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Abstract

Empirical evidence indicates that the use of labour-intensive techniques in African industry would create not only more employment but also more value-added, relative to competing capital-intensive alternatives. The evidence also indicates, however, that it is the latter rather than the former techniques which tend to dominate much of the industrial sector in Sub-Sahara. We argue here that this apparently paradoxical situation can be understood once one takes into account the amount of institutional change (or institutional trait-making) that would need to accompany the introduction of labour-intensive techniques on a large scale. Using a number of concepts advanced by Hirschman and drawing mainly on cases from the road construction industry in Africa, we describe exactly which traits need to be made and how this can best be accomplished.

Keywords: Institutional change; Trait-making; Labour-intensive technology; Sub-Saharan Africa

1. Introduction

On the basis of data collected for nine manufacturing industries and using prices that are thought to be typical of most Sub-Saharan countries, Pack (1982) has shown that relatively labour-intensive techniques generate not only substantially more employment than capital-intensive alternatives, but more value-added as well. There is also evidence, however, from case studies of the region, that governments exhibit a strong preference for the latter over the former techniques in those same sectors. [1] When they are combined, these findings are often taken to imply that substantial gains in output, employment and equality, can readily accrue to governments prepared to make the implicitly costless switch from existing to labour-intensive methods of production.

As we see it, however, this conclusion rests on an (implicit) underestimation of the extent to which the labour-intensive alternatives demand change of one kind or another in the existing environment (such alternatives, that is to say, demand the 'making' of certain project traits, as opposed to the opposite form of behaviour, which implies a decision to accept some traits of a technology or project as 'temporarily unchangeable aspects of the environment'). [2] The

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[1] This evidence is reviewed in James (1995).

[2] This distinction is due to Hirschman (1967). It also forms the core of the discussion in James (1999). The present paper, however, although overlapping with the latter citation, is more concerned with the policy aspects of trait-making for labour-intensive techniques.

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first part of the paper sets out to describe not only the origin of this important feature of the literature, but also the specific types of traits that are neglected thereby. Thereafter and again with the help of certain Hirschmanian concepts, we employ case-study evidence to suggest how these neglected traits can best be provided in support of a wider application of labour-intensive techniques in Sub-Saharan Africa. This is a policy issue, we should emphasize, which has by no means disappeared as a result of structural adjustment and other reforms in the region. For, according to a report from the World Bank (1995), ''although the potential gains from privatization and other reforms are substantial, only a few countries have reformed their state-owned enterprises successfully'' (p. 2). Indeed, ''In most developing countries, particularly the poorest, bureaucrats run as large a share of the economy as ever'' (p. 1).

2. The underestimation of trait-making for labour-intensive techniques

More than 30 years ago, in his extensive study of a diverse range of development projects, Hirschman (1967) pointed to a general tendency for planners in the public sector to underestimate the amount of trait-making that would be necessary for a successful outcome of the projects they administered. At one point, for example, he refers to ''situations in which the project planners were unaware to what extent the good fortune of their project was implicitly premised on trait-making, that is, on making over the social, economic, and human reality of their country in one way or another'' (p. 140). At another point, what he described as a ''persistent failure'' (p. 145) to observe ''the very real links between sociopolitical structure and project behavior'' (p. 145), suggested to him a ''serious and systematic neglect of an area that can be crucial to the performance of the project'' (p. 145). The general point, as he saw it, is that ''development projects are likely to imply far more would-be trait-making than is commonly realized.... Bringing as they do, new activities into a pre-existing environment'' (p. 145). What Hirschman (1967) concluded from observations such as these was that: ''project planners ought to become sensitive to situations in which the amount of trait-making required for the success of a project is substantial, particularly when the contemplated project *must compete against another activity that is not nearly as demanding*'' (p. 140, emphasis added).

In the area of technology choice, unfortunately, Hirschman's advice has, with few exceptions gone largely unheeded, especially, but not only in the context of Sub-Saharan Africa. For, as we see it, there has been a distinct tendency for the literature in this area to underestimate the amount of trait-making that is needed for the application of labour, as opposed to capital-intensive techniques, a tendency that has made it difficult to understand, and hence to correct, the fact that policy-makers commonly choose the latter techniques over the former. Since many of these neglected traits are of an institutional nature, one can argue that in comparison with the very large literature on appropriate (labour-intensive) *technology*, remarkably little has been written about the appropriate *institutions* that such technologies often demand (and more specifically about the institutional innovations that will be required if labour-intensive technologies are to be introduced not merely at the small, decentralized level, but also on a large, macro-economic basis).

