by Whites, have been taken over by Blacks.

In the Bottling Hall, the writer, together with three staff members of the Engineering Department of Company X, studied work operations on one bottling and two canning lines. There was a great variety of different jobs requiring different skills, ranging from the simple mechanical handling of the product, on the one hand, to the monitoring of the running process, on the other.[20]

The production layout of a Bottling Hall is shown in graph 1.

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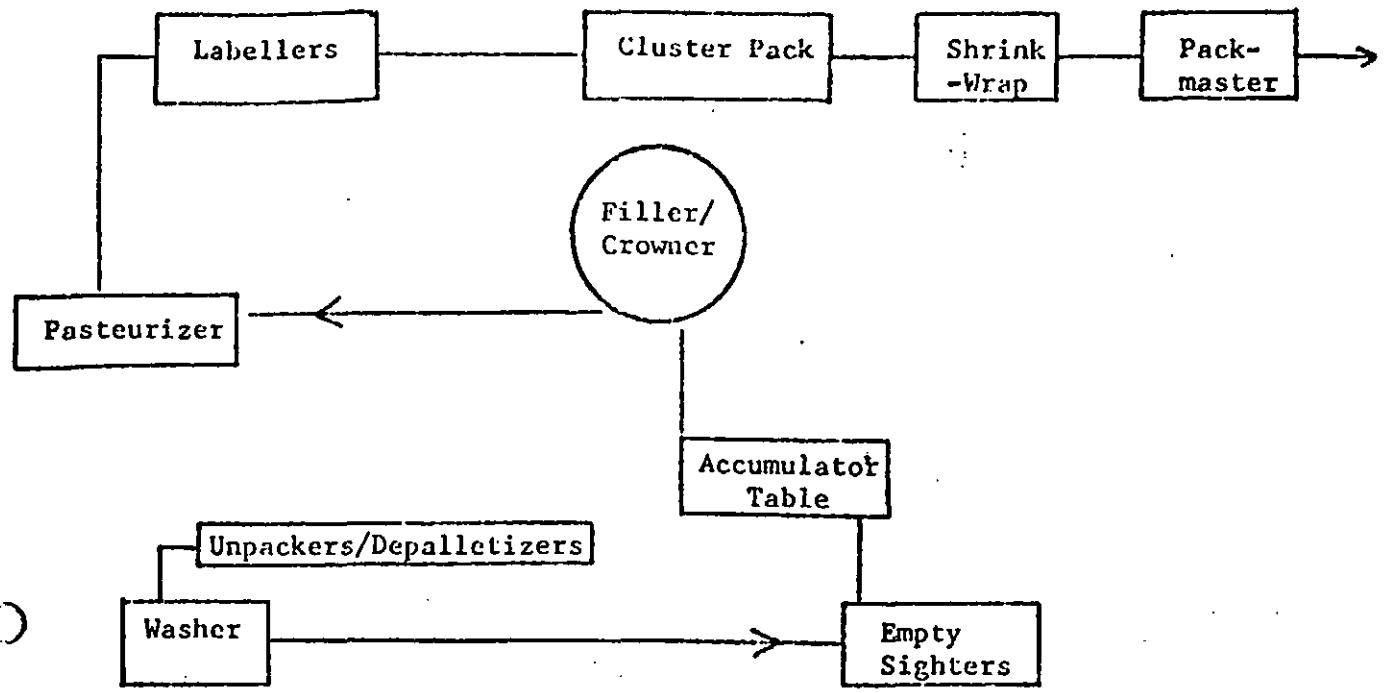

Graph 1: Production Layout of the Bottling Hall

On the bottling line, the production process is begun by unpackers (who are engaged in the manual unpacking of bottles and in placing them on conveyors for the automatic loading of the washer) and on the canning line by the depalletizer (who operates the depalletizing machine and ensures that there is a constant flow of empty cans on the ropeway leading to the filler).

The second main operation on the bottling line is the washer. It is the function of this machine to remove labels, dirt, and microbiological contamination. There are two operators working at the washer, the infeed and the discharge attendants.

The washer-infeed attendant maintains the supply of bottles to the machine and ensures that it is properly loaded. This he does by watching the bottles which enter the washer in periodic cycles. He removes cracked or broken bottles and picks up bottles that have fallen. Like the infeed, the discharge is also completely automatic. Under brilliant light, the bottles are given a first inspection by the washer-discharge attendant when they leave the washer. The operator also removes

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odd lables and cullet. When all goes well, one row of bottles will remain in an upright position on the discharge board until the succeeding row pushes it onto the conveyor which carries the bottles to the accumulator table. Bottles which are returned from customers (in contrast to non-returnable 'dumpies') are inspected by sighters after having left the washer.

The key-machine on the bottling line is the filler - the only machine where the operator comes into direct contact with the end-product. The filler is a rotary machine. Chain conveyors, star wheels and screws space the empty containers and feed them into the machine. A lifting device raises the containers to the filling position, seals them against the filling head and holds them there while they are being filled to the desired height. For maximal filling performance it is necessary that the capacities of all individual machine units before and after the filler, exceed the capacity of the filler so that in the case of temporary machine breakdowns, the work operations of the filler (which sets the speed for normal output) will not be adversely affected.[21)]

According to the current Industrial Council Agreement it is the function of the filler operator to fill and cap bottles "efficiently and economically, (to) ensure air exclusion, pay attention to the speed of the filler, adapt the filler and crowner to take bottles of various sizes, drain and clean the filler at shift end, control conveyors between the washer and the pasteurizer, service filler tubes and valves, train filler attendants and supervise process attendants and labourers in the vicinity of the filler."[22)] Ruff and Becker assert that "probably the most important factor influencing filler operation is the operator himself. A properly trained operator can spot difficulties in advance and remove the cause, thereby eliminating a stoppage." The authors demand that the filler "should know his machine thoroughly, and understand completely both its mechanical and physical operations ..."[23)]

The operations of the filler and the seamer (on canning lines) and the filler and crowner (on bottling lines) are synchronized and can therefore be considered as one single machine unit. During our observations we noted frequent technical difficulties with the crowner on Line 2. On several occasions the hopper disc shaft clutch lacked proper adjustment, resulting in the jamming of crowns, or in crown race.

In contrast to filling, pasteurizing is a process which produces few problems from the operating point of view. There is a pasteurizer-discharge attendant who has to maintain orderly conveyor transport of bottles and cans which leave the pasteurizer. This man also removes short-fills, and - if detectable - unclean bottles.

On the bottling line, labelling precedes packaging. The labeller attendants "ensure the efficient operation of the labelling machine, suggest modifications to the machine, maintain them in peak running order, adapt the machines when there is a change in the product, and maintain the gummed tape dispenser."[24] There are many operational snags which may occur during labelling, such as wrinkling or blistering of labels, spotty adhesion, crooking, etc.

At the end of the lines there are several packing stations. On the canning lines, a cluster-pack machine is followed by shrink-wrap machines and a packmaster. On the bottling lines, the bottles are either packed into boxes by hand, or automatically deposited in cartons.

Whilst the setting-up and running of machines is entrusted to Black operators, it is the function of White artisans to restore the line to operation if a machine-breakdown occur. Planned maintenance, repair, and installation of all types of plant, is also entrusted to artisans, mainly fitters. The supervision of the Black operators who work on the line is done by a White Linesman who is assisted by a Black Leading Hand.[25]

Black employees can be classified into production workers and process operators. Production workers do repetitive and manual work where speed is of importance, such as in the handling of material. Process operators are responsible for the monitoring of processes, such as filling and washing. Occasionally, they also undertake certain manual functions, such as the filling of crowns into the hopper disc shaft.

As production workers carry out recognizable actions, the results of their work are immediately apparent. Manual skills are needed for the co-ordination of hand and eye, classified by industrial psychologists as sensorimotor skills.[26] Moreover, for production and for process operators, a sensory skill known as kinaesthesis is of particular importance. This sense, which enters virtually all motor performance, provides the operator with information about the position and movement of his limbs, and the pressures he exerts with them.[27] Experienced operators tend to substitute the use of kinaesthetic senses for sensory senses, which helps them avoid fatigue of the eye. In contrast to manual labourers, workers who monitor machines do not directly influence the sequence of operations or the speed of the process. The process operator is a controller, rather than a producer. With physical effort reduced to a minimum, operators are required to use their conceptual skills in a constant search for signs of departure from desired conditions - detectable through noise, smell, vibration, sight, or kinaesthetic senses.

Often there are special and complicated procedures when starting up or closing down the machine. Specific briefing usually exists for these and for cases of emergency. Routine maintenance (such as cleaning and removing of cullet) is part of the control activity. Information about the state of the machine should be passed on to artisans and the linesman by word of mouth.

One of the main arguments in the hypotheses of this paper refers to the acquisition of industrial skills. We shall now discuss the organisation of skill acquisition at Company X.

5. Skill Acquisition in the Bottling Hall of Company X

5.1 In-Company Training

Skill acquisition in Company X takes the following forms:

(i) formal in-plant training,

(ii) informal on-the-job training,

(iii) outside training,

(iv) learning-by-doing.

