DIES, MOULDS, AND PATTERNS: COSTLY DEVICES NEEDED FOR DEEPENING IMPORT SUBSTITUTION

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ABSTRACT

Many developing countries now assemble most of the final products they use, but they still need to import most inputs. To escape this dependence, developing countries are focusing on ways to make more intermediate inputs domestically. But very expensive dies, moulds and castings patterns are required to make most rubber, glass, plastic or metalic components used as intermediate inputs. On the other hand, the machinery and equipment used together with the dies, moulds and patterns can make a wide range to products but are often underutilized. So, often only the dies, moulds, or patterns are needed to begin the production of various components. But, to protect their financial interests, multinational corporations (MNCs) often will not allow a developing country to use these key pieces of equipment without a comprehensive transfer of technology agreement. Hence, often either the developing countries remain import dependent for the components or cannot compete internationally due to their small domestic markets and the high cost of the dies, moulds and patterns, and hence high per-unit production costs. So, the costs for DMPs must be lowered to economically enable LDCs to deepen import substitution for currently imported intermediate components. These costs might be lowered by: (1) better negotiation with MNCs; (2) joint South-South purchase of DMPs; (3) aid supported guarantees to encourage firms to lend DMPs to LDCs; (4) decreasing the number of makes, models, and designs for products; and, (5) improving and subsidizing the facilities to make DMPs locally. However, to implement these programmes, third world governments would need to perceive their objectives clearly and firmly confront the resistance from internal and external vested interests which benefit from the LDCs' continuing import dependence.

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ABBREVIATION: DMPs = Dies, Moulds and Patterns

I. INTRODUCTION

Many developing countries now assemble most of the final products they use, but they still need to import most inputs. To escape this dependence, developing countries are focusing on ways to make more intermediate inputs domestically. But very expensive dies, moulds and castings patterns are required to make most rubber, glass, plastic or metalic components used as intermediate inputs. On the other hand, the machinery and equipment used together with the dies, moulds and patterns can make a wide range of products but are often underutilized. Moreover, to protect their financial interests, multinational corporations (MNCs) often will not allow a developing country to use these key pieces of equipment without a comprehensive transfer of technology agreement. Hence, often either the developing countries remain import dependent for the components or cannot compete internationally due to their small domestic markets and the high cost of the dies, moulds and patterns, and hence high per-unit production costs. After examining aspects of the above argument, this article considers five proposals to cut these costs substantially.

Though dies, moulds and patterns are required to enable a country to deepen import substitution industrialization by producing components locally, no literature yet exists focusing on their economically strategic role. A big literature exists on their engineering aspects but articles on the capital goods industry and import substitution almost never even mention dies, moulds and patterns and certainly do not focus upon their importance for industrial development nor upon the conditions for their availability.[1] Perhaps because this topic interfaces economics and engineering it has not drawn the attention of economists.

II. VARIOUS USES FOR DIES, MOULDS AND PATTERNS

Industry uses thousands of expensive dies, moulds

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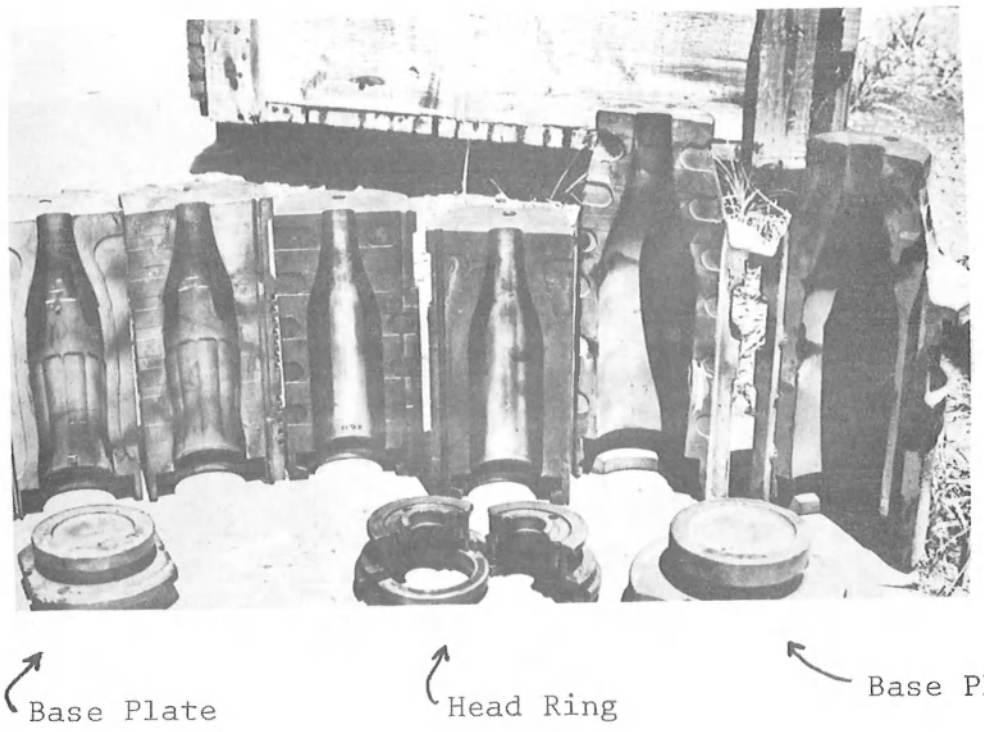
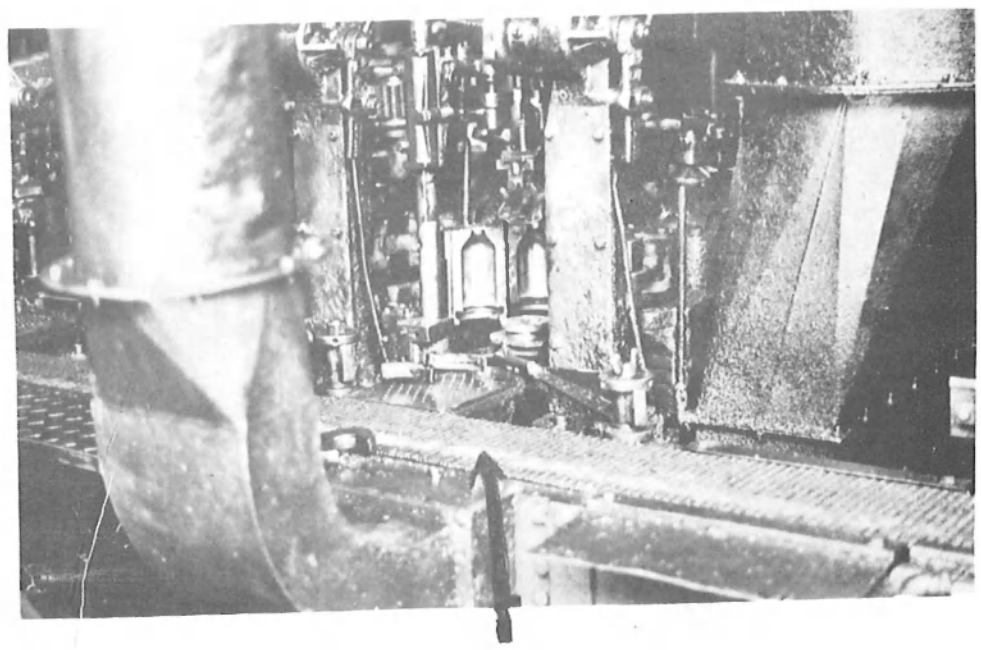
1. See (a) UNCTAD, 'The capital goods sector in developing countries: Technology issues for further research," 7/Oct./80, TD/B/C.6/60, (b) Howard Pack, "Fostering the capital goods sector in LDCs," World Bank Staff Working Paper No. 376, 3/80. (c) Fred Nixon, "Import Substituting Industrialization," in Industry and Accumulation in Africa, Martin Fransman (ed), (Heinemann, 1982), pp. 38-57; (d) Masette Kuuya, "Import Substitution as an Industrial Strategy," in Industrialization and Income Distribution in Africa, J.F. Rweyamamu (ed.), Codesria Book Series, 1980, pp. 69-91.