Much of the problem, it seems, originates in the traditional conceptualization of the choice of techniques in a two-factor world where the only dimensions are capital and labour. This depiction of the issue is unrealistic, among other reasons, because of the implications of the fact that the real choice is often not between one plant using capital-intensive methods and another plant using a higher ratio of labour to capital. In most cases, it is rather between a single, large-scale plant using capital-intensive-methods and a larger (in some cases, much larger) number of labour-intensive units of production. For, as shown in Table 1 across a selected sample of African manufacturing industries, a single capital-intensive plant often requires far more labour-intensive units to produce the same level of output. This, in turn, means that further dimensions will enter into the choice of technique apart from just the two traditional factors, capital and labour. In particular, not only will more entrepreneurs be required to run the additional labour-intensive units of production, but those additional units will themselves impose organi-

zational demands on the public sector. [3] (The road construction industry provides an indication of the additional supervisory capabilities that are associated with labour, as compared to capital-based methods. According to Stock and de Veen (1996), for example, ''A bulldozer can be operated by one or two skilled workers, but more than a dozen supervisors are needed to oversee labourers doing the equivalent amount of work. In addition, labour is often deployed over a wider geographical area, requiring a dispersal of supervision, which further raises supervision requirements'' (p. 14).) The problem is that in much of Sub-Saharan Africa both entrepreneurs and organizational capabilities in the public sector are in particularly short supply. [4] In relation to one country in that region, Tanzania, for example, what Clark (1978) argued many years ago is still substantially true, namely, that ''capital is not the most scarce resource. Rather, both entrepreneurs, people with the ability to initiate projects, and managers, people with the ability to operate them, are in short supply'' (p. 212).

Once the need for making these traits is recognized, moreover, further policy issues arise and these too have received relatively scant attention in the literature on choice of technology. The uncertainty that will attend most attempts to make the entrepreneurial and organizational traits needed by labour-intensive technologies, for example, will usually be unappealing to policy-makers under pressure to produce quick results, especially in comparison to large-scale, capital-intensive turnkey projects, which can be carried out more swiftly and with the greater degree of certainty that comes with the ability to simply import the missing traits with foreign finance (especially, but not only, foreign aid). The danger, here, as with all attempts at trait-making in development projects, is, as Hirschman (1967) himself pointed out ''that the desirable traits which are required for an adequate functioning of the project will simply *not* be 'made' — that is, learned in time — with dire results for the project's success'' (p. 135). [5] Trait-making for labour-intensive techniques on a large-scale is made all the more dangerous, moreover, by the fact that institutional change of a rather fundamental type may often be required in the context of Sub-Saharan Africa (in connection, for example, with the relationships between labour-intensive

Table 1
Number of labour-intensive plants to produce output equivalent of one capital-intensive plant
Sources: respectively, Kaplinsky (1990), Green (1978), Kaplinsky (1987), Bagachwa (1992) and Roemer et al. (1976).

Sector (country)	Number of plants
Bricks (Botswana)	
Capital-intensive	1
Labour-intensive	11
Bread (Tanzania)	
Automated	1
Labour-intensive	50
Sugar (Kenya)	
Vacuum-pan method	1[a]
Open-pan method	
100 tons	81
200 tons	41
Maize milling (Tanzania)	
Maize roller (120 tpd)	1
Maize hammer (4 tpd)	30
Footwear (Tanzania)	
Large-scale	1
Small-scale	142

[a] Equal to 1.3 plants.

[3] For a diagrammatic exposition of this point, see James (1999).

[4] In the aforementioned study of Pack (1982) of the gains in employment and value-added that could be reaped from switching to labour-intensive methods in Africa, this problem is dismissed by assuming ''that the supply of managers and operatives is sufficient to enable a larger number of smaller plants to be established simultaneously'' (p. 6).