5.1.1 Formal in-plant training is defined as the organized and planned arrangement to assist the trainee in the acquisition of industrial skills. This type of training takes place, either under a system of 'legal' formalization or under a system of 'internal' formalization. 'Legal' formalization takes the form of an apprenticeship. 'Internal' formalization comes about through the authority of a Training Department. At times, it may be quite difficult to describe the precise nature of this internal formalization. The required institutionalization of the training process may originate from the existence of a Training Centre or a Training Workshop, but this is not always so. Forklift truck driving, for instance, can also be learnt in the open factory yard. A more obvious kind of institutionalization is therefore the existence of an independent Training Department. Yet the difficulty is that the authority for the training process may not always rest with the Training Department itself. At Company X, the Training Department is solely responsible for a two-day induction course which is given to all Black recruits, involving discussions, slide shows, and a factory tour. Technical training, however, is delegated to those departments which actually employ the recruits because it is maintained that the

supervisor of this department is the person most familiar with all technical operations. By contrast, the Training Department serves only in an advisory capacity. It is the duty of its officers to devise training schemes, prepare and issue instructional manuals, and stimulate the discussion of and the demand for training. The Training Department, not being functionally responsible for the technical training process itself, becomes active only at the request of line management.[28)]

The formalization of the type of training presently under discussion is, however, ultimately determined by (i) a definition of the training syllabus for a particular job and (ii) the existence of a time-table for the training course. At Company X, the training syllabus is worked out by the Training Department in the form of training manuals. These manuals, which are prepared for specific jobs, originate in a three-stage process: (i) the training specialist studies the job, writes a task analysis, and takes photos of task performance situations; (ii) overall performance objectives for the job are laid down; (iii) the job is split into "trainable" sections in respect of which performance objectives are defined.

The job descriptions are written in considerable detail and usually follow a certain procedure, such as pre-start, start, production continuation, fault analysis and emergencies, shut down, and general procedural duties. Consider as an example the case of the filler operator. For him, training consists of 15 lessons or 21 hours of instruction. The lessons (all of which are highly specific), cover issues such as the following: supply crowns; filling the hopper; removing crowns; exit conveyor control; cleaning and cullet disposal; quality sampling; water flushing; pushing water through the system.

In his training, the trainee is familiarized with the method of the experienced worker whose speed becomes his target time (speed is of particular importance

for manual and repetitive jobs). Separate parts of the job are then combined so as to form a complete work-cycle. The objective is to train the worker to perform at the speed of an experienced operator.[29)]

Lessons for specific jobs last for two or three weeks and then end with a formal examination. Blacks who successfully pass the final examination are issued a Certificate of Competence. At Company X, all successful candidates are guaranteed the job for which they received specific training, and they are given the pay increase associated with the enhanced skill. There is therefore no training risk for trainees, nor is there excess training as far as the Company is concerned.

5.1.2 Informal On-the-Job Training

The second major type of skill acquisition is informal on-the-job training. This form of training is probably the most prevalent type in South African plants.[30)] Like formal in-plant training, informal on-the-job training is usually highly specific and is directed toward immediate production needs. But in contrast to the former type of training, informal on-the-job training is not organized in any way whatsoever. The training meets spot needs, and is applied when new processes are introduced, or when a new worker joins a department. The instruction is incidental and frequently consists of "watch-what-I-do" and then "now-you-try". This casual and unsystematic learning of the job, in which the worker is expected to pick up the skills by watching and imitating an experienced worker, is known on the plant as 'sitting by Nellie'. In this situation it often happens that the learner asks irrelevant questions, or that the teacher gives wrong answers. As a rule, informal on-the-job training is not supplemented by class instruction or by lessons from vocational or technical schools. In a thoughtful discussion of the issue, Piore refers to the process of 'osmosis', 'exposure', and 'hanging around'.[31)] Learning through informal on-the-job training is a process similar to the passing on of customs.[32)]

Estle appears to misjudge the informality of this type of training in arguing that on-the-job training occurs "when management (that is, all those in authority over the trainee) directs that explicit instruction be given by members of the firm ... to a worker while he is engaged in producing the product of the firm".[33] This description excludes the important case where experience and knowledge is passed on in horizontal, rather than vertical hierarchy, in other words, where one worker teaches his fellow-worker the skills of the job, without having received explicit instruction by management to do so. In South African plants, where racial boundaries cut across the worker-supervisor level, transfer of skills between persons who work on idential hierarchical levels, is of great importance.

In contrast to Estle's claim the informality of on-the-job training may in reality render the whole process invisible under certain conditions. In a well-motivated work group, on-the-job training is so natural to workers and management that they may not be conscious that it is going on. If this condition prevails, on-the-job training may appear to be costless, although in actual fact it may happen that through re-work or through inferior quality, hidden costs occur. In South African plants, no attempt is usually made by the accounting system to identify and measure this cost item.

5.1.3 Outside Training

In November, 1972, Company X had almost completed the Africanization of the heavy duty driver's jobs. These men, who handle 18 ton lorries, are employed after they have obtained a driver's licence outside. They acquire the necessary licence at their own initiative and they are not reimbursed the cost thereof (about R70 in 1972).

Upon employment, the men are given lessons in documentation, product knowledge, and instrument reading. All in all, the trainees have to learn to distinguish between

more than 20 different documents. As senior distribution drivers, they are also trained to handle cash.

5.1.4 Learning by Doing

A skill is not innate, but learned. The learning process may be initiated, either through a teacher-student relation, or through practice and experience on the side of the student.[34] When practice and experience are the agents of the learning process, we speak of learning by doing. For this, time is the major explanatory variable.

Modern studies of skill acquisition have found that the limit of human capacity to learn is hardly ever reached. For athletic performance (where one would have thought that performance limits should have been reached by now in many cases), Robb argues that "barring environmental restriction, learning continues indefinitely possibly to the extent that an individual's full capacity for learning is never reached."[35] For the area of industrial skill acquisition, empirical verification of this thesis can be had from Crossman's study into cigar-rolling.[36] This job, which is of a very short cycle, requires considerable manual skills and fast decision making, as there occurs continuous variation in the raw material. Crossman found that even after seven years of service, operators still continued to improve their speed performance.

Learning by doing and informal on-the-job training are complementary. When the training process is informal so that the worker acquires knowledge through trial and error or through occasional directions from his colleagues, the two methods of skill acquisition may become indistinguishable.

6. Hypotheses to be Tested

According to neoclassical theory, (i) each worker will be paid a wage equal to his marginal labour product, and (ii) the wage earned by a worker will be commensurate with what he could earn elsewhere.

For various reasons the assumptions and conclusions of neoclassical theory are inapplicable under industrial conditions. A modern firm has to recruit, screen, and train new employees.[37] In other words, the firm incurs costs when attracting job candidates, when assessing their qualifications, and when enhancing their performance levels. These costs must be considered as fixed costs of employment, and in order to gain time for the recoupment of the outlay, the firm will have to work on policy measures likely to cut down on labour turnover. In the present context, fixed employment costs are the central focus, and the curtailment of labour turnover is the derivative of it.

The formal implications of the issue under consideration have been examined by Walter Oi and Gary Becker.[38] Because of the presence of fixed employment costs, the neoclassical postulate for the equality of wages and marginal labour product is inapplicable. Expenditure incurred on recruitment, screening and training are non-wage adjustment costs which, over the period of time during which the appointee stays in the employment of the firm, must be recouped by paying the worker less than his marginal value product. This is so because for the firm, fixed labour costs spent on a new appointee constitute an investment, the replacement costs of which must be incurred when the worker resigns. The specific problem to be considered is that, in contrast to tangible assets, the worker does not become the property of the firm.

In order to lengthen the period of use which can be had from invested money, the firm will work towards encouraging the permanency of employment of the appointee.

The difficulty in which the firm finds itself is that it cannot pay the employee his marginal labour product if it wishes to recoup fixed employment costs. On the other hand, the employee himself, by virtue of fixed employment costs having been invested in him, often possesses bargaining strength which enables him to ask

for and to actually obtain a wage even above his immediate marginal value product - the value of the rent being equal to the value of fixed employment costs, discounted over the difference in time of the expected length of employment had the incumbent been paid the rent, and the length of employment if he is not paid the rent. Assume, for instance, that if the worker does not receive the rent, he will resign after two years of service, whereas if given the rent, he will stay for 14 years. In this case, the reinvestment of fixed employment costs is being delayed by 12 years if the rent is paid. In equilibrium, the discounted value of these fixed employment costs equals the discounted sum of rent payments.