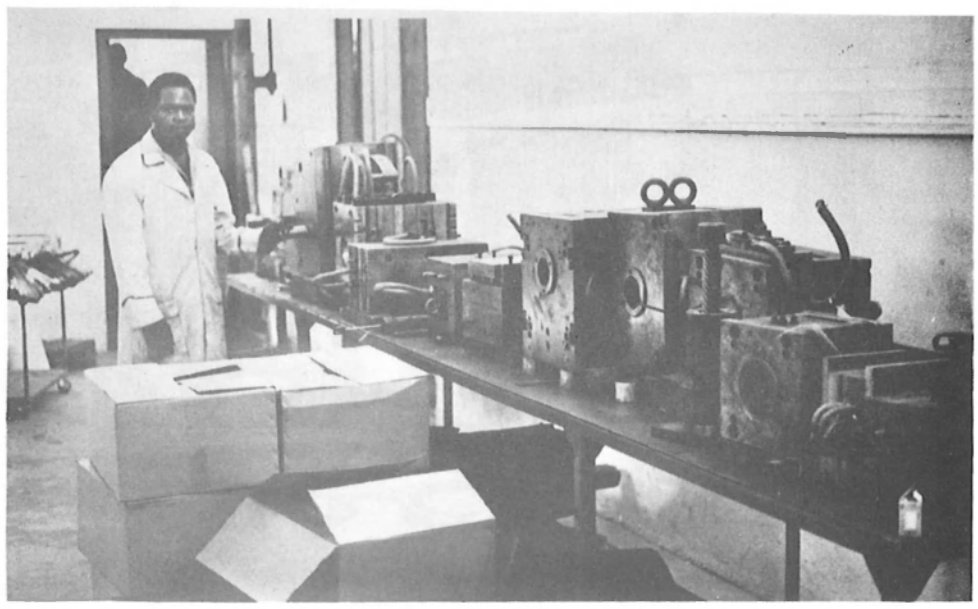
and patterns to make intermediate inputs which go into machines, equipment, and final consumer products. The following pictures show a plastics injection moulding machine and various examples of dies, moulds and patterns. Dies are needed to forge, stamp and form metal. For instance, different dies are needed to forge hot metal into hoes or crankshafts. Expensive and complicated multi-part metallic moulds provide the shapes for rubber, plastic and glass items and for mass-produced non-ferrous metallic castings, such as brass handles or glass and plastic bottles. Intricate and high precision metallic patterns are used to mass-produce the sand moulds needed to cast partsfor motors. Dies, moulds, and patterns are not required to produce non-casted machined components, chemicals, minerals, and agricultural and many other raw materials but they are needed to produce a wide range of mass produced components made from these raw materials. Thus, to deepen import substitution from merely assembling imported components, to making them requires numerous dies, moulds, and patterns. Furthermore, most of the complementary machinery and equipment (e.g. forge and other presses, rubber and plastics injection and blow moulding machines, glass bottle blowing equipment, and metal castings facilities) can make a wide range of products by merely switching the die, mould or pattern in the same machine.



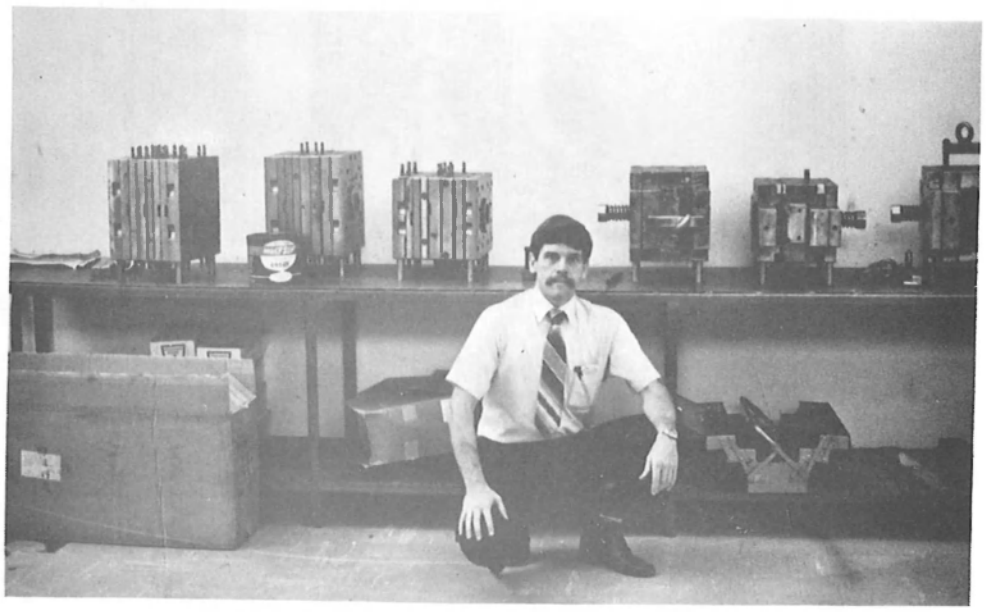
P. 1 Glass bottle moulds, head ring and base plates.
Courtesy of Kenya Glass Works Ltd.,Kenya.



