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RESERVE

"CONVERTING CRISIS TO BOOM FOR KENYAN FOUNDRIES AND
METAL ENGINEERING INDUSTRIES : TECHNICAL POSSIBILITIES
VERSUS POLITICAL AND BUREAUCRATIC OBSTACLES"

by

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"Converting Crisis to Boom for Kenyan Foundries and Metal Engineering Industries: Technical Possibilities versus Political and Bureaucratic Obstacles"

by Peter Coughlin.

ABSTRACT

The present foreign exchange crisis in Kenya could occasion a boom in our foundries and metal engineering workshops if the government adopts policies to vigorously encourage - instead of hampering - these key industries. Their plant and equipment, skilled workers, and supervisors are massively underutilized principally due to a lack of planned development for these industries. But now given that existing capacity, a boom in the foundries and metal engineering industries could be created by: drastically limiting the number of models of cars, trucks and various products, eliminating imports of domestically producible items, selectively improving the capacities and quality controls in these industries, lowering the inflated prices that wholesalers charge for specialty steels, reducing the over-reliance upon and cost of licensing agreements, restricting patent protection, and discriminatorily favouring the allocation of foreign exchange to foundries and the engineering industries. Also the government's huge railway workshops should be put to work to make components for many products (i.e. pumps). The implementation of these policies would create thousands of jobs through backward and forward linkages (e.g. for plastic components; assembly of the products, and from usage in agriculture) and would decrease import dependence. But the adoption of these policies to increase domestic production in these industries would encounter strong opposition from importers and multi-national assemblers of imported components.

These conclusions were drawn from visits to 91 metal engineering workshops and 19 foundries in Nairobi, Kisumu, Thika, Magadi, Mombasa and elsewhere.

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"CONVERTING CRISIS TO BOOM FOR KENYAN FOUNDRIES AND METAL
ENGINEERING INDUSTRIES: TECHNICAL POSSIBILITIES VERSUS POLITICAL
AND BUREAUCRATIC OBSTACLES"

By

Peter E. Coughlin*

1. INTRODUCTION

The present foreign exchange crisis in Kenya could occasion a boom in our foundries and metal engineering workshops if the government adopts policies to vigorously encourage - instead of hampering - these key industries. Their plant and equipment, skilled workers, and supervisors are massively underutilized principally due to a lack of planned development for these industries. But now given the existing capacity, these industries could produce very many products that are currently imported. To achieve this, strong new policies are needed concerning the unavailability and high cost of inputs, foreign exchange allocations, quality controls, selective improvements in capacities, the gross underutilization of the government's huge railway workshops, the rationalization of product lines, patent protection, and the over-reliance on foreign licensing agreements. But the adoption and implementation of these policies to increase domestic production in these industries would encounter strong opposition from importers and multinational assemblers of imported components.

These conclusions were drawn from visits to 91 metal engineering workshops and 19 foundries in Nairobi, Kisumu, Thika, Magadi, Mombasa and elsewhere between August 1981 - and

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January 1983 (the bulk between December, 1981, and July, 1982). Nearly all the large and most of the small workshops in these cities were visited. The author and his assistant visited both commercial metal engineering workshops (66) and those attached to factories (22) or to the Railways (3). Multinational corporations owned five of the commercial metal engineering workshops with one in Nairobi and four in Mombasa; Africans owned only one commercial workshop; Kenyan residents or citizens of Asian ancestry owned the rest. One foundry was at the Railway's Nairobi workshop and four others were attached to factories, the rest were commercial. The author visited the railways' workshops on ten occasions often spending a whole or half day making detailed observations and enquiries. When visiting repair workshops attached to factories, the author first toured the entire factory and then often examined the spares in the storeroom to determine whether some items could be made in Kenya. Afterwards plant managers and/or workshops supervisors were interviewed, an inventory of the metal engineering machinery was taken, and work samples were observed. The study focused on metal engineering excluding metal fabrication (e.g. bending and welding).

2. MASSIVE UNDERUTILIZATION OF MEN AND MACHINES.

2.1. The present situation.

With the presently underutilized machinery, workers, supervisors and space, these industries could greatly expand output with only minimal additional investment. The foundries use only 23% of their capacity and metal engineering workshops use

only 34% (see appendix tables 1A and 1B).¹ Output could be expanded by 42% in machine shops and 106% in foundries just by more intensively using the existing labor force without any additional hours! In the short-term, of course, more overtime could be used too. In the medium-term, machine shops could expand their workforce by a weighted average of 62% without needing more supervisors (see Appendix table 2). Virtually all respondents also claimed that if needed they could promote foremen from among present employees. The workforce could also increase rapidly because even with only on-the-job training new foundry workers can become semi-skilled in less than 12 months and machine shop workers in less than 2½ years especially if they are keen (see Appendix 3A and chart 3B.) Present workers can be upgraded in as much time. Hence these industries can meet their needs for most supervisors and artisans in both the short and medium^{term}.

Space is also underutilized in many machine shops though this varied: on the average shops in Nairobi could expand their equipment by 28% in the same space, those in Mombasa by 3% and in Kisumu by 84% (see Appendix table 2). All except the two big well equipped foundries at the Railways workshop and at the E.A. Foundries are cramped for space. But it is exactly in these two big well equipped foundries that any expansion would best occur.

1. The weighted average capacity utilization (U_2) equals:

$$U_2 = \frac{1}{\sum_{i=1}^n \sum_{s=1}^3 (L_i^s)} \times \frac{\sum_{i=1}^n \sum_{s=1}^3 (L_i^s \times H_i^s) / (1 + A_i)}{120}$$

Where L_i^s = Labourers in the machine shop at plant i during shift s.

H_i^s = average hours worked per week at plant i during shift s.

A_i = percentage of additional work that could be done at plant i without any additional employees, work hours, or plant and equipment. This is a measure of slack during the current shifts.

Seventy-seven per cent of respondents indicated a willingness to run a second shift if work were to permanently increase and 44% thought that productivity on the second shift would be at least as good as on the first shift. Hence, two shifts of 60 hours per week (120 hours) were deemed a reasonable maximum for small workshops. Though large workshops could possibly run continuously, the same measure for capacity utilization was used for all.