[5] The controversial bakery case in Tanzania described by Green (1978), well seems to illustrate this problem. For, on the one hand, small-scale hand-baking technology saves on both capital and import costs relative to the automated, large-scale alternative. And since the spare parts associated with the hand-bakeries could have been locally produced, such technology would also have helped to foster the indigenous capital goods sector. Yet, the public sector institution in question nevertheless chose the automated bakery which was financed with Canadian aid. Part of the reason for this apparently inappropriate decision was the lack of hand-baking experience ''and of successful producer cooperative experience generalizable to new ventures'' (p. 18). These factors, understandably, meant that starting 40 or 50 small bakeries would have been prone to considerable risk and uncertainty.

technology and the degree of state centralization, or the ways in which the uncertainties and risks associated with such technology may be reduced by appropriate institutions of one kind or another).

In Section 3, we shall consider how these difficulties can be overcome in order to promote the wider application of labour-intensive technologies in Sub-Sahara. Much of the case study literature that will be used for this purpose is drawn from experience with the road construction industry. This, we should note, is less a matter of coincidence than it is a reflection of the fact that some of the most successful cases in the region have taken place with regard to the construction, repair and maintenance of various types of roads.

3. Trait-making for labour-intensive technology

3.1. Risk and uncertainty

As already noted, trait-making in general is prone to the risk that the missing traits on which the success of a project crucially depends, will not in fact be supplied. ''Under what conditions'' then, asks Hirschman (1967): ''is the risk sufficiently small that trait-making becomes a practical possibility?'' ''The most obvious answer'' he believed,

> is that many traits, from simple skills to administrative ability, can be slowly learned 'on the job' or alongside it. The fact that these traits are not yet available in the desired quantity and quality at the inception of the project can mean simply that the cost of construction and operation of the project should make allowance for the inevitable learning process to which outside education and training will of course be expected to make an important contribution. It is precisely because much trait-making proceeds through gradual 'on the job' learning that latitude for poor performance can be a welcome attribute of projects (p. 153).

3.1.1. Hirschmanian latitudes

By the term 'latitude', Hirschman (1967) refers to those characteristics of a project that permit ''The project planner and operator to mold it, or let it slip, in one direction or another, regardless of outside occurrences'' (p. 86). Latitude in a project may derive from at least two sources: one having to do with time and the other with the nature of the characteristics embodied in the ultimate output of the project. 'Temporal latitudes' imply that at each of the various stages through which a project progresses, allowances can be made with respect to the amount of time required for the necessary traits to be made (as opposed to the lack of latitude that inheres in the so-called 'time-bound' project). Product quality latitudes recognize on the one hand that standards appropriate to one context may not be appropriate to another. These latitudes also recognize, moreover, that labour-intensive techniques are often incapable, from an engineering point of view, of producing exactly the same product characteristics as capital-intensive alternatives (among other reasons, because of the closer tolerances that the latter is usually able to achieve).

Both temporal and quality latitudes played an important role in what is still arguably the most extensive application of labour-intensive techniques in Sub-Sahara, namely, the Rural Access Roads Programme (RARP) in Kenya, which has constructed thousands of kilometres of access, and more recently, minor roads, on the basis of labour-based methods. Let us consider first the temporal latitudes that were allotted to this programme in the name of trait-making (that is to say, on the basis of an explicitly recognized need to develop the various indigenous capabilities associated with the application of labour-intensive technology on so unprecedented a scale). To quote Edmonds and Ruud (1984),

> The programme had a very slow build up.... Thus in the first 3 years output was low. This was a result of a *quite deliberate policy decision.* It was recognised that this was a totally new programme for Kenya using a technology which was not widely understood. Time was, therefore, required to modify and adapt the existing procedures and to develop a suitable training programme (p. 15, emphasis added).

During this trait-making intensive phase (that lasted from 1975 to 1980), The Roads Programme enjoyed the considerable expatriate support that Hirschman envisaged (in the quotation from him that

Table 2
Quality latitudes in road construction
Source: Stock and de Veen (1996).