P. 2 Glass mould installed in one station of a glass blowing machine.

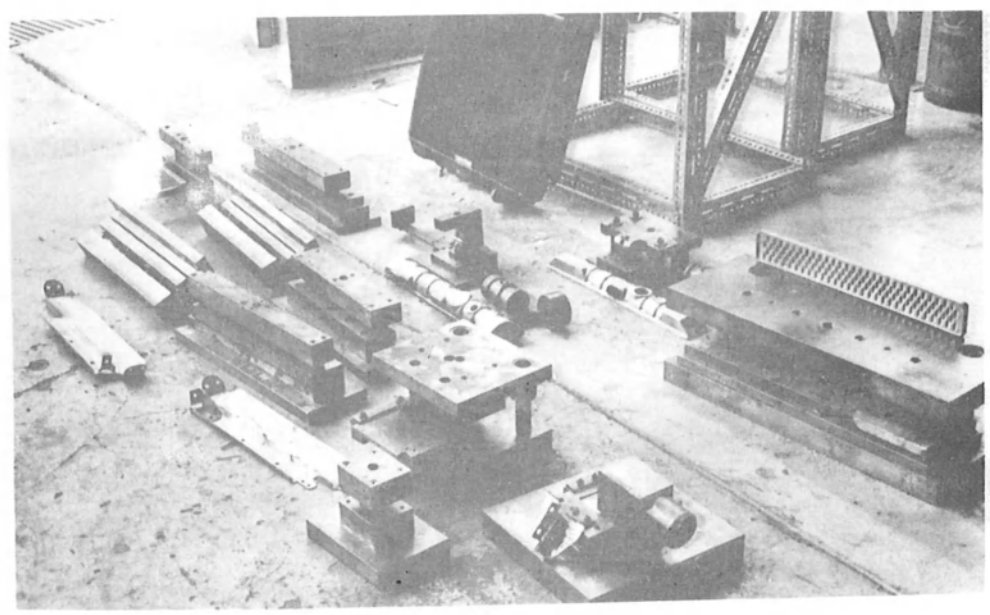


P. 3. Mr. Kariamburi, Production Manager of J.K. Industries Ltd. shows various plastics injection moulds. The six on the right are for making the various components of a telephone c e and receivers.

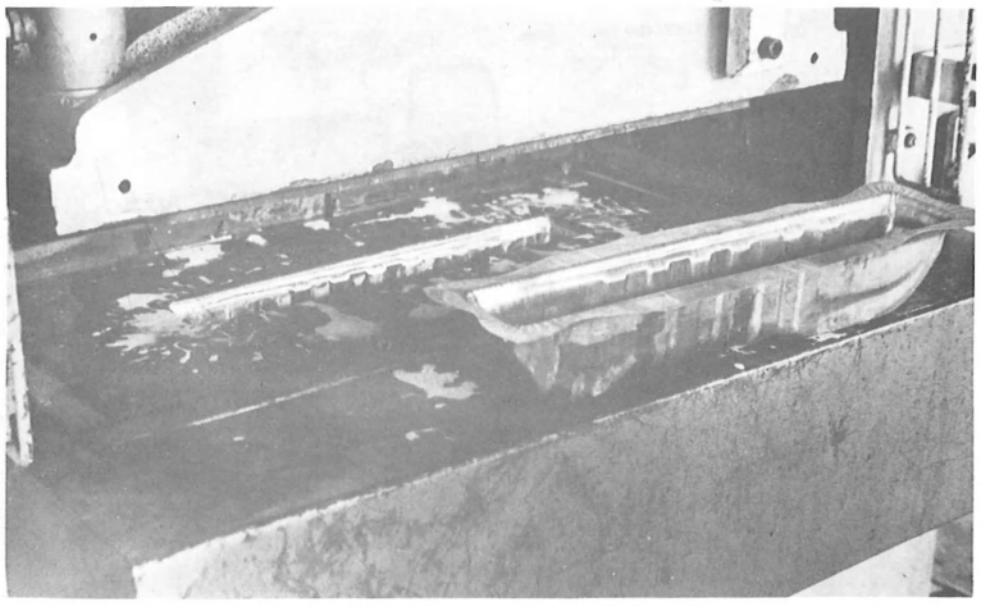


P. 4. The author with moulds to make various syringes. Courtesy of J.K. Industries Ltd. Kenya.

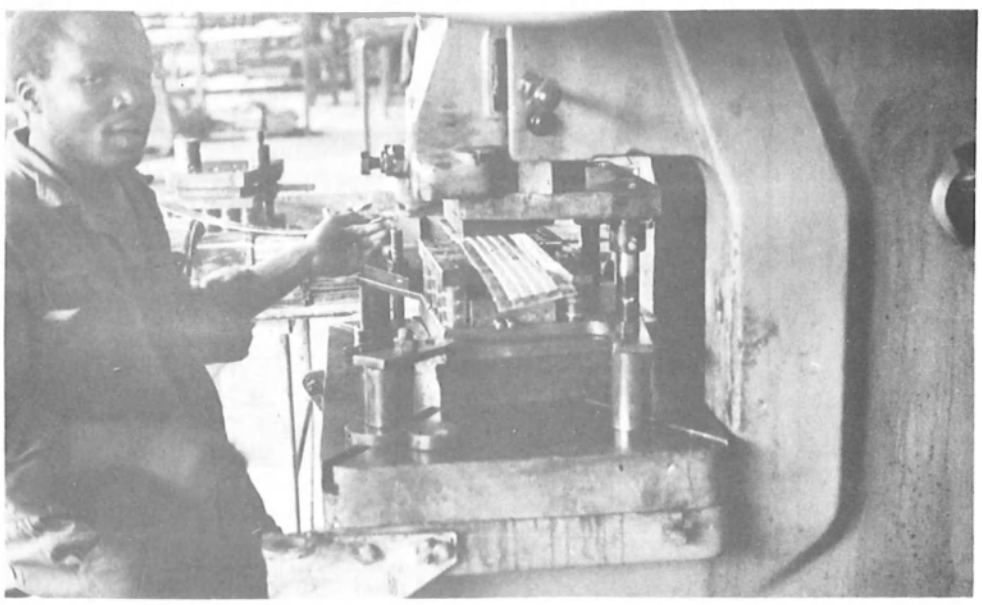
P. 5. Mr. Kariamburi with a plastics injection machine and its control panel.



P. 6. Various dies required to make components for a radiator for a Land Rover Truck. Courtesy of Burns and Blane Ltd., Kenya.



P. 7. A die installed in a press. This die forms Radiator bottoms for one model. Courtesy of Burns and Blane Ltd., Kenya.