2.2. The Causes of Excess Capacity

The perceptions of why so much excess capacity exists differ from the viewpoints of a single shop and of the entire sector. From the shop, the principal causes appear as a lack of demand (26%) and the failure by many machine shops attached to factories to accept outside orders (29%) (See Appendix Table 4; multiple answers were allowed)². This failure is sometimes not necessary. For instance, foremen of some very nicely equipped workshops attached to factories argued that given more men they could cope with outside work especially if it were to make products rather than do miscellaneous repair jobs.³ The shortages of inputs (35%) and of trained technicians (36%) also hindered expansion though these difficulties were often seen as surmountable by the interviewees, whereas the lack of demand was not.

From a sectoral viewpoint the underutilization of capacity appears to result principally from the lack of planning of both investments and demand though the shortage of proper materials and border difficulties with Tanzania and Uganda also affect the industry. On the supply side, an anarchistic series of small investments and the uncontrolled importation of machinery caused the over capitalization of these industries while still leaving important deficiencies (e.g. in high precision and stainless steel casting, and in tool and die making). This over capitalization is manifested by the nearly universal use of only one shift.⁴ On the demand side, the failure to insist on the local manufacture of many spare parts and diverse consumer products (e.g. umbrellas, electric irons, cutlery) and to control strictly

2. Five workshops attached to major enterprises quite/accepted eagerly outside work and a few other such workshops would occasionally accept outside work if the customer had no alternative repair shop to go to .

3. One excellent workshop attached to a factory in Mombasa had extensive gear making equipment but did not seek outside orders even though the factory had been closed for six months.

4. Some small entrepreneurs prefer having one shift. This reduces their managerial difficulties and eliminates any risk from allowing significant control to leave family hands. But still, three quarters of the respondents were willing to start a second shift if a prolonged increase in demand occurred. Furthermore, almost half the respondents anticipated that labour productivity on a second shift would be equal to or better (e.g. less interruptions) than that for the first shift. (see Appendix table 5).

their importation has limited domestic growth. Only the recent foreign exchange crisis and the reversal of the policy allowing easy importation of any spares for factories has forced some to seriously review what can be made in their own workshops.⁵ And though the capacity exists to make certain products, the anticipated inability to get governmental cooperation and protection against well positioned importers dissuades some potential producers from pursuing these possibilities or makes them to be satisfied with small market shares e.g. pumps, ox driven sugar cane crushers (see the section on political/economic and bureaucratic obstacles).

Another reason for the underutilization of capacity particularly in the Kisumu area is the decrease in demand due to border difficulties with Tanzania and internal strife in Uganda.

3. WHAT PREVENTS A SURGE IN DOMESTIC PRODUCTION?

Though output could expand rapidly in these industries, supply, demand, and political/economic reasons are preventing it. These obstacles will be examined below together with policy recommendations.

3.1. Supply Problems

3.1.1. High cost and unavailability of materials and tools.

a). Situation

Seventy one percent (71%) of the respondents vigorously complained about the near impossibility or expensiveness of

5. A huge factory in Nairobi recently assigned a man full-time to assess the possibilities for and to arrange the local manufacture of spares. But even yet, most of the factories visited are not this serious and based on visits to their stock rooms and inquiries about the origins of specific spares, it is clear that very many spares that could be made here are still imported. For example, the repair workshop foreman in a large factory in Mombasa stated that, if management wanted the engineering machine shop could even begin a second shift to produce for inventory many currently imported spares. He said that on net, after purchasing materials, foreign exchange would be saved though the total costs including for local labour on some of these spares might be higher than for the imports. Indeed only recently have many factories begun to use their repair workshops to make spares for stock in anticipation of needs.

obtaining essential materials (e.g. gear quality steels, heat resistant steels, stainless steels, other speciality steels, special grinding stones, coke, certain chemicals). For instance, the machine shop foreman of one large factory stated, "If we could get these quality steels we could produce many more items which are now imported". Elsewhere another foreman stated that given proper steels he could make 15-20% of the spares currently imported by his very large company.

Due to the unavailability of correct materials, unsuitable ones are often substituted but they break or wear quickly. This increases costs and reinforces preferences for imported spares. For instance, Magadi Soda obtained a large gear made of mild steel for one of its cranes; that gear lasted three hours. Later an imported gear was flown in.

When available, specialty steels usually have extremely high prices. The local importers/wholesalers add 100-400% to the c.i.f. Mombasa port price. And yet when small commercial machine shops want to import these steels at much lower prices they usually can not get a license though some multinational corporate subsidiaries can order through their international supplies departments. These high wholesale margins increase the cost of domestically made spares and also lead to a preference for imported spares.

The delays (3-12 months) and frequent rejections of license applications often force the importation of spares that could be made here if the proper materials were available (e.g. gears for cranes and automobile transmissions). Besides, companies often obviate the delays and unpredictability of the government's import licensing by overstocking materials by a weighted average of 57%. (see Appendix 7)⁶. Or, instead of overstocking, some firms

6. For instance, one foundry owner claimed he stocks 18 months supply of coke but he could stock just 6 months supply if licensing were reliable. A large machine shop owner figured he could cut his stocks of materials by 70% if licensing were more predictable.

bring in packages valuing less than 4000 KShs by air freight. This increases transport costs by perhaps half. By either tactic foreign exchange costs are increased.

The structure of import duties often creates negative protection for these industries. The most usual duty on imported spares is 33% and then 15% sales tax if the item is not exempt from sales tax (e.g. spares for agricultural or dairy equipment). Specialty steels attract a higher duty (tool steels 44%, stainless steel rounds and flats 55%) and then on top, the sales tax. Or, worse yet, many classes of spares are exempted from sales taxes while the materials needed to make the spares are not exempted if imported by a commercial machine shop or wholesaler/importer instead of the exempted firm. Two examples illustrate these problems.

- (1) Current tariffs discriminate against reconditioning the stainless steel heat exchangers used by many industries. New imported heat exchangers pay 33% duty and then, on top, sales tax, whereas the seamless stainless steel tubes needed for reconditioning pay 77% duty and then sales tax.
- (2) Brooke Bond can recondition its tea rollers either with finished imported segments or by redressing them using stainless steel automatic welding wire. It now appears to be about KShs. 2,500 cheaper per roller to import finished segments than refurbishing them only because the automatic welding wire pays KSh. 6,000 more in duty and sales tax than the imported segments. However, Brooke Bond still is preferring the later, costlier alternative.

If Brooke Bond reverted to the previous practice of importing segments, it would be cheaper for Brooke Bond, but Kenya would pay about KSh. 4,000 more per roller in foreign exchange. Since about 75 rollers are reconditioned yearly the loss in foreign exchange would be about KSh. 300,000 (see Appendix table 8).

