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How can policy towards manufacturing in Africa reduce poverty? A review of the current evidence from cross-country firm studies.

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Abstract

In this paper it is argued that policy towards manufacturing in Africa can reduce poverty if such policy focuses on the creation of high paying jobs. The paper draws on a range of cross-country firm-level evidence to show how policy can promote jobs and higher real wages. It is shown that Mauritius is a country which has achieved both these objectives. The paper places Mauritius in the context of other African countries and then asks why these countries have lagged so far behind. The paper examines the policies needed to build a linkage from manufacturing to overall economic growth with a substantial impact on poverty drawing on firm-level evidence from Nigeria, Kenya, Tanzania, Ghana and South Africa.

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1 Introduction

In the last decade there have been sweeping changes in the attitude of policy makers towards manufacturing in Africa. Policy rhetoric now focuses on the need for firms to compete and the role of industrial policy is seen to be to promote the effectiveness of firms in such competition. Such a policy stands in stark contrast to the long history in Africa of protection of its manufacturing sector by means of tariffs and non-tariff barriers to imports so that domestic industry did not need to compete internationally. There has also over the last decade been a change in the rhetoric of policy makers and aid administrators to seeing poverty reduction as the core of their policy agenda. These two shifts clearly raise a question: what is the relationship of the new industrial policy to the new policies of poverty reduction?

In this paper we will seek to answer that question. In doing that we will draw on the new evidence that has been emerging of the behaviour of firms in Africa's manufacturing sector. Much of this new information is based on firm-level surveys so policy makers are now much better placed than they were to know how these firms operate and to understand the possible links from industrial policy to poverty reduction. Our purpose here is not to extend the work that has been done but to draw on it to address a range of questions relevant to understanding the links from industrial policy to poverty reduction.

There is essentially only one way that industrial policy can impact on poverty and that is through the creation of higher wage jobs. This process is closely linked to economic growth. Without rapid growth few new jobs will be created, and without access to more better paying jobs poverty reduction on anything but a very modest scale is impossible (two recent studies that emphasise the importance of growth for poverty reduction are Fafchamps, Teal and Toye, 2001, and Dollar and Kraay, 2002). The widespread view that investing in education is a key policy to reducing poverty is in fact drawing on the knowledge that those with higher levels of education get better paying jobs.

Even if it is accepted that the creation of higher wage jobs is the key to successful poverty reduction, do those jobs need to be in the industrial sector? Why could the jobs not be in mining, the services, agriculture, or in informal self-employment? What is so particular about manufacturing? Is the focus on manufacturing simply a fetish left over from the ideas of the 1960s that the industrial sector was part of the modern sector driving the engine of growth pulling workers from backward agriculture to a brighter industrial future? The argument that will be advanced in his paper is that it is a key issue for policy as to what kind of jobs are being created. There has been a long history of policy discussion drawing comparison between the informal or secondary sectors where "bad" jobs are plentiful and employment contracts short-term and insecure, and the formal or primary sector where there are "good" jobs, which tend to be in larger firms, much better paid and with much more secure employment prospects.

Thus in addressing our core question - how can policy towards manufacturing in Africa reduce poverty - we begin in the next section by examining the links between job creation, economic growth and the performance of the manufacturing sector drawing mainly on macro data. In Section 3 we ask where high paying jobs come from and present recent evidence on the links between firm size and wages. The problems posed of high wages and low demand for labour are investigated in Section 4 which draws on data showing how firms in Africa respond to high wages by using less labour. In Sections 5 and 6 we return to the issue of job creation and the manufacturing sector now using micro data to show how high-wage low-cost sectors can be created. We conclude by arguing that the creation of such sectors is the key means by which industrial policy can impact on poverty.