For the abovementioned reasons, the neoclassical maxim of profit-maximization cannot be applied. According to Becker, firms will be prepared to pay workers more than their marginal labour product in early periods, provided the former are compensated through the probability of receiving a marginal product which exceeds the wage rate, in later periods. Neoclassical theory does not, therefore, provide a theory of wages - at best it provides a theory of income.[39)]

On-the-job training enhances the skills of workers, and with it their expected marginal labour products. Whether or not on-the-job training will also lift the workers' bargaining power vis-à-vis management, or whether the enhanced expected marginal labour product can be retained by the employer as a monopsonistic rent, depends on the degree of skill specificity. If the skills acquired by the worker are completely general,[40)] they will raise the worker's marginal labour product in all firms which employ workers for the kind of job the worker has been trained for. Inasmuch as skill interchangeability makes the labour supply curve elastic, a rate-for-the-job for a particular skill will emerge. On a competitive labour market it will then be impossible for the firm to recoup training costs. By contrast, if skill specificity exists,[41)] training will not enhance the worker's marginal labour product in competing firms, and the firm will therefore be more likely to recoup training costs.

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It is the function of the administrative rules of the internal labour market to shield firms from the competitive elements of external and competitive markets. More precisely: the internal market has to serve as a means of bringing about equality of discounted values of expected cost and revenue streams over the expected lengths of employment of workers. The main force which brings about equilibrium of the external labour market, i.e., labour turnover, has to be delayed. Failing this, no marketable skill investment in workers would ever be financed.

It follows that the energy spent by the firm on establishing an internal labour market should be a function of the disadvantage associated with the resignation of particular groups of employees. When the recruitment, screening, and training of a particular type of worker is expensive, and when their skills are general, then a strong case will exist to individualize the position of that particular group of workers in the company. This could for instance be done by declaring the positions of high general skills, non-entry jobs. Whilst this would allow job incumbents to protect their interest sphere from external competition, it would also be of benefit to the company inasmuch as the employee, if he resigned, would have to start at a lower-graded entry job of some competitive industry, rather than being able immediately to move into some sought-after high-skill position. For the company therefore, labour turnover will be less than would otherwise be the case.

7. Evaluation of Hypotheses

Three different methods are used to evaluate the hypotheses. In the first place, a regression model is set up which uses data taken from the company's Black personnel files (section 7.1). Secondly, a study is made of the relative wage structure in the Bottling Hall (section 7.2). Thirdly, some light is shed on the crucial White-Black work relationship. The data for this section are based on a work-sampling study which we undertook in the Bottling Hall (section 7.3).

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7.1 Determination of Income and Income Growth in the Bottling Hall of Company X

7.1.1 Data

The data constitute a sample from the Company's Black Personnel files. Of the total of 1 070 Black workers, a stratified sample size of N = 291 was made up as follows:

(1) all machine minders of the Bottling Hall, both trained and untrained;

(2) all Leading Hands of the Bottling Hall;

(3) all forklift-truck and heavy-duty drivers;

(4) every third grade 1 worker, but all grade 1 and grade 2 workers who joined the company prior to 1963;

(5) every second grade 5 worker;

(6) all grade 6 workers.

The following data were collected from the personnel files: name of employee; code of initial job; code of present job; marital status; number of children; formal education; stamina; year of birth; year of employment with Company X; pay grade; type of training received; history of weekly pay since first employment with Company X; abode of worker.

7.1.2 Explanation of Income and Income Growth

The evaluation of hypotheses requires the quantitative measurement of factors influencing the pay structure. Multiple regression analysis was chosen to determine whether there are certain characteristics which are associated with pay and pay increases. Pay increase ($\dot{Y}$) is the compound annual growth rate of basic weekly pay between the year of employment of a worker, and November, 1972. Pay (Y) is the basic weekly pay in R, November 1972.

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The general model is specified as follows:

$$(1a)\quad \hat{Y} = a_1 + b_{11}X_1 + b_{12}X_2 + b_{13}X_3 + b_{14}X_4 + b_{15}X_5 + b_{16}X_6 + b_{17}X_7 + u_1$$

$$(1b)\quad Y = a_2 + b_{21}X_1 + b_{22}X_2 + b_{23}X_3 + b_{24}X_4 + b_{25}X_5 + b_{26}X_6 + b_{27}X_7 + u_2$$

where

X_1 = Dummy variable for marital status (4 = married, 5 = single).

X_2 = Stamina (ranging from 1 to 9. X_2 = 0 was used for seven newly appointed heavy motor vehicle drivers to whom the stamina test had not as yet been administered when the research was undertaken).

X_3 = Standard of formal education:

1 = Lower primary education (Sub A, B, Std. 1 and 2)

2 = Higher primary education (Std. 3 - 6)

3 = Junior Secondary education (Form I to III)

4 = Senior Secondary education (Form IV and V)

5 = Bachelor degree.

X_4 = Age.

X_5 = Length of employment with Company X in years.

X_6 = Training status (1 = informal on-the-job training
2 = formal on-the-job training
3 = outside training).

X_7 = Abode of labourer (1 = local labourer, 2 = migrant).

The validity of calculated associations depends on whether or not multicollinearity is a serious problem. According to Kane, multicollinearity arises "whenever, either in the population or in the sample, various of the explanatory variables stand in an exact or almost-exact relation to each other ... The greater the degree of multicollinearity that obtains, the more arbitrarily and unreliably do least squares

allocate the sum of explained variation among the individual explanatory variables."[4]

Two methods were employed to test for multicollinearity. First, a matrix of Pearson correlation coefficients was computed. The Pearson correlation co-efficient is defined as

$$r = \frac{\sum_{i=1}^{N}(x_i - \bar{x})(y_i - \bar{y})}{\left\{\left[\sum_{i=1}^{N}(x_i - \bar{x})^2\right]\left[\sum_{i=1}^{N}(y_i - \bar{y})^2\right]\right\}^{\frac{1}{2}}}$$

where x_i = ith observation of variable x;

y_i = ith observation of variable y;

N = number of observations;

$\bar{x}$ = mean of variable x;

$\bar{y}$ = mean of variable y.

The results of the computation are given in Table 2.

TABLE 2

MATRIX OF PEARSON CORRELATION COEFFICIENTS BETWEEN INDEPENDENT VARIABLE (N=291)

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
X_1	1,00						
X_2	-0,01	1,00					
X_3	0,17*	0,12*	1,00				
X_4	-0,55**	0,03	-0,38**	1,00			
X_5	-0,35**	0,12*	-0,37*	0,64*	1,00		
X_6	-0,04	0,18**	0,45**	-0,07	-0,22**	1,00	
X_7	0,25**	-0,08	0,19**	-0,44**	-0,54**	-0,10*	1,00

* significant at the 0.05 level

** significant at the 0.01 level

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Strong associations ($|r| > 1/2$) prevail between age and length of employment (X_4/X_5), age and marital status (X_4/X_1), and length of employment and the abode of the labourer (X_5/X_7). Significant correlations ($|r| \sim 0{,}45$) are also found for the relation between the training status and the standard of formal education (X_6/X_3) and age and abode (X_7/X_4). For the rest, the correlation coefficients between independent variables are trivial.

The second method of testing for multicollinearity is that of successive variable deletion. This test compares the full multiple regression equation which enters all independent variables in the equation with regression equations which omit one independent variable at a time from the number of variables being tested. To quote Melichar: "By observing the amount and direction of change in the coefficient obtained for a given factor as other factors are in turn added to or deleted from the regression equation, one can ascertain which intercorrelations masked the underlying relationship between the dependent variable and the factor being studied."

The result of the process of successive variable deletion is shown in Table 3.[44)]

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TESTING FOR MULTICOLLINEARITY THROUGH SUCCESSIVE VARIABLE DELETION

Dependent Variable	Intercept	b_{11}	b_{12}	b_{13}	b_{14}	b_{15}	b_{16}	b_{17}	F-Ratio	R^2
$\dot{Y}$	-8,9539	-0,5695	1,5946**	0,5283*	-0,0097	-0,0228	7,1802**	4,3713**	14,1072	0,2587
		(1,9395)	(0,3049)	(0,3378)	(0,1224)	(0,1802)	(1,4308)	(2,0431)		
$\dot{Y}$	-12,0219		1,5918**	0,5292*	0,0058	-0,0213	7,2172**	4,3758**	16,4970	0,2585
		-	(0,3043)	(0,3372)	(0,1102)	(0,1798)	(1,4229)	(2,0398)		
$\dot{Y}$	-6,5240	-0,2577		0,6792**	-0,0302	0,1407	8,3899**	4,5675**	10,8900	0,1870
		(2,0265)	-	(0,3518)	(0,1279)	(0,1855)	(1,4760)	(2,1354)		
$\dot{Y}$	-7,2625	-0,5953	1,6353**		-0,0520	-0,0397	8,1038**	4,6319**	15,9692	0,2523
		(1,9444)	(0,3046)	-	(0,1196)	(0,1803)	(1,3066)	(2,0415)		
$\dot{Y}$	-9,5685	-0,5028	1,5954**	0,5342**		-0,0290	7,1678**	4,3861**	16,5151	0,2587
		(1,7457)	(0,3042)	(0,3288)	-	(0,1620)	(1,4197)	(2,0310)		
$\dot{Y}$	-9,0833	-0,5628	1,5879**	0,5309*	-0,0164		7,2311**	4,4787**	16,5129	0,2586
		(1,9354)	(0,2998)	(0,3366)	(0,1101)	-	(1,3706)	(1,8545)		
$\dot{Y}$	-4,0169	-1,4268	1,8420**	1,2278**	0,0574	-0,2773*		1,6323	11,2989	0,1927
		(2,0126)	(0,3135)	(0,3205)	(0,1267)	(0,1801)	-	(2,0510)		
$\dot{Y}$	-0,0593	-0,6008	1,6066	0,5872	-0,0337	-0,1832	6,3624		15,5002	0,2467
		(1,9516)	(0,3068)	(0,3387)	(0,1226)	(0,1649)	(1,3874)	-		

* significant at the 5 per cent level
** significant at the 1 per cent level
$\dot{Y}$ compound rate of annual income growth
X_1 marital status
X_2 stamina
X_3 standard of formal education
X_4 age
X_5 length of employment
X_6 training status

As shown by the results in Table 3, it was found that training, formal education, stamina and abode are the factors responsible for explaining the variation observed among different rates of income growth. By contrast, marital status, age and length of employment, turned out to be poor predictors. As successive variable deletions were made there occurred some changes in parameter values but none of a size to cause concern.