Dimension of choice	Quality latitudes for labour-based methods
Project design	''Designs that support the use of labour-based methods minimize the moving of earth in a longitudinal direction. Designers can reduce earthmoving by following the contours of the terrain where it is feasible (for example, in rural areas with little traffic), by locating smaller borrow pits at more frequent intervals and by achieving earthworks by cross movements rather than by extensive longitudinal movements'' (p. 17).
Type of materials	''The type of materials selected for a project often dictates the technology that must be used. For example, choosing graded crushed stone for the base courses in black-top surfaced roads automatically dictates the use of equipment based methods... choosing concrete and reinforced concrete structures may dictate the use of more equipment-based methods than choosing local materials, such as treated hard wood, masonry or brick, which may be acceptable alternatives'' (p. 17).
Design standards	''In order not to bias designs against labour-based methods, design engineers must specify acceptable (not maximum) standards. For example, designing structures with lower concrete strengths and increased dimensions would allow the use of hand-broken, lower-strength aggregates. Compaction standards should also be specified with care, since these standards can also dictate the choice of technology, particularly on unsurfaced (gravel or earth) roads. Often design engineers stipulate — unjustifiably — that the high compaction standards necessary for paved roads, also be met for unpaved roads'' (p. 17).

was provided at the beginning of this section). By 1980, however, after extensive trait-making had indeed taken place among the local labour force at various levels, the foreign presence, according to Edmonds and Ruud (1984), was ''drastically reduced both in quantity and orientation'' (p. 16). [6]

Similarly, in Botswana, where another successful large-scale, labour-based road construction programme subsequently took place,

> Between 1980 and 1989, 145 people (55 of them women) were trained as road builders, in addition 11 people were trained as multi-site supervisors and six as district level co-ordinators. Whereas by the end of 1983 only some 200 km of road had been improved and less than 200 people employed at any one time, by 1990 over 2000 km had been upgraded and over 3000 people employed (per year). *It can be seen that as for Kenya the lead-in time is extensive, partly because of the fact that one is establishing and staffing an institution* (McCutcheon, 1995, p. 341, emphasis added).

Apparently, the gradual learning that Hirschman envisaged when a degree of latitude is present in a

[6] Apart thus from the replacement of foreign by local personnel, the Kenyans also managed to create a more favourable institutional environment for labour-based methods of road construction. For example,

> The Kenyan government trains all foremen and overseers in both equipment- and labour-based methods. This policy creates greater uniformity in career paths. Career development in labour-based works can also lead to international opportunities. A number of Kenyan — engineers who became involved in the labour-based program later found employment internationally as labour-based experts. The ability to vie for international opportunities may be further incentive for staff to join a labour-based department (Stock and de Veen, 1996, p. 15).

project, can be achieved in Sub-Saharan Africa under the appropriate circumstances.

The Roads Programme in Kenya also exploited certain quality latitudes that favour the use of labour over capital-intensive methods of production. As shown in Table 2, these types of latitudes fall into three categories, namely, those having to do with project design, the choice of materials and design standards. (The examples cited in that table are meant to be illustrative rather than an exhaustive description of all the available latitudes.)

The Kenyans made particular use of the quality latitudes that are available in constructing and maintaining access and minor, as opposed to main roads. Being subject to less intensive use, for example, the former allow a greater degree of latitude in horizontal and geometric design standards than the latter. Access and minor roads, moreover, can be built with less precision than major roads and to this extent there is more scope for labour-based methods. With regard to the ''compaction of earthworks and the final surfacing'' for example, ''it is true that it is extremely difficult to provide the same standard using labour-based methods'' (Edmonds and Howe, 1980, p. 18).

In many other sectors in Kenya, as elsewhere in Sub-Saharan Africa, however, the scope for quality latitudes — and hence for the use of labour-based techniques — has been unnecessarily restricted by the use of developed country inputs and design latitudes.

> Standards and specifications for building materials production and use, for example are one of the most indispensable features of regulations and codes. In the absence of appropriate standards and specifications for building materials... most building regulations and codes (in Africa) make reference to foreign standards. Hence, an adverse impact on the promotion of locally produced and low-cost building materials. This frequent reference to foreign standards has also led to the use of building materials and construction techniques with high import content (Der-Petrossian, 1995, p. 7).