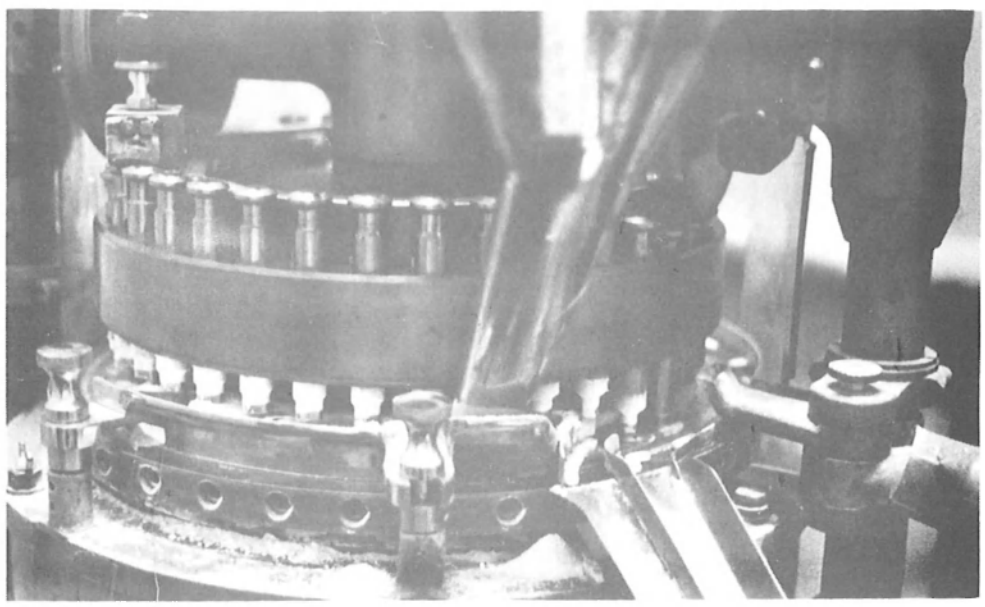
P. 8. A die installed in a press. This die punches holes and the top and bottom base plates used to hold the tubes in a radiator. Courtesy of Burns and Blane Ltd., Kenya.

Lower punches in drawer on left side

Upper punches in drawer on the right side

Cylinders

p. 9. Cylinders and upper and lower punch dies used to compress medicinal powders into tablets. A full set of 40 cylinders and top and bottom punches costs US$5,000 to US$6,000. Each shape of pill requires a different set. Sterling and Winthrop Ltd., (Kenya), which graciously permitted these pictures, has 60 sets of these dies.



p. 10. Dies in a pill punching machine. Courtesy of Sterling and Winthrop,

III. THE EXISTENCE OF UNDERUTILIZED COMPLEMENTARY MACHINERY AND EQUIPMENT

The general purpose machinery and equipment, which are used together with dies, moulds, or patterns (DMPs), are often grossly underutilized in developing countries. For instance, in Kenya in 1982/3, metal engineering workshops used only 34% of their capacity, foundries 23%,[2] and plastics processors 53%.[3] In South Korea the rubber and miscellaneous plastics industry operated at 33% capacity utilization though the profit maximization rate should have been 78%; the corresponding figures for the machinery and metalworking industry were 28% and 63% and those for all manufacturing were 28% and 65%.[4] A World Bank study of four developing countries during 1972-3 revealed the following capital utilization rates which were weighted by the capital investment in each product line in a plant:[5]

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2. P. Coughlin, "Converting Crisis to Boom for Kenya Foundries and Metal Engineering Industries: Technical Possibilities versus Political and Bureaucratic Obstacles," IDS (Nairobi) Working Paper No. 398, August, 1983, p. 3. Based on 120 hours maximum per week.

3. H. Mwangi, The Plastics Processing Industry in Kenya, University of Nairobi, M.A. Thesis, 1984. Based on 154 hours maximum per week.

4. Donald Lecraw, "Determinants of capacity utilization by firms in less developed countries", Journal of Development Economics, June, 1970, Vol. 6, No. 2, p. 141. Based on 8760 maximum per year.

5. Helen Hughes, "Capital Utilization in Manufacturing in Developing Countries," World Bank Staff Working Paper No. 242 Sept. 1976, p. 26. Based on 8760 hours maximum per year.

ISIC	ISRAEL	PHILLIPPINES	MALAYSIA	COLUMBIA
3560 Plastic Products	65.0%	53.0%	67.8%	38.4%
3620 Glass Products	98.9	92.7	92.8	64.3
355 Rubber Products	38.0	51.0	74.9	69.5
381 Fabricated metal Products	55.8	26.5	44.9	37.9
Average for all Manufacturing	78.9	43.1	70.8	60.6

Another study revealed that the Tanzanian capital goods sector used only 35% of its capacity while all manufacturing industries averaged between 50 - 60%.[6] In fact, such low rates of capacity utilization are typical in LDCs.[7] Thus to produce many -- but not all -- intermediate components, only the proper DMPs are needed. The complementary machinery is often already in place in developing countries and is underutilized!

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6. S.M. Wangwe, "Technology issues in the capital goods sector: a case study of the United Republic of Tanzania," UNCTAD, TD/B/C.6/AC.7/4, 14 May, 1982, p. 1-2.

7. UNIDO "Industrial Excess Capacity and its utilization for export," ID/WG 29/8, 21/1/69.

IV. THE COSTS OF DIES, MOULDS AND PATTERNS AND ECONOMIES OF SCALE

Unfortunately, dies, moulds and patterns are extremely expensive. Hence, less developed countries (LDCs) with small markets and heavy dependence on foreign technology are costly producers of items requiring DMPs. To illustrate this, below are varied examples of the cost of DMPs and the impact of these costs upon prices and economies of scale. Though these examples are taken from Kenya, this technology and its costs are similar worldwide.[8]

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8. Unless stated otherwise in the examples, interest was calculated at 10% p.a. and depreciation was assumed to be over a five year period.

(1) A set of stamping and forming dies to make a radiator cost between US$ 9 - 12,000. If, as in Kenya, only about 400 radiators will be needed before a typical model becomes obsolete after a year or two, then about US$30 or 20% is added to the costs of production.[9]

(2) The mould to make Firestone radial tyres for passenger cars costs about US$40,000 before duties. If the demand for a particular size were only about 4,000 per annum, then the interest and depreciation costs on the moulds would add 10% to the other costs, or about US$2,60.[10]

(3) The mould to make plastic beer crates costs about US$80,000 before duties. This is more than the cost of the large plastic injection machine into which the mould is inserted.[11] However, since the volumes are large the impact upon costs per unit is small.

(4) A full set of stamping and forming dies to make the outside and inside panels for the left side door for a pickup truck costs about US$ 2,500,000. Thus if only 3,000 doors are

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9. Source: Interview with V.A. Patel, Burns and Blane Ltd., 11/April/1984.

10. Source: Interview with Mr. Brunson, Firestone Kenya Ltd., 18/Jan/1984.

11. Source: Interview by H. Mwangi with S.J. Berger, General Manager, Emco Plastica International Ltd., 16/8/83.

needed each year, just the interest and depreciation costs for these dies would be about US$ 216.50 per door. Even without counting other costs, this compares very badly to the US$ 50.00 deletion allowed the local assembler for not buying the rough door (only prime painted and with no glass) with the assembly kit.[12]

(5) A BIC-Type ball point pen consists of four plastic pieces besides the ball point and ink container: the case, cap, plug and holder. Each piece requires a mould with multiple cavities to mass produce between 12 to 140 pieces per injection. These four moulds cost more than twice as much as the US$ 100,000 injection mould machine into which the mould boxes are inserted.[13] The interest and amortization for these moulds increases the ex-factory costs of producing these pens by 20% even if three million were produced annually.

So when economists discuss achieving economies of scale to produce intermediate components, they should focus more upon the costs of the required dies, moulds and patterns.

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12. Source: own survey. Respondent requested anonomity. 484. The deletion allowance usually understates the oversees manufacturer's actual production costs. For instance, though the deletion allowance for a rough door is US$ 50.00, its price including freight as a service replacement part from the manufacturer is US$ 212.00.