Allegedly corruption among import licensing officials, the Mombasa post's and Nairobi Airport's customs officers and Central Bank employees, who deal with foreign exchange allocations, also causes delays and increased costs which hinder Kenyan industrialization. Complaints about the need to bribe officials dealing with imports were so frequent that the practice must be widespread. As the purchases manager for a large commercial metal engineering workshop stated, "you can't get things out unless you give a backhand. It happens everyday". For instance, one factory flew in a desperately needed spare part but could not get it released from the airport until a top official of the company made a trip to Nairobi and bribed the customs authorities.

b). Recommendations

(1). Foundries and metal engineering workshops are pivotal to the smooth running of all Kenyan Industries. Foundries and metal engineering workshops are qualitatively different than most other industries in that their products are used almost entirely by other industries. Any additional production would mostly be to replace imports. Thus, if foundries and metal engineering workshops were allowed to import their materials easily, they could make domestically many spares that are currently imported. Furthermore, the materials needed by these industries are so elemental that they could not be diverted for improper usage. Hence the government should issue permanent import licenses for the elemental materials used by machine shops and foundries (some metals e.g. pig iron, zinc, tools e.g. certain grinding stones, cutting tips; chemicals e.g. ferrosilicon, resins for molds; coke).⁷ After mere verification of their documents requesting funds to import any of these materials, the companies in these industries should

7. An elemental rule of business management states that any bureaucratic procedure, which--regardless of circumstances -- always produces the same decision, can be eliminated. Applications for import licenses for elemental materials are almost always approved eventually. And the delays are costly. Hence, should the bureaucrats handling such applications be given other duties?

be permitted to go directly to the Central Bank for an allocation of foreign exchange. Thus the government should be liberal in allocating foreign exchange to these industries. This policy of preferential allocation of foreign exchange to foundries and metal engineering workshops would, on net, save foreign exchange by encouraging the domestic manufacture of currently imported spares and industrial equipment. This would loosen - not tighten - the foreign exchange constraints on other industries.

Moreover this policy would fit within a general policy to stimulate deeper industrialization by preferentially allocating foreign exchange to those basic industries such as cement which have strong backward and/or forward linkages. Under such a policy the government should: (1) squeeze selected consumer oriented industries that rely heavily upon imported inputs; and (2) further limit imports of consumer goods. However, since the recommended policy for the foundry and metal engineering industries would save foreign exchange it is also justifiable on that ground alone and without reference to a broader policy of sectoral priorities for foreign exchange allocations.

2. The government should encourage and through selective credit priorities help the foundries and machine shops to obtain finance to establish an import cooperative. It should be controlled by the plants in the industries to guarantee a keen concern for speed and efficiency and to prevent arbitrary changes in materials specifications. The cooperative would import centrally the industries' principal materials and more common spares. It need not import the entire range of materials and spares; it should focus its finances and efforts to achieve large savings in foreign exchange. This cooperative would enable the industry to:

- (i) obtain price and freight discounts for bulk purchases.⁸
- (ii) reduce overall stock levels in the industry by centralizing these wholesale stocks
- (iii) eliminate profit gouging by wholesalers who happen to possess a material in short supply, and
- (iv) eliminate overinvoicing of

8. Most coke comes from Germany because delivery times are more reliable though it costs twice that of Indian coke. A centralized purchaser could order some coke from India and compensate for the unreliability of the delivery dates by shipment from Germany. This would decrease the average cost of coke. (Note: some use Indian coke without complaint, others complain both about the unreliability of its delivery and its high sulphur content. Before ordering from India the quality of that coke would need to be guaranteed.)

these materials by wholesalers and by firms ordering directly from their mother companies' purchasing departments; and (v) rapidly identify when the Kenyan demand for an item was sufficient to justify its production here.

(3). The proposed import cooperative could also specialize in importing used gasoline and diesel motors for sale to transporters and machine shops which renovate motors. This would create employment and save much foreign exchange since currently only new motors are allowed to be imported.

(4). The combined tariffs and sales taxes for metals should be set lower than those for imported finished spares. This would encourage the local production of spares.

(5). The government should initiate a major and ongoing probe of corruption by import licensing, customs and Central Bank employees and officers.

3.1.2. Poor Quality Control in Foundries and metal Engineering Workshops

a. Situation

Only one foundry had facilities to test the composition of sample casts. One other foundry was installing laboratory equipment. None had spectrometers to read the content of carbon, sulphur and other elements in the hot melt and thus be able immediately to add measured amounts of alloys to improve the quality of the metal.⁹ Hence casts are frequently too hard,

9. For instance, the Kikuyu steel rolling mills has a huge and idle machine that cost K. Shs. 1,500,000 and could machine many of the brake drums used on cars and trucks in Kenya. But because of poor quality control of the drum castings and because of anticipated resistance by the multinational corporations involved in vehicle assembly and spare parts supplies, all the brake drums used in Kenya are imported.

brittle, or soft or have bubbles and so cannot be used. Unfortunately, this is often discovered only after an attempt is made to machine them. Many industries cannot risk such costly delays and so prefer to import spares by air freight.

b) Recommendations:

(1) This problem of inadequate quality controls in the foundries is urgent. It stimulates imports and retards the growth of metal engineering. Hence, the government should: (i) declare that investments to improve the laboratory equipment in foundries is a selective credit priority in order to make loans readily available for that purpose, and (ii) insist that the Bureau of Standards energetically scrutinize the quality control procedures used by foundries.

(2) Last May or so the Railway's workshops which include the only Kenyan foundry with scientific quality control, began to refuse to do most commercial jobs even though it has much excess capacity. This decision was taken to stop corruption and the preferential treatment given to commercial work to the detriment of jobs for railways. Through collusion, jobs were underpriced e.g. a forging die and thousands of mattocks might be ordered but billed minimally or a large sugar roller made while payment was for a small one. But that decision to stop commercial work may also increase dependence upon imports.¹⁰ The workshops' manager does state that he refuses only jobs which can be done elsewhere in Kenya, but in practice that distinction may be difficult to apply. Moreover if corruption was the problem a frontal assault is needed rather than the bureaucratically easy solution of stopping commercial work. Also the Railways might consider eliminating the nuisance of low value - small volume repair jobs, but accept

10. For example, the Railway workshop has occasionally cast cylinder linings for internal combustion engines. Instead of going fully into this and properly controlling quality to replace imported cylinder linings, now the workshops does not cast them. So the country is 100% import dependent for these.

bigger orders. Big jobs are easier to supervise and to guard against corruption.