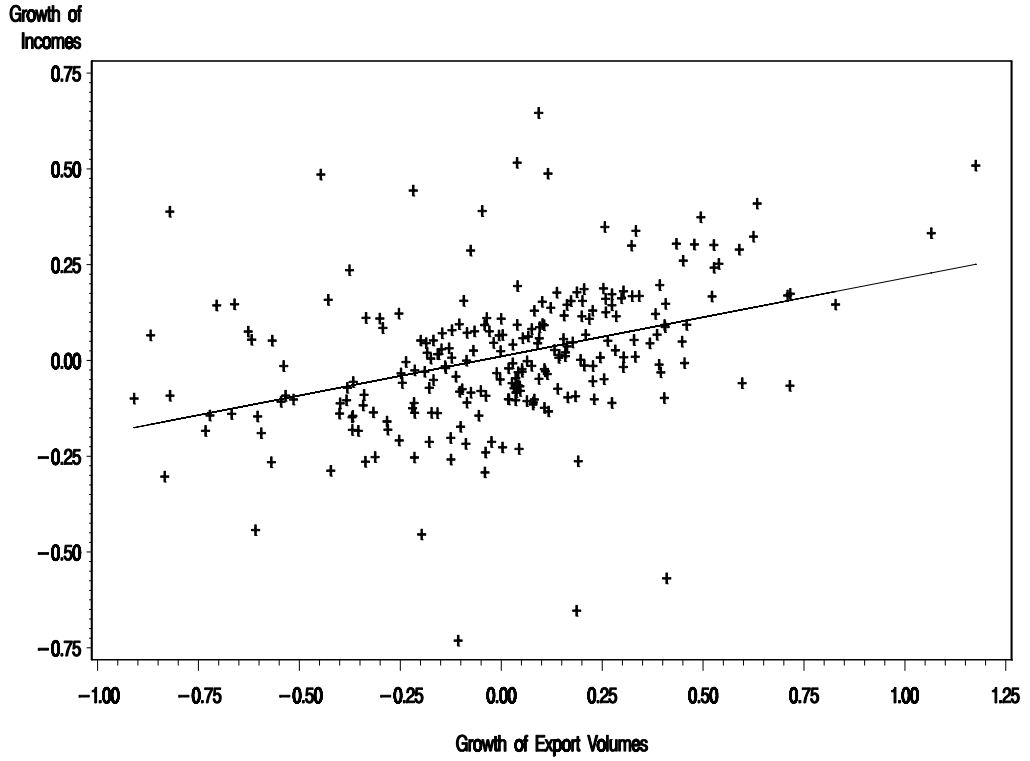
2 Jobs and the Manufacturing Sector

If the key to poverty reduction is the creation of more, and better paid, jobs where are they to come from? The most dramatic fact about developing countries in the last thirty years of the twentieth century was the contrasting fates of SSA and East Asia. In the former there was at best stagnation of jobs, of income and a wide range of health indicators, in many cases substantial decline. In the latter there was dramatic growth of incomes, new jobs and marked improvements in a whole range of welfare indicators (World Bank, 2000/01). It is often forgotten in these comparison that there is a country located in SSA which performed nearly as well as many of the East Asian NICs - Mauritius.

The achievements of the Mauritian economy are best seen in a SSA context. In the mid 1970s four countries from the continent - Botswana, Mauritius, South Africa, and Zambia - all had exports of some US$ 500 (at 1995 prices) per capita (see Söderbom and Teal (forthcoming)). By the end of the 1990s Mauritius exported more than four times as much US$ 2,200 and Botswana twice, US$ 1,000. In contrast the real value of exports from South Africa was virtually unchanged, while those for Zambia had fallen to less than one-fifth of their 1970s level. Of these four countries only Zambia experienced a long run decline in its terms of trade. This decline combined with falling export volumes ensured that Zambia's per capita exports in 1999 were reduced to just US$ 67 (at 1995 prices). So from being on a par in the early 1970s the gap between Mauritius and Zambia by the late 1990s was a factor of more than 30. These differences in export growth are associated with similarly large differences in overall incomes for these economies. This rapid growth of incomes and exports in Mauritius was associated with a rapid growth of employment in new export industries (see Milner and Wright (1998)). Such a comparison shows the extent of the differences within SSA and also how quickly they can grow. The converse also holds. If other African countries could grow as fast as Mauritius poverty could effectively be eliminated in a single generation.