13. Source: Interview by H. Mwangi with Mr. Kairu, production Manager, Haco Enterprises, Mombasa, 28/8/84. Since Haco produces about 26 million pens annually, the impact of the cost of the moulds upon the ex-factory piece of a pen is small.

Since DMPs are so costly and the designs are often protected by patents, developing countries often pay royalties for the right to use the DMPs to produce items locally. If the DMPs cannot be obtained this way then these countries either spend the money to make or import the DMPs and consequently become high cost producers for their small markets or they continue to be dependent on the imported components. A special problem also arises from this dilemma. If a local producer/assembler makes just a few of the components needed to make an item and imports all the rest then, when the supplier changes the model or style of the product, the local producer/assembler has no choice but to spend money again to buy new DMPs in order to continue production. The high dependence on so many imported inputs makes it impossible to opt instead to suddenly produce all the components for the old model. For example, J.K. Industries in Kenya only produces the plastic

cases for telephones. General Electric Co. (UK) has informed J.K. Industries that the telephone model assembled in Kenya is now obsolete and the electrical interior parts for that model will no longer be available. Hence, J.K. Industries will need to purchase a new set of moulds from General Electric Co. since there are too many interior parts to even consider trying to make the entire phone locally now.

Consequently high per unit costs of production impede import substitution and penetration into export markets. For a developing country, this is just one manifestation of a low level production trap: production is low because prices are high; prices are high because production is low. But with the developing countries facing this dilemma, of course, the developed countries are able to continue exporting manufactured goods and components to third world countries.

V. PROPOSALS TO CHEAPEN THE COSTS OF OBTAINING DIES, MOULDS AND PATTERNS.

To break out of this trap and to begin to produce many more intermediate inputs, developing countries must seek to cut the costs of DMPs. In many cases this could be done through: (1) better negotiation with MNCs; (2) South-South joint purchase of DMPs; (3) foreign aid programmes to encourage companies to lend DMPs; (4) decreasing the number of makes, models, and designs for products; and, (5) improving and subsidizing the facilities to make DMPs locally. After discussing these proposals the article considers some ways they could be promoted and implemented.

1. Better Negotiation with MNCs to obtain DMPs

Conditions now exist to allow persuade MNCs to lend DMPs to LDCs thus enabling domestic production at no additional capital costs. Sometimes tough bargaining would be required to obtain DMPs on loan. In other cases, just the removal of various bureaucratic obstacles and a little encouragement would suffice to get MNC subsidiaries to borrow moulds from their parent companies. Furthermore, if DMPs were borrowed by an unaffiliated local company then various guarantees for the MNC would be needed. Finally, the lending of DMPs could become a new sales tactic by MNCs seeking to penetrate third world markets.

a. Propicious Conditions for Borrowing DMPs

Usually the transfer of technology including DMPs occurs through either comprehensive packages to set up all the facilities to make a product or through licensing agreements. These agreements often require the payment of a royalty and may also impose other restrictions on sales and the sources of inputs.[14, 15]

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14. UNCTAD, "Annual Report 1981 on legislative and other developments in developed and developing countries in control of restrictive business practices: Review of recent trends in patents in developing countries," 24/Nov. 81, TD/B/C.6/AC.5/3.

15. Paul Halpap, "Technological Transfer and Developing Countries", Economic Quarterly (Wissenschaftliche Beitrage, Berlin, DDR), 2/76, pp. 16-19.

However, the conditions exist to be able to obtain less costly deals. First, since many developing countries have the machinery and skills to produce many Products if only the DMPs were available, expensive comprehensive transfer of technology agreements may not always be needed; they may be unpackageable. Second, improved electrical spark erosion and die sinking machines, have dramatically cut the cost of making copies of some DMPs.[16] Third, since dozens of producers worldwide often make functionally similar products (e.g. lightswitches, radios, single cylinder internal combustion engines), enough competition often exists for LDCs to pit MNCs against each other and to negotiate aggressively thereby achieving better deals which would increase the percentage of locally made components.

b. Tough Bargaining with MNCs

Local subsidiaries of MNCs often import components made by their parent companies and prefer to continue that dependence unless pressured economically to shift to local sources. To persuade MNCs to provide or lend more DMPs, third world countries should lure and coerce the MNCs by the prospects of cornering or being excluded from a country's market for a certain product. A LDC could make presentations to various producers

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16. Dies and moulds with complicated contours are often made with spark erosion machines. If the original die or mould was made this way, then a duplicate can be made for less than one quarter of the cost of the original because the shaped electrode already exists. If made with a die sinking machine, a duplicate die or mould would cost roughly three-quarters of the cost of the original. Interview with Mr. A. Inglis, Works Manager of Harrtz and Bell Ltd., Kenya's oldest commercial metal engineering workshop. 7/2/84.

(e.g. of lightswiches).[17] It could offer to sign a contract with only one or a few producers to supply, say, one third or one half of the required inputs for a given product if that (those) producer(s) would lend the DMPs for just a short while so the developing country could make enough of the other required components to supply its small domestic market. Often the domestic markets are so small that the developing country would need to borrow the DMPs for just a few weeks in order to make enough components to continue to assemble for six to twelve months.

Even more potently, a group of developing countries could negotiate to increase their local content by obtaining some DMPs on loan. Unifying several LDCs for such joint - front negotiations would be easier than achieving agreement for preferential trade areas or for industrial integration, since each LDC in the group could only gain and would suffer no loss. The negotiations would concern products whose components are not yet made in any of the participating LDCs. Also, in the and each country would be enabled to make the product by using the DMPs on loan.

For an item with many producers, each would know that if it did not acceptthe offer another would. Also if a MNC sold to few countries it would be less concerned that by beginning to lend DMPs it would set a precedent which might threaten its sales worldwide. Moreover, a small MNC with excess capacity might be

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17. Perhaps surprisingly, a one-way lightswitch has 20-25 springs, screws, tiny brass stampings, and thermo plastic pieces most of which require a die or a mould to make.

especially enticed by such an offer which could noticeably increase its sales and profits.

If only a few manufacturers of a product exist worldwide (e.g. transport vehicles or machine tools) then they would be strongly motivated to collude to not lend DMPs and to not provide critical drawings and specifications.[18] However, their resistance might be broken if the LDCs used a non-aligned policy and opened negotiations with large socialist manufacturers. Once the resistence was broken then additional negotiations could be initiated and the best offer chosen. Moreover, this could become a new form of economic conflict and competition between social/economic systems to the advantage of LDCs.[19]

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18. A local Kenya vehicle assembler contacted the head offices of two of the makes it assembles to inquire about the possibility of obtaining, on a short-term basis, moulds for plastic components. One head office simply said that this was not possible. The other responded that they use a system of supply whereby the subcontractors only deliver enough for each day's production. Thus the subcontractors need to use the moulds frequently. Only obsolete moulds might be available and even this was dubious. On the other hand, the manager for a local assembler of refrogerators said that he was willing to obtain and lend the die to make egg trays for refrigerator doors to any local plastics processor who could offer a good price. He claimed that despite this willingness the plastics processors he approached charged too much. But he also agreed that the deletion allowances against which he compares the local price were about half below the foreign cost of production plus a reasonable profit.