In its turn,

> the presence of high cost and import-based building materials and construction techniques which dominate the provisions of existing regulations and codes has had a negative influence on construction practices for the low-income population. In some instances, simple rural dwellings have been constructed in reinforced concrete technology at prohibitive costs (Der-Petrossian, 1995, p. 8).

Conversely, the adoption of lower, or intermediate, standards for building materials, would not only make housing and shelter more available to the low-income majority in Africa, but it would also enable the wider use of labour-based methods of construction. [7]

3.1.2. Pilot projects

We have already described how Hirschmanian latitudes can be used to lessen the risk and uncertainty associated with trait-making for labour-based methods of production in Sub-Sahara. We turn now to an additional tool that can be employed for this same purpose, namely, the pilot project. It is useful to distinguish between at least two forms that such projects can take, because they serve different purposes and contain different mechanisms through which the reduction of risk and uncertainty is effected. [8] On the one hand, that is to say, pilot projects can be used to test, on an experimental basis, whether the new approach is likely to be successful on a larger scale. On the other hand, pilot projects can also be used to demonstrate (on a small-scale) that a new approach is actually feasible. (The distinction is hence between the testing and promotion of new projects on a small-scale.)

In the road construction sector in Africa, pilot projects appear to have taken mainly the latter form

[7] Hirschman (1967) himself recognized this need when discussing the inadequacy of ''standards prevailing in the developed countries'' (p. 124) in the context of poor countries. He saw that ''A tendency to depart from the accepted standards may represent an attempt to find a more appropriate solution, rather than mere slippage'' (p. 125).

[8] For a fuller discussion of this point, see James (1989).

and as noted by Stock and de Veen (1996), they have often succeeded in this demonstrative role.

> Pilot projects can help promote acceptance. In general, governments in the developing world doubt the efficiency of labour-based methods, preferring to pass the risk of their initial implementation to aid agencies. Experiences in Chad, Ghana, ... Kenya and Mozambique prove that once labour-based schemes are shown to produce high quality roads in a cost-effective manner, they become politically attractive to the host government, which thereafter provides counterpart support (p. 14).

Conceived as such, moreover, pilot projects in one country can help to convince policy-makers in other, similar countries. Here again it is worth referring to the Kenya Roads Programme and in particular to the 'study tour' of the Programme that was provided to engineers and economists from other African countries, under the auspices of the International Labour Office and the Kenyan Ministry of Works. The participants were invited to visit some of the field activities and to discuss the programme with the officials most closely involved with it (de Veen, 1980). Subsequently, and based partly on that experience, a number of African countries (such as Botswana and Ethiopia) themselves embarked on pilot road construction projects based on labour-intensive methods (Edmonds and Ruud, 1984). In general, it appears that ''study tours have been particularly effective at changing attitudes in the Africa region'' (Stock and de Veen, 1996, p. 14).

Unfortunately, however, the pilot project approach has not always been used as a means of demonstrating the viability of labour-intensive alternatives to large-scale, capital-intensive methods of production in Sub-Saharan Africa. According to Green (1978), for example, part of an alternative to the controversial choice of a large-scale automated bakery in Tanzania (to which we alluded above), would have been to ''identify and support a group (or groups) interested in creating one to three test cooperative, small-scale, hand bakeries and to experiment with ways of providing procurement and marketing services to the hand bakery'' (p. 19).

4. Decentralization

4.1. Decentralization within the public sector

Though they are not often identified in the literature, there are several reasons why the delegation of authority to local government facilitates and may even be demanded by the use of labour-based methods. One such reason has something to do with the relationship between decentralization and project design and in particular the fact that

> Decentralization places decision-making where heavy equipment is often less readily available, where engineers who favour equipment-based techniques are not concentrated, and where equipment-based contractors do not see big stakes ... Thus, local government entities are likely to espouse a simpler technology that favours the use of labour rather than equipment (Stock and de Veen, 1996, p. 23).