In order to determine the order of significance of independent variables, stepwise multiple regression was applied. This method provides the best possible prediction with the fewest number of independent variables. The first step is to choose the single variable which is the best predictor. Independent variables to be added to the regression equation in successive steps are those which give the best predictions in conjunction with the previous ones. At each step, only one new optimal variable is added, given the other variables already in the equation. The significance of the independent values is measured with the help of F-ratios.[45)]

According to the stepwise regression method, the statistical summary of the prediction of income growth ($\dot{Y}$) is:

$$\text{(2a)}\quad \dot{Y} = -9,5685 + \underset{(1,4197)}{7,1678X_6^{**}} + \underset{(0,3042)}{1,5954X_2^{**}} + \underset{(2,0310)}{4,3861X_7^{**}} + \underset{(0,3288)}{0,5342X_3^{*}} - \underset{(1,7457)}{0,5028X_1} - \underset{(0,1620)}{0,0290X}$$

$R^2 = 0,2587$

F-ratio = 16,5151

* significant at the 5 per cent level

** significant at the 1 per cent level

With an F-ratio of only 0,006, age is below the tolerance level and has therefore not been included as an independent variable.

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Results pertaining to income in November, 1972 (Y), expressed in terms of basic pay in R per week, are given by

$$(2b)\quad Y = 6,9384 + \underset{(0,3607)}{7,0756X_6^{**}} - \underset{(0,5171)}{2,5314X_7^{**}} + \underset{(0,0855)}{0,5587X_3^{**}} + \underset{(0,0456)}{0,1579X_5} + \underset{(0,0279)}{0,0693X_4} - \underset{(0,0771)}{0,0256X_2}$$

$R^2 = 0,7441$

F-ratio = 137,62

* significant at the 5 per cent level

** significant at the 1 per cent level

In equations (2a) and (2b), training status is the most important predictor of pay and pay growth (see parameters b_{16} and b_{26}). For the worker who successfully passes a formal on-the-job training course, the compound annual expected growth rate of income increases by 7,12 per cent, compared with the worker who has received no formal training (equation 2a) - (The parameter b_{16} should not be applied for the prediction of the income growth of heavy duty drivers who received outside training. This is so because prior to 1972, this sought-after job was allocated through the internal labour market, and it became a port of entry only when, in 1972, the Africanization of this job neared completion).

Training was also the most significant determinant of income in November, 1972. Outside-training raised the expected weekly pay by R7,08 over formal on-the-job training, which in turn yielded an identical expected premium over informal on-the-job training (equation 2b).

As in the case with training, so is the standard of formal education positively and significantly related to both income and income growth (parameters b_{13} and b_{23} refer). Advances in education from the lower primary to the higher primary standard, and from there to the junior secondary, senior secondary, and eventually bachelor degree standards, are each associated with an annual expected increase in

income growth of one-half of one percent. Looking at the effect of education on income from a static point of view (November, 1972), the various steps of educational advance were valued at RO,56 per week.

Whilst the influence of stamina and abode between equations (2a) and (2b) is inconclusive, it emerges with clarity that age (X_4), length of employment (X_5), and marital status (X_1) are insignificant predictors of the income growth and income receipt structures.

It appears from the regression on estimations that for Black employees, the income receipt and income growth structures are skill- rather than seniority-related.

Recall that the average standard of formal school education of the Black work force is low. It is also known that Company X faces a situation of elastic unskilled Black labour supply at prevailing offer wages.[46] Moreover, the Company cannot on the external labour market recruit workers with specific skills, such as are necessary to operate the filling, washing, or labelling machines (only heavy duty truck drivers and, occasionally, forklift truck drivers, are hired on the external labour market). Because of the skill specificity of many jobs therefore, training programmes have to be undertaken on the internal labour market. Yet this cannot be done easily and smoothly, because there is always considerable latent or overt protest by White lower line management and White hourly paid employees against the Africanization of additional jobs. For these reasons, the demand for and supply of Black workers who have been given training is inelastic, at least in the short run.

This leads to the following evaluation of the hypotheses:

(i) In order to curtail labour turnover of Black key operators, the Company is prepared to pay trained operators a very significant relative wage premium.

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For the Company, this is considerably cheaper than the opportunity cost of hiring and training Whites for these positions. On the side of the workers, the disadvantage associated with a resignation is significant as their skill-specific position would not constitute a port of entry in other companies.

(ii) The correlation between training, education and pay suggests that the company's relative wage structure is linked to marginal labour products, rather than to length of job tenure or seniority.

(iii) Within the pay structure of key-operating jobs, there is no detectable differentiation according to whether skills are specific or general. The relative pay gradations of key jobs at Company X is done according to technical engineering evaluations, rather than according to the objective of minimizing labour turnover.

(iv) The congruence of the relative wage structure and the length of education and training suggests that the objective of allocative efficiency is observed. In racially homogeneous societies, there is usually a strong tendency to modify allocative optima so as to accommodate employee interest. Often this is done through restrictions imposed on entry into high-skill jobs, or the reliance on criteria such as seniority, length of service, and internal allocation of jobs.[47)]

At Company X, Black employee interests are accommodated only to a small extent. This is clearly shown in the regression equations where neither age nor length of service are significant predictors of the Black income structure. The reason for this is that Black workers are not effectively trade-unionized, and that the existing works committee does not have a notable impact on relative wage settings.

(v) Consider the parameter values b_{15} and b_{25} (length of employment with Company X in years), and b_{16} and b_{26} (training status). The outcome of the regression model is that both formal on-the-job training and outside training yielded high rents for the workers who underwent vocational education. Moreover, informal on-the-job training and learning-by-doing (the length of which is given through the period of employment with Company X) have little predictive value for the structure of income and income growth.

Below it will be shown that the reason for this anomaly lies in the backlash of White Linesmen and rank-and-file hourly employees, toward the training of Blacks. Without the co-operation of White workers, Blacks have little chance of improving their industrial skills. Through error accumulations they may even hold back their prospect for industrial advance.

By contrast to unorganized learning-by-doing and informal on-the-job training, White racial prejudice does not militate against the undertaking of formal training programmes. At Company X, the manager of the training department was an enlightened young man who, together with his Non-White training staff, tried his best to market the idea of Non-White occupational advance. He succeeded in many cases in organizing formal training programmes in such a way that racial prejudice was minimized.

(vi) Much of the preceding analysis illustrates the effect of customary racial prejudice on the South African Black labour market. In conclusion we note that the existence of racial discrimination has militated against the formation of collective bargaining power for Blacks. The outcome of this has been a more, rather than a less, competitive internal Black labour

market. Whilst this may enhance the allocative efficiency within the Black labour market, it also produces a relative bargaining disadvantage toward the monopolized White worker aristocracy. It is thus the co-existence of the relatively perfect Black labour market, and the relatively imperfect White labour market, which lies at the root of inequality of South Africa's racial income structure. There is a dual labour market which allows one race to draw a rent at the expense of the other. Economic logic suggests that in order to achieve commensurate labour market forms, competition within the White labour market should be intensified, rather than reducing competition within the Black labour market.

7.2 Relative Wages in the Internal Labour Market of Company X

Although wage rates were not the central focus of the studies from which this paper derives, it became apparent during the process of research that the administrative rules and concepts which lie at the root of the determination of the in-plant wage structure of Company X differ from those which prevail in racially homogeneous societies.

In Europe and the U.S.A. there has been a tendency for in-plant blue-collar hourly wage differentials to shrink during the past four decades. Crossman reports for instance that on the whole, process workers in British industries are paid about the same as production workers, "though there is little opportunity on continuous-flow plant for the occasional very high earnings made on piece work."[48] The situation is similar on U.S. plants.[49] As a result of the condensed relative wage structure, workers tend to become unambitious. For them, the lack of vertical mobility is neutralized by the enjoyment of the immediate advantage of good pay and security.

By contrast, there are large wage differentials between process workers and production workers in the bottling hall of Company X. In terms of pay and pay

increases, trained process operators constitute a worker 'aristocracy' among their fellow-workers. As piece-rates are non-existent, there is no possibility for manual production workers to match the pay of process operators.