19. For instance, the Indian government astutely used a non-aligned economic policy to break the resistance of the MNC oil companies to the exploration, extraction and refining of domestic petroleum reserves. Stephen Clarkson, The Soviet Theory of Development: India and the Third World in Marxist-Leninist Scholarship. (University of Toronto Press, 1978) pp 172-177.

Some products are patented thus making it even more difficult to obtain the DMPs. But the power of the patent is severely weakened if many functionally similar products are available. That power could also be countervailed by the threat to deny access to a country's or a group of countries' market. Furthermore, countries such as India and Mexico have exempted products of entire industries from patentprotection and deny protection if the product is not made locally within three years of registration.[20] A similar policy could be implemented legally in other LDCs to undermine the power of patents when used to deny a country the chance to produce patented items.

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20. 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 control of restrictive business practices: Review of recent trends in patents in developing countries." 24/Nov/1981, TD/B/C.6/AC.5/3.

c. Removal of Bureaucratic Obstacles to the Entry and Exit of DMPs

Some subsidiaries of MNCs would be willing to borrow DMPs from their parent or sister companies but have encountered tariffs and irksome customs barriers or have just not considered the possibility of borrowing the DMPs. For instance, a major MNC subsidiary in Kenya specializing in lotions and baby products wanted to lend a bottle mould to its Zimbambwean and Nigerian sister companies but was discouraged by the slow import licensing and customs procedures and the import tariffs applied each time the mould would enter or re-enter a country. A MNC pharmaceutical firm in Kenya imports from its parent company complicated plastic container tops for dispensing and automatically cutting off its sanitary hand towel product. That company had not even considered borrowing the parent company's mould for the short time needed to produce enough tops to cover its requirements. The local manager had not objection to the idea and thought that this should be possible for several of the company's currently imported containers. So, by streamlining customs processing and launching a campain to encourage MNC subsidiaries to seek DMPs on loan from their parent companies, an LDC might stimulate voluntary increases in local content.

d. Needed Administrative and Financial Guarantees

Though enticed, a foreign producer may be reticent to enter such a deal with an unrelated company unless guarantees were provided to protect these strategic pieces of equipment whose loss, damage or delayed return could severely affect its business. As an alternative to lending the DMPS, if the original DMPs were made with spark erosion or die sinking machines then a company may decide to make cheaply a second set of DMPs for a third world company(ies) to use. This would avoid the risks of transporting the DMPs back and forth. But any programme to borrow DMPs would need various measures to minimize and pay for the risks and uncertainty that a foreign producer lending DMPs would incur. First, the developing country would need to ensure that any local participant be careful and prompt in the use and return of the DMPs. Big fines would need to be imposed for any tardiness in the return of the DMPs and only a few, very reliable participants could be allowed in each industry. Since the programme must be absolutely reliable to be effective, the authority involved would need the power to quickly sieze the loaned DMPs from any delinquent uncooperative manufacturer. Second, the foreign producer and the local participant would need to agree on an engineering workshop whose prices and judgement about repairs or replacement of damaged DMPs would be accepted as fair and competent. This engineering workshop would need to inspect and/or

repair the DMPs in transit. Since dies and moulds are usually made of very tough steels and the critical high precision machining is in the interior, damage during transit would be rare. The main purpose of the inspection would be to ensure that they were in good condition when sent or returned. Third, the developing country's government would need to guarantee the prompt return of the DMPs and payment for required repairs or replacement since the MNC may not have enough information to trust many third world companies. Since speed and reliability of these payments must be emphasized, the state itself should be responsible for these payments. Later it should collect from the local company. Fourth, the import/export licensing and customs procedures would need to allow swift unencumbered entry and exit of these DMPs.

Just the enumeration of the requisite guarantees for a programme to borrow DMPs underscores the difficulties in its execution. Clearly, when economical, making a duplicate set of DMPs for use in a LDC would be best. It would simply eliminate most of the difficulties.

e. Lending dies, moulds, and patterns -- A new sales tactic?

Some MNCs may not need to be coerced to lend

their DMPs. By cheaply providing copies of DMPs to developing countries or by lending DMPs on a short-term basis in exchange for supplying the remaining components, MNCs could penetrate large new markets for their products. By offering to enable the LDC to make locally a significant portion of the components a MNC could easily steal the market from another which only assembled completely-knocked-down (CKD) kits. Since this would both create jobs and save foreign exchange, the MNC could approach the LDC's government for assistance in finding a local partner if the current local assembler were intransiently attached to assembling CKD's without increasing local content. For instance, Kenya would probably be glad to replace 100% CKD Delta switches assembled by E.A. Cables Ltd., if it were possible to increase the local content substantially by cooperation with a different supplier. Such offers could become a new sales tactic in competitive world markets. The MNC could make an extra set of DMPs to fly around between LCDs. This would certainly accelerate third world industrialization and import substitution.

2. South-South Joint Purchase of DMPs

a. The Concept

Though regional industrial integration has often been advocated as a partial solution to the problem of small markets in many developing countries, seldom has

this been achieved except in socialist countries.[21] The prospects of closing down some industries, the jealousies arising when determining each country's industrial specialization, and the risks due to the unreliability of promises because of possible political instabilities have stymied regional industrial integration. However, for many products, an alternative solution may be possible.

The per-unit production costs, except for the costs of the DMPs, are similar for both small and medium sized markets for many products in developing countries. The equipment and administrative overheads usually are very low on the margin in currently underutilized plants. Furthermore, the set-up times and costs usually are not large. For example, the per-unit production costs to stamp and form 5,000 truck doors is nearly the same as for 30,000 doors except for the cost of dies. This is also the case for rubber and plastics processing and metal stamping, forming, forging and casting though perhaps not so for glass blowing.[22] Thus for many products it may actually be cheaper to freight the DMPs between countries than to freight the outputs of regionally specialized industries. These economic considerations suggest that the joint purchase of DMPs by a few developing countries may be cheaper and easier to

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21. Elliot Berg et al., Accelerated Development in Sub-Saharan Africa: An Agenda for Action, (World Bank, 1981), p. 118-119. Also see: UNCTAD "Economic Co-operation among Developing Countries, "Trade and Development Report, 1983, part II, 5/10/83, UNCTAD/TDR/3 (part 2).

22. The set-up and adjustment times for glass blowing can be about eight hours. During that time the furnace must continue firing. This represents a large fixed charge that must be covered by each run of a model.

negotiate than agreements about industrial specializations.