A second reason has to do more with the political economy of technical choice and although the following citation refers to the case of road works, it also applies more generally. For what is essentially at issue is

> enlarging and strengthening the domestic constituency in favour of labour-based methods. In centralized programs, often the only stakeholders supporting labour-based methods other than the donors financing the program are the small farmers in rural areas who work on the road sites, and the small-scale contractors who have little access to equipment. In decentralized programs, however, the set of stakeholders grows to include local civil servants. These civil servants support labour-based methods because of their simplicity — they enable civil servants to manage road works that would have been managed at a higher level if carried out with equipment-based methods. In addition, decentralization often makes it easier for the supporters of labour-based methods (the contractors, the local officials, and the small farmers who work as labourers) to press their demands on government, since they may have more power at the local level and are closer to where management decisions are made (Stock and de Veen, 1996, p. 24).

From both these points of view, it is unfortunate that in most African countries the state is run along highly centralized lines. In fact, for reasons that have to do both with internal political factors as well as a tendency for foreign aid donors to bypass ''secondary structures in favour of relationships with central authorities'' (Picard, 1994, p. 8), [9] the African state is highly centralized even by Third World standards. [10]

That so extreme a degree of state centralization might hinder even the espoused political goal of promoting labour-intensive methods was recognized many years ago, as the following quotation from Phillips (1979), in the context of early Tanzanian industrialization, well illustrates. [11] In particular, he argued that,

> the pattern of investment input and output is determined by the 'locus' of control over the means of production. Technology will similarly be dependent on this control structure, and the degree to which small-scale labour-intensive techniques are possible depends on the degree of decentralisation of control and ownership. The Tanzanian economy is characterised by centralised control, strongly influenced by external trade and foreign technology and capital dependence. It follows that Tanzania's objective of relocation of industry and small-scale industrial development will not be achieved, *and technological alternatives will not be adopted, unless a far-reaching redistribution of control occurs in industry*, involving local enterprises, cooperatives, district development corporations and other organisations able to control appropriation and distribution of investable surpluses, bank credit, savings, employment policy, raw material supplies and markets (p. 86).

It was also not long after the Arusha Declaration of 1967 that precisely this problem emerged in the choice of technology for the bakery project in Tanzania, to which we have already referred in a number of other contexts. For, in addition to the traits that needed to be made in those other contexts, the hand-baking alternative also ran into a major organizational problem, namely, that ''there was no evident decentralized public sector institution to operate (them)'' (Green, 1978, p. 15). The large-scale, automated bakery, on the other hand, fitted very readily into the centralized state apparatus, through which foreign finance was generally administered without much regard to the technological aspects of development projects. [12]

It is, of course, true, that since then in Africa as indeed most other parts of the Third World, attempts have been made to strengthen local governments. Indeed, according to one observer (Manor, 1995), ''Decentralization has quietly become one of the fashions of our time'' (p. 81). And in some African countries there has been undeniable progress towards meeting this objective. [13] Yet, overall reviews of the African experience tend to suggest that progress towards a more decentralized state has at best been rather limited. Garrity and Picard (1994), for example, represent the predominant view among authorities on the subject, when they conclude that ''Throughout Africa, policy elites have been less than successful in decentralizing policy-making and administration.... Both decentralization and pluralism have foundered on lack of resources (physical and human) a lack of skills, and the lack of political will to commit to devolved, participatory government'' (p. 156).

There is, however, at least one example from the region which attests to the positive influence that decentralization can exert in favour of labour-based methods, on those (relatively rare) occasions when it has been successfully implemented. I am referring here to the case of the non-gazetted road network in

[9] In Madagascar, for example, ''decisions on public investments of regional and local interest... have remained mainly determined at the central level and almost entirely externally financed by the donor community'' (World Bank, 1999, p. 2).

[10] For empirical confirmation of this point, see Heller and Tait (1983).

[11] Clark (1978) cites many statements from Tanzania's top political leadership in favour of labour-intensive techniques in the period after the Arusha Declaration of 1967.

[12] For an extensive discussion of the relationship between aid donors and the state in Sub-Saharan Africa and the implications of these relationships for the choice of technology and the acquisition of indigenous technological capabilities, see James (1995).

[13] See, for example, Bratton and Rothchild (1994) and Oyugi (1994).