What Mauritius and Botswana have in common with the East Asian NICS is the association of growth of incomes with growth of exports. However both Botswana and Mauritius are atypical of other African countries so it is of interest to ask if the data show a link from export performance to growth of GDP for other African countries. Söderbom and Teal (forthcoming) show that there is evidence from the macro data that exporting is associated with faster growth for a set of nine countries -Mauritius, South Africa, Botswana, Ghana, Kenya, Nigeria, Tanzania, Uganda and Zambia. These countries were chosen on two grounds. The first was to show the range of outcomes that have occurred in Africa. The second was that for several there are micro data on their manufacturing sector which will be used below. Figure 1, taken from Söderbom and Teal (forthcoming) shows the result of plotting the growth rate of GDP (defined as a fifth difference) on the lagged growth of exports (both on a per capita basis). It is clear that the growth of income and growth of exports are closely linked for these countries.

FIGURE 1: GROWTH OF INCOMES AND EXPORT VOLUMES*

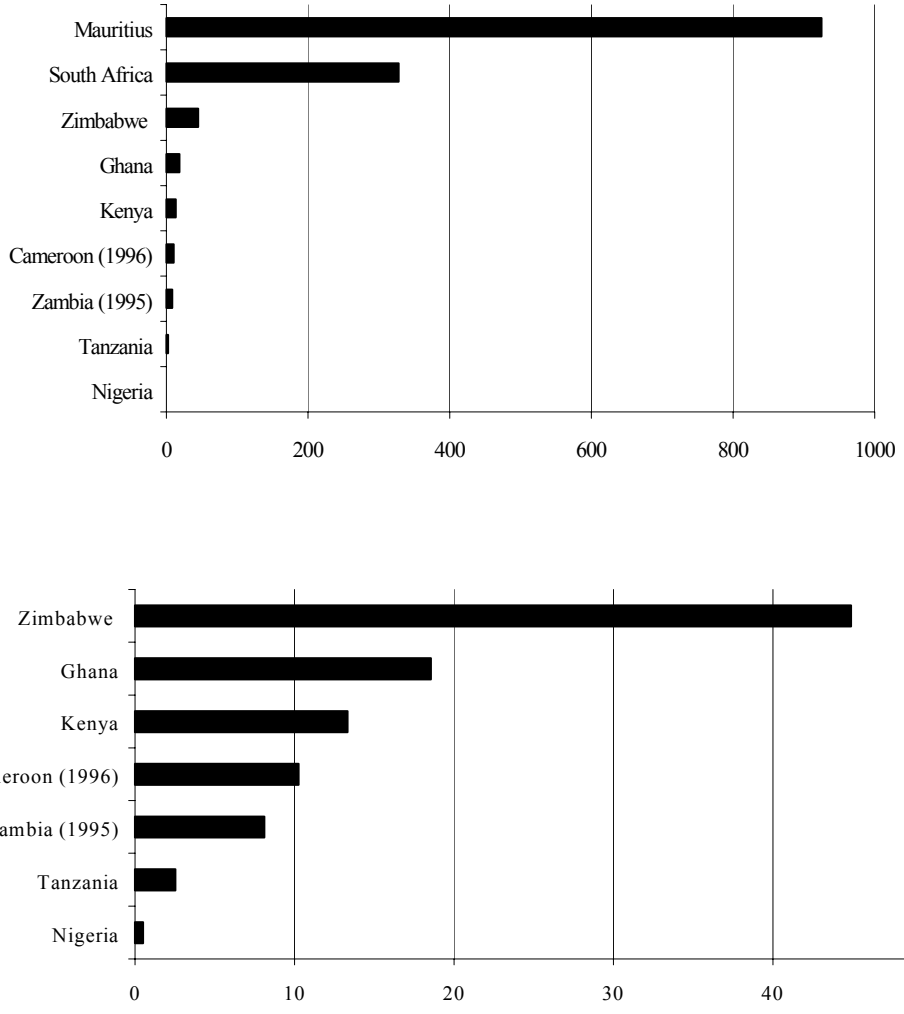


* Incomes are GDP (PPP) per capita at 1995 prices. Export volumes are constant price volume figures. The growth rate of both incomes and exports are fifth period differences. The growth rate of exports is lagged one period.
The line shown is the predicted value of the regression
$\text{Ln}(Y)_t - \text{Ln}(Y)_{t-5} = \beta\,[\text{Ln}(X)_{t-1} - \text{Ln}(X)_{t-6}]$,
where Y is per capita income and X is per capita exports.