3.1.3. Need for selective investments to improve the scope of metal casting and engineering.

a. Situation

Kenyan foundries have only a limited capacity for high precision casting. They have resin and sand and shell-mould casting and some iron moulds for mass production of non-ferrous castings.¹¹ There is only one hot metal injection mold machine in the country and no foundry does investment and centrifugal casting. The Railway's workshop will soon receive a small, 1.2 tonne, induction furnace able to make stainless and other steels if the proper laboratory equipment is obtained.

The metal engineering industry needs to considerably strengthen its capacity to make sophisticated tools for industrial use. For instance, heat treatment equipment is often inadequate and/or improperly controlled and monitored. This detracts from the industry's ability to make items such as gears which must sustain strong stresses. Also the industry needs to upgrade its capacity to make dies, especially for the plastics, rubber, and glass industries. Many tools and dies are now imported.

11. The Ministry of Industry is collaborating with a Yugoslav consulting firm, Gostol, to assess the economics of establishing a high precision foundry in Kenya. In various conversations I have suggested that perhaps expanding and improving the E.A. Foundry or the Railway's Foundry would be a quicker and cheaper alternative to implement than a separate new plant. Though it is anticipated that improvement via expansion is likely to be technically possible some view it skeptically due to what they perceive as negative attitudes by management and the unlikelihood that the government would exert strong influences to remedy those perceived administrative inefficiencies. But the trade-off might be between: (1) using domestic resources to rectify whatever administrative deficiencies exist; and, (2) using more and very scarce foreign exchange to sidestep those problems. This prejudice in favour of separate new facilities and against using and improving existing capacity should be overcome. All options should be evaluated! If Gostol does not, then the Ministry of Industry should evaluate this option too.

d). Recommendations

(1) To encourage the few existing Kenyan tool and die makers to increase their capabilities substantially, such investments should be designated a selective credit priority. The government should stringently control the importation of tools and dies and insist on their domestic manufacture whenever possible.¹² Also some experienced expatriate tool and die makers (who speak English or Kiswahili so that they can train Kenyans) should be allowed into the country to strengthen this capacity. In fact, there are immediate possibilities to export tools for aluminium spinning and to make locally many of the currently imported dies if more skilled tool and die makers were available.

(2) The Railways should be requested to assess quickly the economics of installing a very large forge in their workshops. The railways uses many large forged items (e.g. wagon axles, axle frames and 5000-6000 metal rail tyres per year) and there are other potential customers especially if the vehicle assembly industry were rationalized.

3.1.4. Railways Workshop - A Bound Giant

The railways workshop is grossly underutilized and, for example ^{could} produce most of the currently imported sugar crusher rollers.

12. A manufacturer of rubber boots admitted that he refused to use a locally made aluminium die because of very small and technically insignificant differences in the ripples around the neel when compared to the original worn out die. He said the consumers want to continue to receive identical products. So he ordered an imported die.

Situation - Underutilized Capacity.

The railways' workshop with some 2600 employees is the largest workshop in the country, yet its facilities are grossly underutilized. It has about 9% of the centre lathes in the country and 68% of the turret lathes which are designed specifically for mass producing items. The tool and machine rooms have 233 employees, run one-shift and have a capacity utilization rate of 28%. According to the workshops' manager, the tool and machine shops could produce two-thirds more with the same men, same hours, and same machines if they had additional jobs to do and had better supervision and production planning. For instance, he agreed that the Railways could machine 4000 centrifugal water pumps (all currently imported) for near zero marginal costs.

The foundry has 127 employees and a capacity utilization rate of 25%. The blacksmiths workshop has 60 employees and A.K. Mitra of UNIDO/ estimated that it uses a mere 5-10% of its large capacity.¹³

There is no technical reason why these shops could not run up to three shifts. Also the workshops' manager and his assistant both claimed that with proper production planning the workshops could make commercial products without interfering with service to the Railways. Unfortunately the Railways Act, by omission, does not allow the workshops to engage in commercial production unless specifically directed to do so by the government.

13. A.K. Mitra, "Report of the Field Mission in Kenya, Uganda, Tanzania, Zambia, and Mauritius for upgrading existing foundry, forging, heat treatment, machine shop, tool room and identification of the manufacture of selected agricultural machinery, capital goods, and spare parts", U.N. Economic Commission for Africa, Joint ECA/UNIDO Division, Addis Ababa, July, 1980.

Recommendation:

The government should immediately direct the Railways to identify needed products such as pumps and to begin commercial production. A directive could be quick and would avoid legal difficulties. Distribution, sales, spare parts supplies, and servicing should be set up as a separate organization or perhaps sub-contracted temporarily to an existing distributor (e.g. of pumps). Once the Railways commits itself to making a particular item the government should monitor and limit permits to import competing items. By the time the Railways begins production, most of the stocks of competing items should have been sold. Afterwards their importation should be stopped.

Later, the government could widen the scope of the Railway's Act to explicitly allow the workshops to do commercial work.

Situation.- Sugar crusher rollers.

The Railways workshops' production of sugar crusher-rollers deserves special mention. The workshops have the capacity to cast and shape all but the largest sugar crusher-rollers, but a major complaint by Railway's customers for sugar rollers is slowness of delivery. However, millions of shillings are spent on imported sugar crusher-rollers!¹⁴

(1). Since these rollers have standard sizes, the Railways should carry a ready inventory of rough castings and machined rollers for quick delivery to customers.¹⁵ To assist

14. For instance, the E.A. Sugar Factory imports nine out of the twelve or so sugar crusher-rollers it uses yearly. The c.i.f. Mombasa price was about KShs. 50,000.00 each before duties.

15. The Railways' only boring machine which is large enough to handle these rollers appears to be the bottleneck for speedier delivery. It should be run two or three shifts when necessary especially since the alternative is to waste foreign exchange on imported sugar rollers. The acting workshops' manager said that running the boring machine for multiple shifts could eliminate that bottleneck.

the Railways, the sugar factories should be required to submit a yearly plan of their anticipated requirements. With these measures a ban should be placed on imported sugar rollers that can be made here.