Botswana, as reported by McCutcheon (1995). In particular, ''Under its policies of decentralization and rural development, responsibility for non-gazetted roads had been given to the District Councils which were autonomous bodies falling under the overall jurisdiction of the Ministry of Local Government and Lands (MLGL). In 1980, a pilot project of labour-intensive 'district road' construction and maintenance was initiated in the Central District.... Eventually, a successful programme was established and many key aspects are similar to the RARP (the Kenyan Rural Access Roads Programme)'' (p. 341). Engineers working on the gazetted road network in Botswana, by contrast, had steadfastly ''refused to countenance the use of labour-intensive methods'' (p. 341).

4.2. Decentralization outside the public sector

As opposed to decentralization that takes place within the public sector itself, decentralization to non-state actors occurs when governments permit privately owned firms and voluntary organizations to perform tasks formerly undertaken by enterprises owned by the state. As part of structural adjustment reforms and privatization programmes, this latter form of decentralization has become increasingly relevant in recent years.

Compared, for example, to the period of African socialism in Tanzania when the choice of the automated bakery was made, the scope for decentralization to small-scale privately owned firms and voluntary organizations in that country has widened considerably, as the comparatively recent experience in the oil-processing sector well illustrates. In particular, on the basis of a low-cost, labour-intensive technology known as the ram press, and with assistance provided, among other institutions, by Appropriate Technology International (an American-based NGO), no fewer than 2000 new enterprises have been created in Tanzania and Zimbabwe, with the benefits accruing mainly to those located in dispersed/rural areas. It appears thus that the project has been highly successful not only in making scarce entrepreneurial traits but also the capabilities needed to operate the small-scale technology. As in the case of the RARP in Kenya, however, the making of the traits that are required for applying labour-intensive technology on so large a scale was not achieved in a matter of months. Rather, ''The Tanzanian (oil processing) experience indicated the importance of a sustained, gradual approach to technology transfer with a time horizon of five years or more'' (Hyman, 1993, p. 442).

What also needs to be emphasized moreover, is that this form of decentralization (to actors outside the public sector) is complementary to, rather than independent of, decentralization within the public sector itself. The reason is that highly centralized systems of government tend to be ill-informed about and hence tend to underestimate the potential afforded by small-scale, labour-intensive firms in the private sector.

> An example of how capacities of local firms are often underestimated by central government ministries is provided by Burundi and Tanzania, where private sector firms have been contracted by local governments to build sections of roads even as their respective Highway Authorities were unaware of such activities and did not know that such private contractors were available with their own road equipment (Silverman, 1992, p. 12).

5. Conclusions

In this paper, we have sought to revive an observation advanced originally by Hirschman (1967), that development projects tend to require much more change in the existing socio-economic environment than is commonly supposed (in his terms, that is to say, more traits need to be 'made' than is commonly thought, in order for development projects to be successful). More specifically, what we have argued is that if labour-intensive technological choices are to be applied more widely than has hitherto occurred in Sub-Saharan Africa, far more attention needs to be paid to trait-making of an institutional kind, especially, but not only, because of the fact that in reality the choice confronting policy-makers is between a single, large-scale, capital-intensive plant and a much larger number of small-scale, labour-intensive units of production (as opposed to the traditional depiction of this choice as being between a *single* plant which is either capital- or labour-intensive).

Some degree of institutional trait-making will need to be undertaken, for example, with respect to the

risk and uncertainty that is bound to attend the introduction (on a large scale) of labour-based methods of production, many of whose features will be new to an industrial environment where large-scale, foreign-financed projects embodying few attempts at local trait-making tend to be very much the norm. In addition it is likely that the design and administration of numerous small-scale, labour-intensive units of production (often located in dispersed rural areas) will require a far more decentralized set of institutions than currently exists in most of Sub-Saharan Africa.

The discussion of these relatively neglected problems of institutional trait-making forms the main part of our analysis, which, again, relies partly on certain Hirschmanian concepts and which draws mainly on examples from the area of road construction and maintenance, where many of the most extensive applications of labour-based methods have occurred in Africa. What appears to be common to these successful cases is that the necessary amount of institutional trait-making was explicitly taken into account in project design and implementation, not only by the state but also by foreign aid donors or international agencies. And because the state still dominates much of the industrial sector in many African countries, this policy conclusion has by no means lost its relevance to contemporary technological choices in those same countries.

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