Source: Söderbom and Teal (forthcoming).

Figure 1 refers to total exports. What was the position regarding manufacturing exports? In 1980 such exports were at a similar level in both Mauritius and South Africa, about US$ (1995) 200. After a period of stagnation exports from South Africa started to grow in the 1990s. South African manufacturing exports have grown slightly faster than overall exports during the last decade. However this achievement is markedly less than that of Mauritius where per capita exports of manufactures rose from some US$ 200 to more than US$ 900 (all at 1995 prices). Figure 2 shows the figures for per capita exports of manufactures from Mauritius and South Africa in 1999 in a wider context. In the case of all the other countries these are negligible.

FIGURE 2: MANUFACTURED EXPORTS PER CAPITA AT US$ (1995 PRICES)*



* The data are taken from the World Bank Development Indicators Data Base for 2001 and refer to 1999 unless otherwise stated.

The rapid growth of jobs in Mauritius was associated with a rapid growth of manufacturing exports (Dabee and Greenaway, 2001). Were these jobs high paying ones and why were the firms in Mauritius able to generate so many jobs? We take these questions in turn. In the next section we discuss how wages are related to firm size. In section 4 we consider how high wages can be linked to job creation.

3 High Paying Jobs and Firm Size

Teal (1999) provides a comparison between wages in the manufacturing sectors of Ghana and Mauritius. Monthly wages in Ghana were US$ 56, in Mauritius US$ 340, seven times the Ghanaian level. It seems rather clear than one very effective route out of poverty for Ghanaian workers would be to ensure that earnings levels in Ghana approach those of Mauritius. We will address the question as to how this can be done after we have considered the link between firm size and wages.

We referred in the introduction to the long history of comparing "good" jobs with "bad" ones. So what does a "good" job look like in Africa's manufacturing sector? One major factor in a characterisation of whether a job is "good" or "bad" is the size of the enterprise in which the individual works. Recent work drawing on labour market surveys has enabled the extent of the differences in wages across firm size to be documented at the level of the individual worker.[1] Table 1 is taken from Söderbom, Teal and Wambugu (2002) and allows a comparison between large and small firms in Kenya and Ghana. Earnings for workers in firms employing more than 30 workers are about twice those in firms employing less than thirty. Even if we confine attention to production workers the differences, particularly in Ghana, are large. Monthly wages in these small firms thus range between US$ 40-50. Such rates of pay are clearly low, not simply in an international context, but even within Kenya and Ghana.

The result that wages rise with firm size in developing countries has been documented in several previous studies (e.g. Mazumdar 1983; Valenchik 1997; Strobl and Thornton, 2001; Manda, 2002; and Mazumdar and Mazaheri, 2002). Hence the fact that large firms pay more than smaller ones is not in dispute. What is a matter of great controversy is why this relationship is observed. Söderbom, Teal and Wambugu (2002) discuss various explanations that have been offered. The most influential theory has been the human capital

[1] The comparison undertaken by Teal (1999) between Mauritius and Ghana was based on firm-level information on wages. It is probably better, however, to base comparisons of earnings on labour market surveys. Doing so provides not only a better measure of average wages, but also makes it possible to take differences in individual skills into account.