(2) As with many items produced by the Railways, sugar rollers are sold to intermediaries. These middlemen merely increase the price and re-sell the rollers to the sugar companies. The Railways should obtain the full profit by insisting on dealing directly with the sugar companies! In fact, the Railways' dubious practice of selling many products through intermediaries should be severely limited.¹⁶

3.2. Demand Problems

3.2.1. Too many Makes and Models.

a. Situation

Too many makes and models of trucks, cars, tractors, pumps, stoves, and other machinery and equipment are imported or assembled in Kenya. For example, India with perhaps 60 times Kenya's population produces only two makes of cars in three models, but Kenya actually assembles more than 90 models of trucks and buses and has at least 60 makes of sedan cars in about 200 models on the streets. Kenya also imports more than 260 models of water pumps and obtains tractors from at least 15 countries.¹⁷ The existence of so many models inhibits the local manufacture of components and spares, increases inventory costs and encumbers labour training.

16. Examples were cited to the author where government agencies (e.g. Post Office) would order thousands of machined castings through a middleman who would merely order these from the Railways and resell them to the government at a large profit. To stop this the Railways should be required to know the ultimate user of its products. Except for small amounts, if the user is the government itself, then the order should be placed by that governmental body, not by a middleman.

17. G. Begumisa found that 33 firms sold 4,582 pumps in 116 makes and 263 models during 1980. "The worst redundant differentiation is concentrated around low capacity water pumps." This is exactly the range of pumps that Kenya should and could begin quickly to make. This abundance of models is indisputably beyond mere technical requirements and could be decreased radically. Gregory Begumisa, Machine Goods Spareparts Industries. A case Study of the Water Pumps Industry in Kenya, University of Nairobi, Unpublished M.A. Research Paper, 1982, pp. 63,64, and 101.

So few spares and original equipment components are needed for the local repair or assembly of any particular model that the costs for their local production would be very high. This is especially true if expensive metal stamping dies are required. Such short production runs and high costs stymie the local manufacture of most spares and original equipment components. In fact, so long as the chaos of so many models is allowed, Kenya's foundries and metal engineering industries will be crippled.

The stocks of spares parts are immense yet insufficient. A limitation in models would enable a more complete range of spares to be stocked and thus lessen prolonged breakdowns of equipment due to an unavailability of spares.

Even the training of mechanics and the maintenance of our vehicles, motors, and pumps are handicapped by the multitude of makes and models. As some countries have discovered, mechanics would learn better and quicker with, say, 2 models of cars, 7-8 models of trucks and fewer models of motors and pumps.

The Kenyan foundries and metal engineering industries have the capacity to begin rapidly to make spare parts or even entire products if policies were initiated to limit seriously the number of makes and models. But without the government's cooperation and prohibitive tariffs against imports, corporations prefer not to hazard their money in such small and sliced-up markets. Consider the following examples where, if the models were limited and imports restricted, Kenya could produce for much of its own needs:

- (1) Kenya could produce all its needs for small or medium sized single stage centrifugal water pumps at substantial savings of foreign exchange. G. Begumisa costed the production of 1500 pumps (20 meter head and 50m³/hr capacity) at less than half the cost including freight at Mombasa of imports! And only 4.5% of the total cost would be for imported finished components (i.e. just the bearings).¹³

Chemelil Sugar Factory has also made a few large pumps cheaper than the imported ones even on a one-off basis. Probably half the 10,000 pumps that Kenya now imports yearly could be made here just by using a small portion of the foundries and metal engineering industries' current excess capacity.

The Railway's workshop also occasionally makes large water pumps for its own use. So, there is no question that the necessary skills do exist in Kenya. Kenya spent KShs 21,000,000 on imported pumps for use in Kenya in 1980.

13. G. Begumisa, Machine Goods and Spareparts Industries: A Case Study of the Water Pumps Industry in Kenya. University of Nairobi, M.A. Research Paper, Department of Economics, 1982. pp. 63, 64 and 101.

(2) Kenya could cast, machine, assemble, and distribute its own small (less than 10 horsepower) electrical motors. By using the prices which the Railways charges commercial customers for casting and machining and adding other costs including those for assembly and distribution by a separate corporation, Josphert Konzolo estimated that a Kenyan-made 3 horsepower a.c. electrical motor could retail for KShs. 3200.00 or about equal to average retail price for which imported motors are currently being sold here. But since the Railways workshops are so underutilized, the casting and machining could be done with the same men, same hours and same machinery as the workshops now use. Thus the opportunity costs to the nation would be about K.Shs. 1915.00 which is less than the cheapest 3 horsepower motor being sold here. The foreign exchange cost would be only KShs. 835.00 Konzolo concludes that, "These motors can be manufactured in this country without the need for any form of reliance on multinational companies and at low foreign exchange costs"¹⁹ Of course, a competent engineer would need to strictly supervise the assembly and quality control.

(3) Kenya also has the proper equipment to manufacture gas and electric stoves and refrigerator boxes. Nevertheless, all the stoves except the small tabletop version and about half the refrigerators

19. Josphert Konzolo, Machine Goods and Spare Parts Industries: A Case Study of the Electrical Motor/Generator Rewinding Industry, Economics Department, University of Nairobi, Unpublished M.A. Research Paper, 1982, p. 64.

are imported as semi-or completely - knocked - down kits and subjected to "screw driver" assembly. Refrigerator boxes need metal cutting and bending, but stoves need metal stamping. The Railways' workshops have two usually idle 150-200 tonne sheet metal stamping presses (the large one can stamp 5 ft square sheets). The enameling for the stoves could be done in Kaluwork's very large continuous process oven. If organized this way, then any large sheets which Kaluworks is unable to stamp could be done by the Railways workshop and then transported to Mombasa for enameling.²⁰ Many companies have the capacity to make the small metal and plastic parts for stoves.

- (4) | Virtually all the required plant and equipment now exists in Kenya to make the major parts for small, one and two cylinder compressors and diesel or gasoline internal combustion engines. Kenya would only need to import the valves, bearings, and some small components plus the metal ingots for the castings. The E.A. Foundries has brand new continuous process sand selection and no - bake mold making equipment that is exactly what is required to cast pistons, heads, blocks, and cam shafts for internal combustion engines and compressors. This equipment at E.A. Foundries is unscratched and has been idle for two years! The Railways' Blacksmith shop has the proper equipment

20. When these possibilities were mentioned to the expatriate manager of a large assembler of (completely knocked down) refrigerators and stoves he argued that the local enameling was not up to international standards and "we must maintain international standards". He assembles under license agreements with international firms but these stoves and refrigerators are sold only on the domestic markets. The need for both the "standards" and the licensing agreements are dubious.

to forge connecting rods and crankshafts. The pattern dies for the castings and forgings would have to be imported. Several machine shops have the boring machines and surface grinders to machine the rough castings and forgings though better heat treatment equipment might be needed.