In an attempt to investigate the rationality of the internal wage structure of Company X in more detail, 38 different jobs pertaining to the operations in this plant were defined. With the assistance of the Technical Training Superintendent, each job was given a job score which was based on the following factors: object variety, motor variety, autonomy, required interaction, learning time and responsibility. The job score measurement scale assigned a task attribute score of between 1 and 5 to each job (Appendix B).

A questionnaire asking for the skill classification and the hourly pay of different jobs was sent to a large brewery, a trade union, and a Technical University in West Germany, and to seven breweries in Black Africa. Only the first three addresses responded. This made it possible to set the multi-racial South African wage structure against its non-racial German counterpart.[50)]

For the German brewing industries, 18 different geographical wage agreements apply. In these, wages are differentiated for journeymen (Handwerker), qualified machine minders (Maschinenführer), unqualified machine minders (Hilfsarbeiten schwer) and unskilled labourers (Hilfsarbeiten leicht).[51)]

In both Germany and South Africa, a journeyman means a skilled artisan who has served an apprenticeship.[52)] Inevitably, this man is a White person at Company X.

An important difference between the labour markets of the two countries applies in relation to the classification of qualified machine minders. In Germany, a qualified machine minder is an operator who has been trained on at least two machines in the bottling hall. He must be able to adapt these machines to

containers or packs of varying sizes, to undertake the maintenance of these machines, and to do minor repairs (all major repair work and the setting of machines is, however, done by the artisans). With this vocational training, the operator is classified as a 'trained machine minder' (Maschinenführer, gelernt und gleichgestellt). In this position, his pay equals that of an artisan.[53)]

By contrast in a South African plant, machine minding on machines that have previously been set to measurement by a journeyman, is considered a semi-skilled operation.[54)]

Details of the comparison between German and South African bottling hall wage data are given in Appendix A. The following information is listed: job number, job content, job score, mean weekly wages in R per week and South African wages as per cent of German wages.

In South Africa, only three out of 38 jobs are occupied by Whites. These are the jobs of the shift bottler (job No. 21), the maintenance fitter (job No. 22), and the shift supervisor (job No. 29). Of these three, the South African maintenance fitter fares significantly better than his German counterpart, whilst the wages of the shift bottler and shift supervisor are approximately equal in the two countries.[55)] For the rest, the German weekly wages exceed the South African ones by between R53 and R80 per week. This means that the South African Black wages are equivalent to between 15 and 38 per cent of the German ones.

Let Y stand for the weekly pay in R, November 1972, and S for the job score ($1 \leq S \leq 5$). The income prediction emanating from a linear regression[56)] of the German data is

$$Y = \underset{(4,0403)}{76,0876 + 4,0660\ S} \qquad R^2 = 0,4516$$

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and of the South African data:

$$Y = 7,5368 + 4,1461\ S \qquad R^2 = 0,4899$$
$$(4,0010)$$

If the marginal utility derived from income increase were constant for all income levels under consideration, the additional satisfaction derived from advances in job scores would be the same in Germany and in South Africa. But this is of course not the case. For the South African Black who advances from, say, a job score of 1,5 to a job score of 4,5, the predicted wage per week will rise from R11,61 to R24,06, which is an increase of over 100 per cent. This pay increase would allow the worker to advance from proletarian to middle-class status. In Germany, however, a similar skill advance would only lead to a predicted wage increase of about 15 per cent with relatively little bearing on the worker's standard of living.

7.3 Racial Patterns of Communication in the Bottling Hall of Company X

The observation of racial patterns of communication was part of a wider study which the writer, assisted by three members of the Engineering Department of Company X, undertook in the Bottling Hall. During several weeks of both day- and night shifts, we recorded 20 175 work-sampling observations, covering Black operators, White Linesmen, and the condition of machinery. In the present context, only findings related to racial communicational patterns between White Linesmen and Black operators will be reported.[57] Work-sampling was chosen because it is a method suitable for the observation of irregular, non-repetitive, or semi-repetitive work. Heiland and Richardson suggest the following definition of this method: "A Work-Sampling study consists of a large number of observations taken at random intervals; in taking the observations, the state or condition of the object of study is noted, and this state is classified into predefined categories of activity pertinent to the particular work situation. From the proportion of observations in each category, inferences are drawn concerning the total activity under study."[58]

Thus, the observer has to note visually, classify into categories, and record the instantaneous state or condition of an object of observation.

In the planning of the design of a work-sampling study, the following factors have to be observed:

(i) the observations must take place at random times;

(ii) the categories of sampling must be clearly and concisely defined and must be recognizable by visual observation. Rating procedures should not be applied as they are subject to error;

(iii) in contrast to the traditional stop-watch procedures, work-sampling has the advantage of observing a great number of workers simultaneously over a number of days or weeks;

(iv) the purpose of work-sampling is to establish the percentage occurance $\bar{p}$ of the element being observed. If samples are drawn at random and if the composition of the mass does not change, then the probabilities of a sequence of $\bar{p}$ observations will be normally distributed. As a measure of dispersion, the standard deviation, when laid off on both sides of the mean, will measure known portions of the area under the number distribution curve. The standard deviation is

$$\sigma = \sqrt{\frac{p(1-p)}{n}}$$

where p = percentage occurance of the element observed;

n = number of observations.

In the Bottling Hall of Company X, work-sampling observations could conveniently be recorded from gangways which ran about 3 m above the shop floor. After

considerable experimentation, we adopted the following categories for the observation White Linesmen:

The observation is A_p, where

p = 1 man is absent

p = 2 man sits at his desk and does paper work

p = 3 inter-racial contact (White-Black) - productive

p = 4 intra-racial contact (White-White) - productive

p = 5 inter-racial contact (White-Black) - unproductive

p = 6 intra-racial contact (White-White) - unproductive

p = 7 man checks machine or supervises operators

p = 8 man is idle

p = 9 man gives instruction or training to Blacks.

In the present context, the relative frequencies of the observations p = 3, 4, 5, 6 and 9 are of importance. The result of the computation is given in Table 4.

TABLE 4

RELATIVE FREQUENCY AND DIRECTIONS OF COMMUNICATIONS OF LINESMEN[59)]

Category of Observation	Relative Frequencies of Observed Categories, ± 1σ		
	Line 1	Line 2	Line 3
$\tilde{p}$ = 9 man gives guidance or training	0,56±0,56	0,14±0,08	0
$\tilde{p}$ = 3,5 man has inter-racial contact (White-Black)	0	0,29±0,12	2,12±1,05
$\tilde{p}$ = 4,6 man has intra-racial contact (White-White)	4,47±1,54	6,20±0,53	3,70±1,37

Table 4 shows that the communication between the workers of the Bottling Hall is determined, not by the functional criterions of the manufacturing plant, but by the discriminatory criterion of race. Employed to supervise Black process operators, the White Linesmen give only a minute fraction of their time to communication with Blacks. Their desire for a normal amount of inter-personal communication (which, according to our study, lies somewhere between 5 and 10 per cent of the total work time) is satisfied almost entirely by communication with other Whites. It is impossible to quantify the disadvantage of this behaviour, but we know that for process operators, a considerable amount of inter-communication is needed to keep the associates informed about the state of the plant.[60] Crossman speaks of "social skills" and demands that "each member of the team must be able to communicate easily with his fellows, understand their points of view and put his own across."[61] Process workers should be good mixers. Friendship between workers, and the absence of racial antagonism, must be considered a 'conditio sine qua non' for the smooth operation of interconnected machinery.

The lack of inter-racial communiation is particularly damaging to repair and maintenance jobs. Operators usually have intimate knowledge of the machinery. Their failure to communicate with artisans about the nature of machine faults is therefore likely to delay repair jobs, particularly when inexperienced artisans are put on the job.[62] It is a permanent dilemma in South African plants that the Bantu machine operator is not trained and authorized to co-operate in the repair of machine breakdowns. The definitions of jobs laid down in Industrial Council Agreements, frequently curtail, rather than encourage, the use of latent skills. The following quotations may serve as examples:

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"artisan's labourer" means an employee who assists an artisan ... in all his duties ... and may perform such duties delegated to him by the artisan ...: Provided that they do not involve the independent use of tools;

"bottling hall leading hand" means an employee who assists in the supervision of the bottling process ... and reports any difficulties to his superior;

"filler attendant" means an employee who operates a filler and ... stops the machine for any irregularities and reports them to his supervisor;[63]

It is clear that restrictive rules such as the above will suppress the worker's initiative and consequently prevent him from acquiring the skills necessary for the adjustment and repair of machinery.

The lack of communication between Whites and Blacks has produced a deep gulf between Black operators and their White foremen.[64] When asked to identify his 'boys' from the employment cards, one of the three Linesmen of the Bottling Hall could identify only three out of the 18 workers of his line. We also discussed with the same Linesman the pay earned by his Black workers. The weekly pay figures given to us were out by as much as 40 per cent, compared with the true values. All Linesmen had a similar paternalistic, domineering, and austere attitude towards Blacks. The relatively low pay and the low status of their jobs, and the knowledge that they were replaceable by Blacks, attracted only a poor calibre of Whites to the job of Linesman.[65]

Inadequate Black operator performance and poor inter-racial communication are among the reasons for low plant efficiency.[66] During the weeks of research, the average plant efficiencies were as follows :[67]

Line 1 73,4 per cent,

Line 2 66,4 per cent,

Line 3 73,6 per cent.