TABLE 1: SUMMARY STATISTICS EARNINGS AND FIRM CHARACTERISTICS

	Small firms (employment ≤ 30)				Large firms (employment > 30)			
	N	Mean	Median	Std. Dev	N	Mean	Median	Std. Dev
A. GHANA								
Earnings (all occupations)	1294	53.48	44.06	42.4	3401	121.68	77.57	142.3
Earnings (production workers)	571	41.24	37.85	21.3	1185	70.14	57.58	52.7
Employment	1294	16.47	16.00	7.3	3401	177.55	93.00	224.6
Log [Capital / Labour]	1294	7.36	7.40	1.7	3401	8.60	8.74	1.3
Log [Output / Labour]	1294	8.19	8.27	0.9	3401	8.72	8.69	1.1
Average education in firm	1294	10.04	10.39	2.4	3401	11.00	11.21	2.1
Proportion managers	1294	0.04	0.00	0.1	3401	0.03	0.03	0.0
Proportion supervisors	1294	0.05	0.00	0.1	3401	0.05	0.04	0.0
Profit per employee / 1000	1294	0.65	0.38	1.1	3401	1.32	0.86	1.9
Firm age	1291	18.87	19.00	11.6	3155	21.84	19.00	13.4
Years of education	1291	10.04	10.00	4.3	3155	12.15	11.00	4.1
Age	1291	33.91	31.00	11.7	3155	38.54	37.00	10.9
Years of tenure / 10	1291	0.70	0.40	0.8	3155	0.83	0.60	0.8
Male proportion	1291	0.76	1.00	0.4	3155	0.87	1.00	0.3
B. KENYA								
Earnings (all occupations)	664	54.16	45.57	40.6	1246	106.61	64.25	127.7
Earnings (production workers)	468	51.22	45.57	29.0	842	76.20	57.02	59.9
Employment	664	13.34	12.00	8.1	1246	216.40	90.00	355.5
Log [Capital / Labour]	664	8.23	8.55	1.7	1246	9.40	9.53	1.1
Log [Output / Labour]	664	8.51	8.55	1.1	1246	9.32	9.26	1.0
Average education in firm	664	8.38	8.37	1.4	1246	9.56	9.46	1.6
Proportion managers	664	0.17	0.14	0.1	1246	0.06	0.05	0.0
Proportion supervisors	664	0.03	0.00	0.1	1246	0.04	0.03	0.0
Profit per employee / 1000	664	1.48	0.59	3.5	1246	2.72	1.92	3.4
Firm age	629	21.16	20.00	15.4	1157	24.25	22.00	13.1
Years of education	629	8.95	8.00	2.8	1157	10.40	11.00	2.8
Age	629	32.22	30.00	10.1	1157	34.99	34.00	8.8
Years of tenure / 10	629	0.68	0.40	0.7	1157	0.86	0.60	0.7
Male proportion	629	0.85	1.00	0.4	1157	0.83	1.00	0.4

Note: All financial variables are measured in 1991 constant US$.
Source: Söderbom, Teal and Wambugu (2002).

model, where the common factor in many of the arguments is that large firms employ more skilled workers.[2] Skill in this context is defined very broadly. If this is the explanation for the firm size wage relationship, then small firms pay lower wages than larger firms because the quality of the workers is lower. Investigating this issue is difficult, however, because some dimensions of skills are not easily measured (e.g. cognitive skills, personality factors, job specific ability etc.). A significant step towards addressing this problem has recently been made in the collection of data on both firms and workers over more than one period. Data of this form is particularly useful to establish the effect of size on earnings because if we observe changes in wages for the individual worker as firm size changes, then the size-wage relation cannot be due to unobserved skills.[3] It must be because there is some causal relationship between size and wages. In fact Söderbom, Teal and Wambugu (2002) show that is exactly what we do observe in the data. Allowing for all the unobserved factors that may affect earnings they still find that as firm size changes wages of the workers in the firm alter.

It follows from this result is there has to be some factor not related to skills that determines why large firms pay higher wages than small firms. Söderbom, Teal and Wambugu consider one such factor to be imperfections in the markets for labour and capital. One implication of such imperfections is that some workers will have "good" jobs, higher paying ones in larger firms while others, who are not necessarily less skilled than those with "good" jobs, will have "bad" ones, much more poorly paid in smaller firms. If this is right there are obvious implications for both income levels and income distribution. Further, Teal (2001) shows in a comparison drawing on Ghanaian household data that the differences in income between small-scale private sector wage jobs and non-agricultural self-employment are remarkably low. These data suggest that the outside options for those working in the private sector are little if any better than for those working within the small-scale manufacturing sector. If this is so then creating "good" jobs in the manufacturing sector is the key to poverty reduction.