As a side effect, a programme for South-South joint purchase and sharing of DMPs may also ease the bargaining with MNCs for DMPs because: (1) the organizational framework would exist to provide the required guarantees, (2) a wider market could be offered to a cooperating MNC, and, (3) by having the option to jointly purchase the DMP, the LDC would be in a stronger negotiating posture vis-a-vis the MNC. However, some administrative and political/economic difficulties would exist in implementing a programme for joint purchase of DMPs.

b. Administration

The governments in a few LDCs or the industries themselves could form a multi-country cooperative specializing in the joint purchase of DMPs. The cooperative would be approached by or seek out companies needing the DMPs to produce some item. The cooperative would purchase the DMPs and lease them for limited times to participating companies.

The risks and the guarantees needed to implement a programme for joint South-South purchase of DMPs would be similar to those when borrowing DMPs for MNCs.[23] The companies would be liable for any repairs or replacements needed due to damages. Also, the cooperative could lease DMPs from

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23. Transitional socialist countries with nationalized industries may be able to initiate and implement a joint purchase programme easier than other countries. Participation by industry would be a national decision and less subject to resistance from individual companies.

companies and sub-lease them to companies within the LDC's territory.[24] As when borrowing DMPs from MNCs, the success of such a programme would depend on the cooperative's reliability and promptness and on whether the Central Banks in the participating LDCs gave high priority and speedy remittal of fees for this programme. The leased DMPs would also need swift and duty-free processing by customs agents.

c. The Political Economy of Cooperation

In attempting to establish a cooperative to own DMPs jointly problems can be anticipated concerning:

(i) the optimum initial size of the cooperative,

(ii) conflicts about the division of benefits, and

(iii) the development of internal conflicts impending its growth.

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24. If several countries adopted a joint economic policy of industrial cooperation and mutual acquisition and lending of DMPs, then the multi-country cooperative assigned this responsibility might need special powers. Even with a reasonable fee to lease a DMP from a local company for re-lease elsewhere the local company may be obstinate or demand an exorbitant fee. After providing for a fair review of the circumstances, the multi-country cooperative may eventually need the authority to insist upon a forced lease. However, such authority should not be allowed until the cooperative had proven its own efficiency and reliability.

(i) Optimum Initial Size of the Cooperative

Building local branches of the multi-country cooperative capable of reliably and punctually fulfilling commitments and having good ccoperation from their Central Banks and customs authorities is difficult. Even building the required trust between branches so that they could smoothly send the mutually owned DMPs between participating countries would not be easy. Hence, initially the cooperative would need to have only two or three participating countries whose governments had made high level commitments to ensure that the programme would succeed.

(ii) The Division of Benefits

Conflicts might arise concerning the right to export products made with the jointly owned DMPs especially if the participating countries had unequal levels of development.

If the participating countries wanted to export assembled or disassembled components made with the jointly owned DMPs some conflict might arise if each wanted to export to the same buyers, However, solutions such as market sharing would be difficult to negotiate successfully. The easiest solution would be just to allow the participants to compete..

Difficulties might arise during the negotiations if nearby countries with unequal levels of development were involved. First, a more developed country would

run the risk of lending DMPs for items it currently or potentially exports to the other country(ies). Second, the supposition that idle complementary equipment exists to be able to use the DMPs in each country may not apply well in the poorer country. Also the DMPs needed by the poorer country may already exist in the more developed country and most DMPs needed by the more developed country may not yet find application in the poorer country. Hence, the lease/sub-lease programme would be vital to the mutual satisfaction of such unequal partners. So, special attention would be needed to ensure that the poorer country would receive adequate benefits from the programme. From these considerations, it becomes obvious that negotiations would be easiest if all the participating countries possessed under-utilized complementary equipment needed to be able to use the DMPs and if the programme focused upon DMPs for items which were not yet produced by or traded among the participants.

(iii) The Development of Internal Conflicts Impending Growth of the Cooperative

Once the cooperative functioned well then additional participants could be sought. But some existing participants may have begun to export products under the programme to the potential entrants and would like to deny admission. To prevent this opposition, the potential entrants and the procedures for their admission should

be specified in the beginning.

3. Aid Supported Guarantees to Encourage Lending DMPs for use in developing countries

Recognizing the strategic role of DMPs, LDCs should urge developed countries to provide aid aimed at encouraging companies to lend or provide DMPs to LDCs. The aid could assist the establishment of the regional institutions needed to facilitate the borrowing and interchange of DMPs. The aid donors could also be the ultimate guarantors that the costs to repair or replace damaged DMPs would be promptly paid. This would eliminate mistrust by potential lenders of DMPs about the reliability of the financial guarantees provided by the LDC's government. An aid package focusing on encouraging an easier transfer of DMPs to LDCs would be very cost effective. It could be catalytic to enabling LDCs to use their underutilized industrial capacities and to decrease their import dependence.

Still, many MNCs probably would politically oppose the initiation of such an aid package or its application to their industry since a programme to lend DMPs would adversely affect their total sales to LDCs. True, the chosen MNC, which agreed to provide or lend DMPs and to sell the other components to a LDC, would increase its total sales revenue. But the others would suffer an even larger fall in their sales since the LDCs would now make many previously imported components locally.

Lacking such internal conflicts between its industries a socialist country might more easily initiate such an aid package -- especially since lending DMPs would enable its corporations to penetrate new markets.

4. Fewer Makes, Models and Designs for Products

By failing to adopt a strict policy on technically unnecessary product differentiation a LDC condemns itself to either high cost or no production even when its domestic market would allow one or two efficient producers but not more. The policy of providing high tariffs and licensing any would-be manufacturer of an item just reproduces domestically the chaos of numerous varieties of technically similar imported items. Inefficiency is guaranteed. Exports? Minimal! And far too many DMPs are imported. But, if tariffs are low, then no potential producer will venture to capture merely a slice of an already small market. Result: no production. So, the key often may not be tariff policy alone but rather the policy toward the number of varieties allowed.

Kenya exemplifies the situation. The plastic industry produces 27 models of half litre bottles for liquid and powder household chemicals, baby powders, liquid soaps and motor oils. Eighty-one per cent (81%) of these designs are technically redundant.[25] Kenya's white glass factory at Nairobi makes 105 sizes and designs of bottles including 19

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25. H. Mwangi, op. cit.

of approximately three-quarters a litre whereas many fewer would suffice.[26] With this proliferation of sizes and designs the factory ties up about one sixth of its capital in moulds. The moulds cost US$10,000 - 25,000 for each full set of 18, including six for maintenance requirements, needed to run the six-station two-gob glass blowing machines. Firestone Kenya Ltd. has 45 sizes of tyres but some sizes have multiple designs. Hence, they have 100 moulds. Twenty-five (25) sizes are for cars and twenty (20) are for trucks including pick-ups. If Kenya were to have only two sizes of tyres for cars then 92% of the currently used moulds for cars would be redundant. This equals about one million US dollars in excess investment since each mould costs about US$40,000. The redundant designs also mean excessive change-over costs and consequently even higher per-unit costs. Incidentally, Firestone's Managing Director figures that they could increase their sales by 10% if there were fewer models of trucks, buses, pick-ups, and cars because the current imports of odd sized tyres would not be necessary.[27]

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26. Own survey, August, 1983. "Approximately" means plus/minus fifteen per cent.