This average standard of efficiency is well below to what can be achieved with modern machinery and well-trained staff. Thus it is reported that on German bottling plants, average efficiency lies nowadays between 90 and 95 per cent.[68]

8. Conclusion

The one fact that emerges with clarity from the foregoing analysis is the lack of equilibrium on the South African labour market. Define a microeconomic equilibrium as a situation where no person's welfare can be improved unless the welfare of some other person is deteriorated.[69] Alternatively, if compensation payments are allowed, it is a situation where the "potential losers could not profitably bribe the potential gainers to oppose the change."[70] The compensation principle could profitably be applied to remove part of the imbalance of South Africa's labour market. This is so because there exists unused skill potential of Black operators: If allowed vertical probility, properly selected and trained Blacks would aspire to more demanding positions. Blacks would then receive pay increases, and the productivity gain could be shared between the employers and White employees.[71]

In spite of the all-round advantages of industrial training, the actual training achievement lagged behind what was considered optimal in the minds of the managers of Company X.[72] Thus, it was one of the objectives of the Personnel Department of Company X to give formal in-plant training to all Black workers holding positions in grades 4, 5 and 6. Yet at the time when we carried out our studies, only 28 of 319 workers employed in these grades had been trained.[73] Although the monetary gains from Black skill advancement and from Africanization are remarkably high, there is a considerably underinvestment in formal in-plant training.

Most South African Blacks continue to live on bare subsistence wages. With their enforced abstention from consumption they help finance an immense waste of human potential. The tragedy is that South Africa possesses the physical wealth to produce a high income for all races. But the "schisms (of) a century-old ambivalence of ideas", as Professor Frankel has called it, is still with the country: it is the simultaneous fear of and dependence on the Black man, the "benefits ... of drawing men together, (and) the fear that all will be lost if they are not kept apart."[74] South Africa continues to delay social decisions. Legislative and executive paternalism allocates the Black man a proletarian status, whilst economic forces have long begun to work towards his social integration.

APPENDIX A

Job Scores for 38 Brewery Jobs. Wage Comparison: Mean Weekly Pay in South African Rand, November 1972, South Africa (S.A.) and Germany. Overtime wages are excluded.

Job No.	Job and Job Content	Job Score	S.A. Wage	German Wage	S.A. Wage as per cent of German Wage
01	Accumulator Attendant - controls flow of bottles and cans on accumulator tables: unjams bottle-necks; keeps conveyors lubricated; removes cullet.	1,53	13,22	80,46	16,44
02	Artisan Labourer - assists White artisans.	2,73	15,51	80,46	19,27
03	Automatic Palletizer Machinist - controls the palletizing machine which patterns cases on a pallet.	1,87	18,70	86,76	21,55
04	Bottle Unpacker - unloads cases and places bottles on conveyor belts.	1,27	12,70	80,46	15,78
05	Can Filler Relief - replaces filler when need arises, connects beer tanks, removes cullet and helps with cleaning.	3,13	14,95	86,76	17,23
06	Case Unloader - takes cases from pallet and places them on conveyor.	1,13	12,70	80,46	15,78
07	Cluster Pack Attendant - loads the cluster pack machine, and watches infeed and discharge. Cluster pack machines fold jackets around cans and bottles of beer.	2,27	18,03	86,76	20,79

Job No.	Job and Job Content	Job Score	S.A. Wage	German Wage	S.A. Wag as per ce of Germa Wage
08	Crown Removers - remove crowns from bottles which are returned from traders.	1,67	12,70	80,46	15,78
09	First Aid Orderlies - assist the Medical Officer with first-aid duties, keep records of consultations.	3,53	19,53	86,76	22,51
10	Filler Operator - controls filler and crowner, checks proper fill of bottles, controls pressure of beerflow, flushes filler with water and is responsible for tank changes.	3,40	20,72	86,76	23,88
11	Flap Folder - turns carton flaps on non-deposit cartons.	1,13	12,70	80,46	15,78
12	Forklift Truck Driver - drives forklift.	3,47	20,33	86,76	23,44
13	Fulls Packer - packs cases with bottles, controls conveyor belt and lubricates conveyor.	1,60	15,77	80,46	19,60
14	Fulls Packer Machinist - controls the fulls-packing machine which lifts 24 bottles at a time into cases.	2,13	17,13	86,76	19,75
15	General Labourer - works in any department	1,53	12,77	80,46	15,87
16	Labeller Cutter and Glue Mixer: cuts labels to indicate the date of production. Mixes glue with water.	3,00	18,15	86,76	20,92

Job No.	Job and Job Content	Job Score	S.A. Wage	German Wage	S.A. W as per of Ger Wage
17	Heavy Duty Driver - drives trucks of 18 or more tons of weight.	3,60	33,18	86,76	38,24
18	Labeller Operator - feeds labels, adjusts glue supply, cleans machine, watches infeed and discharge. He is responsible for minor adjustments.	2,80	17,69	86,76	20,39
19	Laboratory Assistant - receives beer samples, determines CO_2 and air content, volume fills, PK calculations.	2,47	21,94	86,76	25,29
20	Leading Hand (Black) - exercises authority over workers on the line. Keeps records of absenteeism, unpunctuality, and sickness.	4,67	22,01	95,49	23,05
21	Shift Bottler (White) - controls production of a line, i.e. output and quality. He supervises approximately 30 workers. Responsible for a certain amount of paper work. Organizes the activities of the line during breakdown.	4,53	109,45	99,80	108,67
22	Maintenance Fitter (White) - responsible for repairs and maintenance.	4,47	124,20	91,07	136,38
23	Messenger - responsible for internal deliveries	2,33	12,77	74,16	17,22
24	Packmaster Operator - controls the packing machine.	2,13	16,05	86,76	18,50

Job No.	Job and Job Content	Job Score	S.A. Wage	German Wage	S.A. Wa as per c of Germ Wage
25	Palletizer - takes full beer cases from conveyor and palletizes them.	1,53	13,14	86,76	15,14
26	Personnel Clerk (Black) - responsible for a variety of clerical functions in Workers' Personnel Office.	3,13	26,13	91,07	28,70
27	Security Guard - controls gates.	3,00	19,02	86,76	21,93
28	Senior Distribution Labourer - foreman on trucks, organizes the load and stepping of entries.	3,27	15,47	95,49	16,20
29	Shift Supervisor (White) - controls shift bottlers, ensures that crews work according to programme. He checks quality standards and organizes the labour force.	4,80	135,00	141,47	95,43
30	Sighter - watches and inspects bottles, both empty and full. His job is exchanged with other jobs, from time to time, such as accumulator-table attendance.	2,07	13,77	80,46	17,11
31	Shrinkwrap Operator - controls machine, changes rolls of film, and rejects bad packs. The shrinkwrap machine folds plastic folios around cases.	1,87	15,47	86,76	17,83
32	Stitcher - erects boxes, forms them into the right shape and stitches them.	1,93	15,00	86,76	17,29

Job No.	Job and Job Content	Job Score	S.A. Wage	German Wage	S.A. Wage as per cent of German Wage
33	Washer Discharge - watches bottles leave the washer, inspects bottles, removes dirty and broken bottles, controls "on" and "off" buttons for the machine.	2,20	14,58	86,76	16,81
34	Washer Infeed - watches and controls bottles being fed into washing machine. He has no authority to start the machine, but he can stop it.	2,13	18,20	86,76	20,98
35	Weight Operator - weighs tips, and puts barley in hopper.	1,53	14,95	86,76	17,23
36	Engine Room Attendant - looks after refrigerator plant in engine room.	3,58	28,23	95,49	29,57
37	Senior Personnel Clerk - performs senior duties in Workers' Personnel Office.	3,27	32,40	99,80	32,47
38	Filler Relief - assists filler operator and replaces him during his absence.	3,15	14,95	86,76	17,23

APPENDIX B

Job _____

TASK ATTRIBUTES 75)

OBJECT VARIETY

Number of different kinds of objects, tools and controls worked on	1-4	5-12	13-28	29-60	61-120

MOTOR VARIETY	1		2		3		4		5
Change in work pace	Same for 95% of working time				More than one pace, but variations only at long intervals				Varies considerably during day
Change in physical location	At same place for 95% of work time				Moves in fixed place				Moves most of time to different positions
Change in required physical operations	All of the same physical motions				Some operations differ, but not on large scale				Considerable changes required. Frequent and important

AUTONOMY	1		2		3		4		5
Method Choice	Detailed and specific, determined for job				Partly predetermined. Some leeway given				Wide latitude given in selection of method
Sequence Choice	Predetermined 90% of time or more				Partly predetermined. Some leeway given.				Wide latitude given in selection of methods

Pace Choice	Mechanically determined 90% of time		Mechanically predetermined 40-60% of time or predetermined by others in crew		Can set own pace at least 90% of time
Quality of Input Choice	None - completely predetermined		Some. Can occasionally reject substandard material or after discussion with external agent		Considerable discretion allowed
Importation of Outside Services Choice	Almost none		Must be discussed with outside agent but S shares in decision making		Initiates discussion and makes or can make veto decision

FOOTNOTES

1. In the present context, the terms White and Black indicate the polarization which is typical of a multi-racial society. In the applied section of this paper, White will denote persons of European descent, whilst Black will stand for members of the indigenous Bantu-speaking population.