A separate corporation should be established to subcontract out the local manufacture of parts, arrange for necessary imports, assemble the motors and compressors and arrange for their distribution and sale. Close supervision by competent engineers would be necessary to maintain quality during the manufacture and assembly.

b)

Recommendations

(1) To industrialize, Kenya must limit the number of models of transport vehicles! There is no escape from that conclusion. Already, 35% of Kenya's imported spares are for motor vehicles and tractors. And without fewer models increased local production of these spares and components is unlikely. So, the sooner this issue is confronted the better for the nation.

To tackle this task the government should decide to allow only one model in each size class of commercial vehicle and tractor and at most two models (but one make) of sedan car.²¹ Then

21. Kenya imports tractors from at least 15 countries "with the result that hardly 40-50% are operational." S.S. Gill, Development of Agricultural Machinery in Kenya, Industrial Survey and Promotion Centre, Kenya Ministry of Industry, 29 July 1980, p. 7.

competitors would bid to make each vehicle. The bids would be compared for price, suitability of the vehicle, commitment to increasing domestic content over time, speed of Kenyanization, etc. Once a bid were accepted the government would have to enforce severe penalties for non-obedience as the vehicle distributors and assemblers have strong financial incentives to procrastinate and thwart the local manufacture of parts.²²

(2) For domestically producible items such as the foregoing examples, the government should apply three measures:

- (i) designate one or at most two producers/assemblers
- (ii) drastically limit the number of available models;
- and (iii) restrict imports.

The designated producers (s)/assembler(s) should be instructed to subcontract the production of components whenever possible in order to use the existing capacity better. The Kenyan price controller and Bureau of Standards should also be provided the staff and legal authority to intervene quickly and effectively in disputes between a producer/assembler and any subcontractor. This is especially necessary when a subcontractor is the only firm possessing the ability to make a certain component.

22. Locally made products often cost more than the deletion allowance (refund) given by the supplier for an item not imported in the completely knocked down (CKD) kit. But these allowances are usually less than the production costs in the mother country. Hence it is very difficult for the local vehicle component to ever be cheaper than the imported one. For instance, the production manager for a large Kenyan vehicle assembly plant figured that the deletion allowance for wire harnesses is about 70% of the production cost in the mother country.

Combined, the above three measures would greatly lower market penetration costs, enable economies of scale, and overcome consumers' aversion to domestically made products. Without this, a potential domestic producer, who could efficiently produce an item if he captured most of its Kenyan market, would often refrain from investing. This leaves Kenya in a low level production trap: costs would be high because of little production; there would be little production because costs would be high. For instance, as we have shown, Kenya could cheaply produce single stage centrifugal water pumps, but she does not. Why not? All the large workshops possessing an adequate foundry and machine shop to produce pumps were asked this question. They cited as reasons: the low number of pumps that they could sell given continued imports (100 was an often cited number), the consequently high production costs; and the large market penetration costs for sales, advertising, gaining consumer confidence, and establishing a pump repair service. They also anticipated an inability to gain governmental protection and cooperation. So, each concluded that it was not worth the time and effort. But it is not a mere 100 pumps, it is at least 4000 yearly and most costs to penetrate the market and gain consumer acceptance could be eliminated through governmental protection against similar imports. These large shops often cited other products that they could make (e.g. internal combustion engines, cabins and jibs for cranes, automobile and transport vehicle components) or actually were making in small quantities (e.g. pumps, ox driven sugar crushers, and even 50-70 foot long steel fishing trawlers). Again their frustration was the lack of governmental support and protection. Whence comes this recommendation.

But that is not to ignore its difficulties. A private monopoly may well attempt to afflict consumers with high prices and shoddy products. Hence the need to honestly regulate prices and quality or to allow a parastatal to produce the item and then confront the problems of efficiency. But, we argue, to produce these items and to tackle the consequent problems is better than not producing for fear of them.

Incidentally, if Kenya did begin to produce pumps, electrical motors and small internal combustion engines, she would have the ability to launch a massive campaign for irrigation at a low cost in foreign exchange. Of course, that irrigation could begin faster and at less cost where people already live and the infrastructure exists.

(3) The government should also commission a study by engineers and economists to identify electrical and mechanical products which if the number of models were limited, could be produced partially or wholly in Kenya. The study should not cover transport vehicles as that case is obvious.

3.2.2. Kenyan Acceptance of British Patent Law

a) Situation

According to Kenyan law only patents registered in England are accepted here and, in fact, Kenya does not have its own patenting procedure. This subservience to England's patent law makes Kenya pay royalties or licensing fees to produce patented items even when the designs are simple and sufficient technical capacity exists to produce these items here without dependence upon foreign "know how".

Indeed Kenya benefits little and pays much for its adherence to this patent system. In a study of multinational corporations in Kenya, Kaplinsky found that:

"For all the firms in the sample the parents obtain the property rights over new technologies generated by the Kenyan subsidiaries and take responsibility for the registration of patents and brand names".²³

b) Recommendations

(1) Kenya should modify its law to exclude patent rights for products of and processes in industries which Kenya would like to develop (e.g. motors, agricultural equipment, electrical).

23. Raphael Kaplinsky, "Technical change and the multinational corporation: some British Multinationals in Kenya," in Readings on Multinational Corporations in Kenya, (Oxford University Press, 1978). P. 239.

goods).²⁴ This would be a nationalist - not a radical measure. For instance, when Italy wanted to develop its chemical industry it exempted chemicals from patent protection and later, after the industry was large, reimposed patent coverage.

Also the production of spare parts for use by Kenyan industries should be completely exempted from patent protection. This is necessary because some firms feel morally obliged to purchase imported patented spares even though these could be produced in their own workshops. For instance, the machine shop foreman of one large manufacturer figured that his shop could produce one-third more spares than currently if patent restrictions did not apply. He claimed that his company conscientiously avoided violating patent rights. Admittedly this case was atypical; most manufacturers ignore patent rights when making spares for their machinery.

(2) Kenya law should also oblige the patent holder to locally produce satisfactory quantities of patented items or to lose his patent protection after three years.²⁵

24. The Andean group excludes drugs, beverages and foods; India excludes drugs, other chemicals and foods. Mexico excludes alloys, chemicals, fertilizers, pesticides, herbicides, fungicides and their manufacturing processes, and computer programs. See UNCTAD, "Annual Report 1981 on Legislative and other developments in developed and developing countries in the control of restrictive business practices: Review of recent trends in patents in developing countries". 24/Nov/81, TD/B/C.6/AC.5/3.