27. Interview with Mr. Brunson, Factory Manager, Firestone Kenya Limited, 18/1/84.

Many models of radiators for transport vehicles are not made in Kenya due to the large number of rapidly changing vehicle models. Burns and Blane Ltd. reports that a set of dies to make the components for a radiator costs about US$11,000 which is prohibitively high if only a few hundred radiators are needed. Even so, the company produces 17 models of radiators and one-quarter of its total investment in radiator manufacturing is for the dies.[28] Kenya also imports 260 models of water pumps[29] and about 60 makes of sedan cars in 200 models and assembles 94 models of trucks, buses and pickups.[30] The result is that Kenya produces almost no pumps and very few parts for transport vehicles.[31]

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28. Source: Chief Accountant, Burns and Blane Ltd., 12/March/1984.

29. G. Begumisa, Machine Goods Spareparts Industries: A case study of the Water Pumps Industry in Kenya, University of Nairobi. Unpublished M.A. Research Paper, 1982, p. 63, 64 and 101.

30. Z.N. Murage, The Automobile Assembly Industry in Kenya, University of Nairobi. Unpublished M.A. Research Paper, 1983.

31. But Kenya could now produce single stage centrifugal water pumps at about half the cost of imported ones if the local manufacturers were to supply the entire domestic market. Begumisa, op.cit., pp. 63, 64 and 101.

Despite the bad effects upon industrial growth from having so many models · the importers and diverse high-cost producers are often so well connected politically that a more rational approach would likely encounter overwhelming opposition.[32] So, reducing the number of makes, models, and designs would only be possible under a strong clear sighted state leadership.

For countries with small markets, tariff policy by itself may not be able to resolve the dilemma of either high cost or no production. Furthermore, for many products the slogan that you cannot have efficiency without competition may be a myth in such countries; the opposite may hold: you cannot have efficiency with competition. Otherwise, each producer will have underutilized capacity and high overheads, and will spend too much on capital including DMPs. So, the solution to engender efficient production including cutting the costs for DMPs may often be to severely limit the range of available products

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32. See Coughlin, op.cit, especially the section on the political and bureaucratic obstacles to a boom in Kenya Foundries and Metal Engineering Workshops. op. cit.

and to curtail investment in new makes and models.[33, 34]

5. Improving and Subsidizing Facilities to Make DMPs Locally

Tool and die making is often the last portion of the metal engineering industry to develop.[35] However, it is strategically important for accelerating the industrialization of developing countries. By locally making DMPs and other

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33. Then the dilemma might transform itself into a problem of price, quality and the use monopoly profits (e.g. repatriation versus local investment?).

34. This is one reason that the World Bank's policy of structural adjustment, which usually entails killing off some local industries by lowering the levels of protection, is sometimes inappropriate. True, the increased competition from imports pressures individual firms to become efficient. But many of the sectoral level causes for inefficiency are not redressed by this policy. With many sources of domestic and foreign supply, each local producer may be condemned to low rates of capacity utilization and high per-unit costs no mater how well he manages the plant. If lucky, after much agony and expenditure of foreign exchange for competing imports a local firm may endure the pressure to eventually dominate the market. If unlucky, the entire industry dies.

35. For instance, my 1981/82 survey of Kenyan metal engineering workshops revealed that out of 91 workshops only three specialized in making DMPs and they only had limited capabilities. A few other workshops did occasionally make low accuracy stamping dies. Mwangi op. cit., found only seven out of 32 plastics processors which made some of their own moulds. These seven import blank moulds and then machine the desired shapes. Ninety-four percent of the processors imported moulds; the remaining seven percent used the moulds supplied by customers for plastic products.

making DMPs and other metal products, the local manufacture and assembly of components becomes possible thus employing otherwise underutilized resources. By possessing tool and die making capabilities a third world country can internalize the high costs of DMPs and more easily subsidize them if needed especially since their manufacture is a very labour intensive activity costing little foreign exchange. Thus third world countries should place high priority on the development of tool and die making capabilities. But good tool and die makers and designers need at least 8 - 12 years to gain adequate experience to handle diverse complex jobs demanding high precision machining. Thus the development of this capacity demands serious long term planning and good training institutions. But having a local capability to make and repair DMPs would not only directly stimulate import substitution since DMPs are often imported, but it would also enable the industries needing DMPs to begin and to maintain production more easily.[36]

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36. Kenyan plastic processing firms used few locally made moulds. The managers of these firms reported that the local engineering workshops were technically competent to make only the less complex moulds. But for these, the local moulds were reportedly cheaper than imported ones. Nevertheless, easily more than 90% of all the moulds used in Kenya's plastics industry are imported. Most repairs were done locally. Mwangi, op. cit.

VI. PROMOTION AND IMPLEMENTATION OF THE PROPOSALS

The proposals just discussed could noticeably accelerate third world industrialization but many big MNCs and their governments might be reticent to assist the LDCs to this extent. Similar to demands for the free transfer of patent rights from developed to developing countries, these proposals to get access to DMPs menace the financial interest of MNCs as a group and attack the constraints on third world industrialization.[37] It will not happen spontaneously; pressure and hence organization is required to achieve the goal.

The most effective pressure would be for smallgroups of LDCs to form South-South cooperatives to jointly own DMPs and to jointly confront the MNCs where they cannot easily resist i.e. concerning globally competitive products. But to attain such a joint posture the understanding of the existence of these possibilities needs to be promoted. They need to be discussed and action endorsed in international forums (e.g. the United Nations and the Organization of Non-aligned States) and in regional groupings of LDCs.

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37. Organization of African Unity, Lagos Plan of Action for the Economic Development of African, 1980-2000, (International Institute for Labour Studies, Geneva, 1981), p. 26

Also individual LDCs need to: (1) have staff to identify potential products and search for MNCs willing to lend DMPs; (2) incorporate the subject of DMPs as a standard element in negotiations for technological transfer; and, (3) request aid donors to institute donor supported guarantees for lenders of DMPs and to assist LDCs to establish multi-state cooperatives to purchase DMPs jointly.

VII. SUMMARY

Dies, moulds or castings patterns (DMPs) are required to make rubber, glass, plastic and metallic intermediate components. But DMPs are so expensive that efficient local production of components is often not possible due to these high costs which must be spread over the low output needed to satisfy a small market. So, the costs for DMPs must be lowered to economically enable LDCs to deepen import substitution for currently imported intermediate compoents. These costs might be lowered by: (1) better negotiation with MNCs; (2) joint South-South purchase of DMPs; (3) aid supported guarantees to encourage firms to lend DMPs to LDCs; (4) decreasing the number of makes, models, and designs for products; and, (5) improving and subsidizing the facilities to make DMPs locally. However, to implement these programmes, participating third World governments would need to perceive their objectives clearly and adopt a definite policy toward technological transfer. The governments must then firmly confront the resistance from internal and external vested interests which benefit from the LDCs continuing import dependence.