2. The writer gratefully acknowledge the unfailing courtesy and co-operation of members of management and workers of the plant studied, without which this investigation would not have been possible.

3. Muriel Horrell, South Africa's Workers, South African Institute of Race Relations, Johannesburg, 1969.

4. In contrast to the U.S. Department of Labor, its South African counterpart does not work toward change in the climate of inter-racial work relations.

5. Peter B. Doeringer and Michael J. Piore, Internal Labor Markets and Manpower Analysis, Heath, Lexington, 1971, p. 5.
   The term 'internal labour market' goes back to John T. Dunlop, "Job Vacancy Measures and Economic Analysis", in: The Measurement and Interpretation of Job Vacancies: A Conference Report, NBER, Columbia University Press, New York, 1966.

6. Doeringer and Piore, ibid., p. 2.

7. Clark Kerr, "The Balkanization of Labor Markets", in: E. Wight Bakke et. al., Labor Mobility and Economic Opportunity, MIT, Cambridge, Mass., 1954, pp. 92-110.

8. Arthur M. Ross, "Do we have a New Industrial Feudalism?", American Economic Review, Vol. XLVIII, December, 1958, pp. 914-5.

9. During 1971 at Company X, labour turnover was 22 per cent for (predominantly White) salaried staff, 74 per cent for White weekly paid staff, and 56 per cent for Blacks, all of whom are weekly paid.

   $$\text{labour turnover} = \frac{100 \cdot \text{total separations per year}}{\text{average monthly labour force}}$$

10. South Africa is a bilingual country with English and Afrikaans being the two official languages. Blacks speak their own languages, such as Xhosa and Zulu.

11. A significant number of (illegal) work stoppages and strikes occurred at the beginning of 1973, particularly in the Natal Province. Company X and its subsidiaries were not affected in this.

12. The objective of this Act is to curtail Black influx into White areas. Adverse repercussions on the economy's growth performance are a consequence of this legislation. Republic of South Africa, House of Assembly Debates (Hansard), 26th May, 1967, col. 6780.

13. In June 1972, the 'avoidable' labour turnover (i.e., resignations, dismissals, and desertions) was 11,0 per cent for local, but only 3,9 per cent for migrant labour.

14. F. Wilson, Migrant Labour, The South African Council of Churches, Johannesburg, 1972, p. 195.

15. ibid., p. 45.

16. Average household income from: Bureau of Market Research, University of South Africa, "Income and Expenditure Patterns of Non-White Urban Households", Tembisa Survey, Rep. No. 27-13, 1972.
The secondary poverty datum line estimates the income needed by an individual household if it is to maintain a defined minimum level of health and decency. F.J. Potgieter, "The Poverty Datum Line in the Major Urban Centres in the Republic", University of Port Elizabeth, Inst. for Planning Research, 1973, p. 58. The 1973 figure was discounted by the consumer price index to make it comparable with the 1970 living standard.

17. Tembisa Survey, ibid., (1 Rand = 1,40 U.S. $, December 1970).

18. Piore reports for the U.S.A. that employers hiring ghetto workers may accommodat to their behavioural characteristics rather than attempt to change them. Unstab employment is reported to be tolerated, so is lateness, and whilst the employer does not actually condone theft and the employee is fired if he is caught, the employer does expect a certain amount of theft and does not monitor it closely. Similar observations would probably apply to the employment of domestic servants in South Africa. Yet in manufacturing, the writer has not observed similar lax employment patterns.
Michael J. Piore, "Public and Private Responsibilities in on-the-job Training of Disadvantages Workers", Working Paper No. 23, Massachusetts Institute of Technology, 1968, pp. 5-10, 34.

19. J. Woodward, "Management and Technology", Department of Scientific and Industrial Research, Problems of Progress in Industry, No. 3, H.M.S.O., London, 1958.

20. The following sources were consulted for the description of bottling operations:
Donald G. Ruff and Kurt Becker, Bottling and Canning of Beer, Siebel Institute of Technology, Chicago, 1955.
Republic of South Africa, Government Gazette, No. 2680, Vol. 58, 3rd April, 197(
This Gazette contains the current Industrial Council Agreement with various detailed job descriptions pertaining to Company X.

21. F. Berg and P. Duckeck, "Personalbedarf im Flaschenkeller - spezifische Arbeitsleistung in Abhangigkeit von Geräteausstattung und Kolonnengrösse", Brauwelt, Nr. 44, B. Nürnberg, 1967, pp. 837-843.
K. Rübelmann, "Prämienlohnsystem im Flaschenkeller", Brauwelt, Nr. 65, A. Nürnberg, 1971, p. 1416.

22. Government Gazette No. 2680, ibid.

23. Ruff and Becker, ibid., p. 91.

24. Government Gazette No. 2680, ibid.

25. During 1973, the positions of Linesmen were Africanized.

26. There is a general lack of studies in the acquisition of non-symbolic skills. Excellent work has been done in the field of sport, such as Margaret D. Robb, The Dynamics of Motor-Skill Acquisition, Prentice-Hall, New Jersey, 1972. On the acquisition of industrial skills, see W. Douglas Seymour, Industrial Skills, Pitman, London, 1966.

27. In driving a car, the positions of clutch, brakes and accelerator are adjusted kinaesthetically. Compare W.L. Jenkins, "Somethesis", in S.S. Stevens (ed.), Handbook of Experimental Psychology, Wiley, New York, 1962, pp. 1172-90.

28. This type of work division between the technical and the training departments is also common in the U.S.A.
National Manpower Council A Policy for Skilled Manpower, Columbia University Press, New York, 1954, p. 210.

29. Company X applied a training method known as the 'progressive part method', in which subsequent parts of a particular job are each learnt first in isolation, and then put into practice together with what has been previously learned.
In contrast to the 'whole method' where a complete task is practised from beginning to end, the 'part method' allows the worker to obtain the speed of a skilled operator with less practice. The 'part method' is superior where trainess have to learn associations between different parts of the machine, usually involving a complex sequence of interdependent manual operations.
Compare H.M. Clays, "How Research can help Training", Department of Scientific and Industrial Research, Problems of Progress in Industry, No. 16, H.M.S.O.,

London, 1964 pp. 11 and W. Douglas Seymour, Operator Training in Industry, Institute of Personnel Management, London, 1959.

Seymour's study deals with the acquisition of manual and repetitive skills. A paper which examines the problem in relation to process work is S.D.M. King, "Vocational Training in View of Technological Change", European Productivity Agency, E.P.A. Project 418, Paris, 1960.

30. For blue-collar workers, on-the-job training is the prevalent type of skill teaching in many Western countries.

National Manpower Council, A Policy for Skilled Manpower, ibid., p. 208 f.

U.S. Department of Labor, "Formal Occupational Training of Adult Workers", Manpower/Automation Research Monograph No. 2, December 1964, pp. 43 f.

Department of Labour, Canada, "Acquisition of Skills", Research Program on the Training of Skilled Manpower, Report 4, Queen's Printer and Controller of Stationery, Ottawa, 1960.

31. Michael J. Piore, "On-the-Jobe Training and Adjustment to Technological Change", Journal of Human Resources, III, 4, 1968, p. 437.

32. In this context, Sapir notes that "from a biological standpoint all customs are in origin individual habits which have become diffused in society through the interaction of individual upon individual. These diffused or socialized habits, however, tend to maintain themselves because of the unbroken continuity of the diffusion process from generation to generation. One more often sees custom helping to form individual habit than individual habit being made over to custom."

Edward Sapir, "Custom", Encylopaedia of the Social Sciences, Vol. 4, MacMillan New York, 1931, pp. 658-662.

The effect which custom (rather than the written law) has on the flexibility of society is referred to by Marc Bloch when he discusses the replacement of the

customary through the written law, which took place in feudal Europe in the twelfth century.

Marc Bloch, Feudal Society, translated by L.A. Manyon, Routledge and Kegan Paul, 1961, pp. 113-130.

33. Edwin F. Estle, "On-the-Job Training: A Theoretical and Empirical Analysis", Ph.D. Thesis, Princeton University, 1966, p. 2.

34. Practice is needed for the acquisition of manual skills, whilst experience is required for mental skills.

35. M. Robb, The Dynamics of Motor Skill Acquisition, ibid., p. 15.

36. E.R.F.W. Crossman, "A Theory of the Acquisition of Speed Skills", Ergonomics, Vol. 2, 1959, pp. 153-66.

37. Even in a low-wage country like South Africa, areas of activity where fixed employment costs are negligible are fast disappearing.