25. For instance, Atlas Copco sells a brass cylinder and piston pump with a patented ball bearing valve. The very sturdy upper wooden drive is entirely made in Kenya. The cylinder and piston pump is imported and accounts for 60% of the total value. But the pump is simple and could without doubt be made here. With a domestic production requirement to sustain patent rights someone could make these here if Atlas Copco refused.

3.2.3 Overreliance on Licensing Agreements

a) Situation

Some items (e.g. fire extinguishers, pumps, stoves, safes) are assembled or partially manufactured here under license with foreign firms even though adequate local capacity exists to make nearly all their components and then to assemble them. Often capable, potential producers of an item are forced into a licensing agreement just to obtain a foreign label needed to penetrate the local market due to purchasers' biases favoring foreign labels.

The excessive use of licensing agreements leads to (i) remittals abroad of licensing fees, (ii) more than necessary imported components, and, (iii) illegal transfer pricing of purchased components which are required to be obtained from the licensor. Consider three examples:

- (1) A local manufacturer showed the author many large safes (40"x27"x27" outside dimensions) made under an international licensing agreement. Only the door and its built-in lock were imported. The manager states that, of course, they could make the door too, but the licensor insists on supplying it in exchange for allowing use of its brand name. The manager argued that the brand name was necessary to gain acceptance of the product in the local market. Besides steel sheets only the lock really needs to be imported and it could be purchased from many suppliers in Germany, Switzerland, Japan, etc.
- (2) A domestic assembler/manufacturer of fire extinguishers said that most of the imported components in it could be produced here though nearly all were imported from the licensor. Furthermore, only about one-third of these simple devices are even assembled here; the rest are imported already made. He also

stated he pays more for these imported components than locally produced ones would cost -- "since we don't pay a licensing fee"--i.e.. in lieu of the licensing fee. Incidentally the licensor thus avoids paying Kenyan taxes on licensing fees.

- (3) The local manager of an Indian multinational corporation recently licensed to assemble completely - knocked - down (CKD) imported pumps stated that his firm "hoped" to eventually use 20% domestically made components. Whereas, for about half the pumps that Kenya uses, the only directly imported components should be the bearings costing a fraction of the pumps' value.²⁶

b) Recommendations

- (1) The government should vigorously review the terms of many licensing agreements and their usefulness. Payments for labels - except perhaps if the item is being exported - should stop. Also contracts should provide for (i) the complete transfer of designs for use at least in the Kenyan market; and, (ii) the elimination of the licensing fee after a stipulated number of years with a legal maximum of five years.

26. Begumisa, op.cit., pp. 63, 64 and 101.

(2) Kenya should not allow imports that can be made locally. If so, then local labels would suffice for the domestic market. However, the price controller and the Bureau of Standards must prevent exorbitant prices and poor quality. Take the above case of fire extinguishers, Kenya should not allow this abuse! The solution is simple: designate one or two domestic producers; stop the imports; use as many domestically produced components as possible; use a local label and pay no licensing fee or inflated prices for inputs.

3.3. Political/Economic and Bureaucratic Obstacles To A Boom In Domestic Production

6. Strong opposition and some support would arise if measures to limit the number of makes and models, restrict imports; and domestically produce various items and components are seriously supported by elements inside the government. A strong pressure group would oppose the adoption of the policies, or attempt delays and detrimental compromises. Finally, an often corrupt and sometimes incompetent bureaucracy might undermine the policies' implementation by still allowing imports or by failing to properly enforce price and quality controls.

In the past, the Kenyan strategy for agricultural exports together with shallow import substitution created a political dilemma. That very strategy slowed the growth of a strata of entrepreneurs with strong financial interests in the country's deeper industrialization. Meanwhile numerous people arose whose incomes and lifestyles depended upon continued imports of finished goods and components for assembly (e.g., transport vehicles, electrical apparatus, pumps, various machinery, stoves). For instance, there are 27 distributors of imported pumps and Associated Vehicle Assemblers assembles vehicles for 21 distributors, Leyland for 4, and General Motors for 20. These importer/distributors and local assemblers of foreign products do not want to be displaced or have their profits squeezed by protection to domestic producers of similar products, components or spares. Also the local subsidiaries of multinational corporations

prefer not to invest to make items here if the mother company has sufficient capacity elsewhere.²⁷ Thus the very way Kenya approached import substitution ensured the growth of a strong group which would oppose or stall deeper import substitution.

These importers/distributors and subsidiaries of multinational companies also cultivate economic and political alliances with influential Kenyans. These then sit on the Boards of Directors, become shareholders or develop other lucrative relations with these companies.²⁸ Thus some policy makers are seriously compromised with groups having financial interests contrary to the fast industrialization of Kenya. For instance, many vehicle distributors are associated with powerful politicians. It is also widely alleged that small importer/distributors often subvert policy by bribing clerks and lower echelon officials in the ministries and Central Bank to permit unnecessary imports. In addition, external lending and aid agencies sometimes even explicitly oppose

27. For instance, the Kenyan vehicle assembly industry has been slow to increase domestic content and, as one managing director admitted, "undynamic" in searching for and stimulating the domestic manufacture of original equipment components. Artificial standards are sometimes used as an excuse to refuse to produce domestically. The general manager of a local vehicle assembly plant, himself, made this point and cited the case where locally made leaf springs were sent for "testing" by the mother company's supplier. Predictably, they failed the "test". See the forthcoming (1983), University of Nairobi, Economics Department, M.A. Research Paper by Z.N. Murage on the Kenyan Vehicle Assembly Industry.

28. Nicola Swainson, The Development of Corporate Capitalism in Kenya, 1918-77, (University of California Press, 1980), Ch.5 and 6. Also see Raphie Kaplinsky, "Capitalist Accumulation in the Periphery : Kenya", in Martin Fransman (ed), Industry and Accumulation in Africa, (Heinemann, 1982). See especially the lists of major Kenyan African capitalists and their ownings and directorships on pp. 204-6.

deeper import substitution by Kenya.²⁹ This coalition of interests and politicians, abetted by corruptible bureaucrats jeopardizes Kenya's ability to embark on the strong nationalist policy needed for rapid industrialization to be able to maintain 30,000,000 Kenyans by the turn of the century.

Potentially arrayed against this coalition are various nationalist elements inside the government, the commercial metal engineering workshops and foundries, certain labor unions, and some enlightened industrialists who identify with the country's long term economic prospects. But this is a dispersed and only potential alliance. Furthermore, most entrepreneurs owning commercial foundries and metal engineering workshops are small. And -- as revealed by the surveys -- though the few larger ones may have sufficient connections to overcome difficulties with an occasional import license, they do not feel that alone they have enough political clout to win in a clash against importers.