38. Walter Y. Oi, "Labor as a Quasi-Fixed Factor", Journal of Political Economy, December 1962.

Gary S. Becker, Human Capital: A Theoretical and Empirical Analysis, Columbia University Press, New York, 1964.

39. Doeringer and Piore, Internal Labor Markets, ibid., p. 77.

40. Only a few perfectly general skills can be conceived. Basic literacy and the ability to communicate constitute probably the most important general skills.

41. On-the-job training itself is a condition for the mutation of plant equipment toward specificity. For U.S. plants, Doeringer and Piore report that there is a tendency for line management to modify equipment even if it is standardized, and thereby to improve overall plant efficiency. Normally no written records are made of these plant mutations, workers and company engineers tend to build up a "knowledge monopoly" over the firm.

Doeringer and Piore, Internal Labor Market, ibid., p. 17.

42. Edward J. Kane, Economic Statistics and Econometrics, Harper and Row, New York, 1968, pp. 277, 8.

43. E. Melichar, "Least-Squares Analysis of Economic Surveys Data", American Statistical Association, 1965 Proceedings of the Business and Economics Statistics Section, Papers presented at the annual Meeting, p. 382.

44. The data were adjusted to the SPSS System: Norman Nie, Dale H. Bent, and H. Hadlai Hull, Statistical Package for the Social Sciences, McGraw-Hill, New York, 1970.

The writer is grateful to Mrs C. Skjolde for the organization and coding of data for input in the SPSS system.

45. The number of degrees of freedom being 6 for the regression and 284 for the residual, the F distribution gives a value of 2,13 at the 5 per cent level, and 2,88 at the 1 per cent level of significance.

46. This statement is valid although the absolute maximum number of Black employees is pegged in terms of the Physical Planning Act.

47. Phillip Selznick and Howard Vollmer, "The Rule of Law in Industry: Seniority Rights", Industrial Relations, Vol. I, No. 3, May 1962.

48. E.R.F.W. Crossman, "Automation and Skill", Department of Scientific and Industrial Research, Problems of Progress in Industry, No. 9, H.M.S.O., London, 1960, p. 14.

49. For an American automobile plant, R.H. Guest reports that "ninety-five per cent of the workers fell into four pay groups, the highest and lowest being 20 Cents apart. ... In other words, advancement for production workers within the hourly ranks was highly restricted."

R.H. Guest, "Work Careers and Aspirations of Automobile Workers", American Sociological Review, Vol. 19, 1954, p. 155 f. (The above observation was made for the year 1952 when the starting wage rate was $ 1,82).

50. The German data refer to the average wage which prevailed in Bavaria in November, 1972.

51. Brauereiindustrie - Lohnentwicklung 1972, mimeographed, Gewerkschaft für Nahrung, Genuss und Gaststätten, Hamburg, Germany.

52. In South Africa, a skilled artisan means a person who has served his apprenticeship under the Apprenticeship Act of 1944, or who holds a Certificate of Proficiency in terms of Sections 2(7), 6 or 7(3) of the Training and Artisans Act, 1951.

53. Gewerkschaft Nahrung, Genuss, Gaststätten, Landesbezirk Hamburg/Schleswig Holstein, Manteltarifvertrag für gewerbliche Arbeitnehmer und Auszubildende in den Brauereien von Hamburg und Schleswig Holstein, gültig ab 1. Januar 1971, Sec. 7(2).

54. F.v.d. Bogaerde, "Occupational Wage Differentials in the South African Metal Industry", The South African Journal of Economics, Vol. 30, 1962, p. 270. As is the case in South Africa, machine minders are generally classified as semi-skilled in the U.S.A.
U.S. Department of Labor, Occupational Outlook Handbook, 1970-1, p. 350 f.

55. 1 DM = R 0,2456 (November, 1972).
South African Reserve Bank, Quarterly Bulletin, No. 110, December 1973, S-63.

56. In order to bring the values of the standard errors below the values of the slopes, the following (White) jobs were omitted from the regressions:
(i) for the South African data: jobs No:. 21, 22, 29.
(ii) for the German data: job No. 29.

57. A full report is entitled "The Economics of Bantu Operator Training in a South African Beer Bottling Hall" by A. Spandau, mimeographed, 1973.

58. R.H. Heiland and W.J. Richardson, Work Sampling, McGraw-Hill, New York, 1957, p. 1.

59. Relative frequencies are given with 1-sigma deviations. If, say, 0,53 is the 1-sigma deviation for the observed value of 6,20 per cent of all cases, the true relative frequency of the respective category lies between 5,67 and 6,73 per cent, provided that sampling was done on a random basis.

60. This is particularly so in the Bottling Hall where successive units of machinery are closely linked one with the other.

61. E.R.F.W. Crossman, Automation and Skill, ibid., pp. 52,3.

62. Similar conditions have been reported for Nigeria before Independence: Peter Kilby, Industrialization in an Open Economy: Nigeria, 1945-66, University Press, Cambridge, 1969, p. 224.

63. Republic of South Africa, Government Gazette, No. 4093, Vol. 101, 30th November, 1973.

64. An American study of racial attitudes in large companies notes the following divergence between top and first-line supervision: "First-line supervisors were more likely to rate the Negro's performance lower, more likely to be opposed to hiring the unqualified Negro and training him at company expense, and more prejudiced than were top management. (W)here perceived company pressures on management to hire Negroes preferentially (were) greatest, more resentment was indicated in the form of expressed prejudice ...". Undoubtedly the pattern of South African racial discrimination is very similar.
Mendel Winston Cook, Industry Attitudes About the Employment of Negroes, unpublished Masters' dissertation, Massachusetts Institute of Technology, June 1968, pp. 110 and 111, quoted from: M. Piore, Public and Private Responsibilities ..., ibid., p. 14, ft. 17.

65. Subsequent to the field-work of this study, the job of Linesman was in fact Africanized.

66. The principal reason for low plant efficiency stems, however, from the small size of the South African market, which made it rational for Company X to produce nine different brands of the product in no fewer than 46 different packs. On line 2 alone, we noted 16 changes in the size and shape of bottles. Moreover, 81 brand changes were recorded for the three lines.

67. Average efficiency is the quantity of product actually filled as a percentage of standard output.

The capacities of the three observed lines was as follows:

Line 1: 27000 cans/hr (340 ml cans);

Line 2: 21600 bottles/hr (375 ml bottles);

Line 3; 21600 cans/hr (450 ml cans).

68. Schäuble, Duchek and Berg report that on German bottling plants, efficiencies exceeding 90 per cent are quite common, even for plants which bottle less than 60 000 bottles/hr. It is stressed, however, that these performances require highly trained staff.

Rolf Schäuble, "Rationeller Flaschenkellerbetrieb", Brauwelt, Jg. 111, (1971) Nr. 65A, 10. September, p. 1409.

P. Duchek, "Anlage bei Lindener Gilde-Bräu, Hannover", Brauwelt, Jg. 111 (1971), Nr. 65A, 10. September, p. 1435.

F. Berg, "Wirkungsgrad und Ausnutzungsgrad von Flaschenkolonnen und ihre Auswirkung auf die Abfüllkosten",Brauwelt, Jg. 112, (1972), Nr. 41 A, 9. Juni, p. 839.

69. This condition is known as the Pareto Optimum.

70. F.M.D. Little, A Critique of Welfare Economics, Second Edition, O.U.P., 1963, pp. 98-105.

71. Compensation payments to White employees were part of the 1973 wage agreement between the Chamber of Mines of South Africa and the Mine Workers Union. A. Spandau, "Income Policy and Distributive Justice", Inaugural Address, University of the Witwatersrand, Johannesburg, 1974, p. 13.

72. Being considered as not directly productive, staff training often lags behind to what is technically optimal. The following reasons tend to lead to a decline of training: financial stringency; intense pressures of production; lack of appreciation of the potentiality of training; and clash of personalities between those responsible for training and the staff of other departments; racial prejudice.
National Institute of Industrial Psychology, Training Factory Workers, Projects 179 of the European Productivity Agency, Staples Press, London, 1956, pp. 90, 91, 94. Compare also Department of Scientific and Industrial Research, "Training made Easier", Problems of Progress in Industry, No. 6, H.M.S.O., London, 1960, p. 4 f. Arnt Spandau, "On-the-Jot Training on the Assembly Plant of a South African Motor Vehicle Producer", The Rhodesian Journal of Economics, Vol. 6, Number 4, December 1972, pp. 26-45.

73. The 28 Blacks who had received formal in-plant training had been given training for one of the following jobs: filling operations; washing operations; packing operations; labelling operations; engine room attending; forklift-truck driving.

74. S. Herbert Frankel, "The Tyranny of Economic Paternalism in Africa, A Study of Frontier Mentality, 1860-1960", Supplement to Optima, Johannesburg, December 1960, p. 47.

75. Source: H.S. Alverson, "The Social and Organizational Antecedents of Job Satisfaction among Black South African Industrial Workers: A Multivariate Analysis", Yale University, Ph.D., 1968, p. 213 f.