But Kenya suffers a foreign exchange crisis. The continued imports of luxurious consumer goods (e.g. wines and liquors, passenger cars, fancy clothing, television sets) and the unrationed use of gasoline by the upper and middle income strata have already caused factories to lack inputs and lay off men. Luxuries for layoffs -- a volatile exchange? Thus the imperatives at this juncture bolster those insisting on rapidly deepening Kenya's industrial base. So, with no more avenues for shallow import-substitution and meagre prospects for increased exports, many in the government are looking for a new strategy to create jobs and ward off an economic breakdown and political instability.

29. The World Bank argued " .. it is most desirable for Kenya to avoid going through the second stage of import substitution (protection of intermediate goods) with the additional taxation of the rest of the economy that this brings in train". (p. 40).. Kenya Into the Second Decade, World Bank Country Economic Report (John Hopkins University Press, 1975.

To provide jobs in Kenya, a significant policy would be to limit the number of makes and models -- especially of transport vehicles -- and to insist on the domestic manufacture of components and entire products whenever large amounts of foreign exchange would be saved. But a sharp political conflict would ensue especially if the government adopted the suggested proposal for bidding to make a limited number of models of vehicles and then stopped almost all imports including Mercedes cars. Confronted with a serious stance by the government, the assemblers and distributors would definitely attempt to persuade the government to increase the number of acceptable models to, say, two or three for each size category of trucks and buses and to four to six sedan cars. This would ensure each company some share of the market. But, it would deprive the country of big savings from economies of scale and ruin the chance to streamline the production and administration of this industry which is mostly government owned. To properly defend Kenya's interests the government would need to firmly resist this tactic of the assemblers and distributors!

4. Conclusions

Many people with high income or secure well paying jobs or import businesses may be better off if Kenya continues to import a wide variety of goods, even those that could be made here. But it would be in the interests of most Kenyans to work and make useful products whether or not they do it as efficiently as the developed industrial countries. Too often the arguments for obeying "comparative advantages" are but apologies for continued dependence and failure to industrialize. If Kenya has sufficient underutilized equipment and skilled and unskilled labor to make certain products and by doing so can save much foreign exchange, it should do it and put Kenyans to work!

Indeed the equipment and skills do exist in Kenya to make very many items that are imported currently. A boom in the foundries and engineering industries could be created by: rationalizing the number of models of various products, eliminating imports of domestically producible items, lowering the inflated prices that wholesalers charge for speciality steels, reducing the scope and cost of licensing agreements, restricting patent protection, and discriminatorily favoring the allocation of foreign exchange to basic and engineering industries.

This would create thousands of jobs through backward and forward linkages (e.g.. for plastics components; assembly of the products; and in agriculture) and would decrease import dependence. The technical capacity exists to do this. Does the political capacity exist? Can the resistances be overcome? Is a vigorous nationalist policy for integrated economic development possible? A serious test of this is whether the Kenyan government can rationalize the transport vehicle industry.

The other Appendices are Available
upon request from IDS.

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Appendix

Suggestions Needing Additional Evaluation

1. Machine Tools Industry

The government is currently evaluating establishing a machine tools factory, yet, most of the equipment required to make parts for the machine tools is already in the Railways' workshops and is grossly underutilized. There is also considerable extra space inside the building housing the tool and machine shops. Indeed the workshops' management agreed that with proper production planning, better supervision, and more employees for a partial second shift, the Railways' workshops could become the basis for the machine tools industry in Kenya. The imported and locally made components could be assembled in a separate building, perhaps located on the railways' premises so as to minimize transport costs.

For the Railways' workshop to render the precision required some artisans would need special training and a few machines purchased. Supervisors would need ample authority to reward or discipline artisans for good or shoddy work. Quality control would have to be strict. The organizational questions would have to be confronted boldly and firmly.

By utilizing the huge Railways workshop as the basis for the machine tools industry in Kenya, the country would save much foreign exchange and domestic expenditure by not purchasing redundant machinery to make parts and not building redundant factory space to house yet another metal engineering workshop. In fact, the government has been considering establishing a domestic machine tools industry during at least the last five years. But the project's low profitability has hindered efforts to raise finances for it. If it were possible to partially use existing capacities then the domestic financial costs, foreign exchange requirements, and the per-unit overhead costs would be lowered, and profitability increased. If labour productivity and quality could be sustained under this set-up, then it might improve the project and speed its implementation. This option should be evaluated further --- but quickly.

Appendix

2. On-the-job training of machinists

The small workshops are more dependent upon expatriate artisans than larger workshops. The small entrepreneurs often express reluctance to train Kenyans to become technicians. They fear losing their investment in that training if the employee suddenly leaves. Some even scheme to provide so limited training that the employee will not be able to market his skills elsewhere. With this fear of "poaching" and occasionally a very negative attitude toward African workers, a small workshop owner may prefer to obtain or retain an expatriate or if he does train a Kenyan it may be in a haphazard manner. As one owner said, "if we train they are 'poached' ... If this could be avoided then we would need very few expatriates but because of this 'poaching' we have no apprentices."

This is a problem of attitudes and incentives. Usually these small entrepreneurs have the skills and capability to train artisans on-the-job but often they do not train. The government should commission a small quick study to identify better how to stimulate these small machine shops to train machinists.

3. Technical training

When in Mombasa I visited the Mombasa Technical Training Institute, and the Mombasa Polytechnic. Until just before the time I arrived the Polytechnic had been operating from 7.00 a.m. - 1.00 p.m. This suggested to me the possibility of running such technical training facilities on two-shifts.

Appendix

Both the Chairmen of the Mechanical and Civil Engineering Departments agreed that by hiring additional staff and building small offices for them, the number of students could double without needing more classrooms or equipment. The Technical Institute could also expand - though not double - its student body. The Chairmen claimed that the extra graduates could easily find employment. The extra students would need to be housed with relatives or to rent accommodation in the city. This would be a change from current policy for the Polytechnic. By starting second shifts and using local housing, technical education in Kenya could be rapidly expanded at very low capital costs. If vigorously pursued, a second shift could possibly begin within 12 months after the policy and financial decisions were made by the government. This contrasts with the long delays and large expense of expanding entire educational complexes or building new ones. This cheaper, faster option merits serious consideration.