We return now to the question as to how high wages can be linked to high rates of job creation. The answer to that question hinges on the efficiency with which firms operate and the technology the firms choose to employ. In the next section we examine the evidence for these aspects of firm performance.

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[2] It has been argued for instance that if physical and human capital are complements in the production process, then the most skilled workers will be employed by the largest firms (Hamermesh, 1980, 1993). Others have argued that there are advantages to matching high-skill workers with other high-skill workers, and that there are fixed costs (i.e. decreasing average costs) to hiring skilled workers. Because large firms can absorb the fixed costs they are more likely to match high-skill workers.

[3] This assumes that upgrading of skills (if any) is not systematically linked to the expansion or contraction of individual firms.

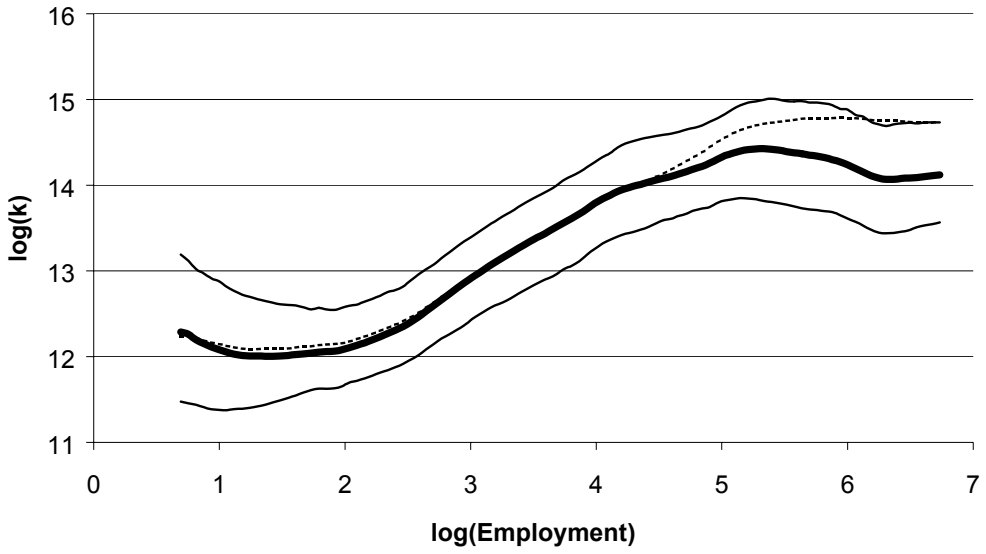
4 The Choice of Technology and Job Creation

Job creation is directly linked to the firms' demand for labour, which in turn is linked to the technology with which firms operate and the factor prices. Empirical studies based on firm-level data, both from developed and developing countries, typically report substantial variation in factor intensities across firms. Figure 3, taken from Söderbom and Teal (2002a), shows a plot of the log of the capital labour ratio against the log of firm size as measured by employment. The underlying data is from Ghana and covers the period 1991 to 1997. Over a substantial part of the size range, essentially from micro firms with less than ten employees to firms with about 150 employees (a very large firm by Ghanaian standards) there is a monotonic rise in capital intensity with size. Put differently, large firms rely relatively less on labour than do small firms. Clearly if the labour intensity in large firms were the same as that in small firms, then there would be many more jobs in the manufacturing sector than is currently the case, everything else equal. It is therefore important to understand why we observe these differences in factor intensity over the size range.

We illustrate in Figure 4 two possible mechanisms generating factor intensity differentials of the form just discussed.[4] In this graph we assume that the technology used by firms to produce output can be described by a production function, and that there are two inputs, capital (K) and labour (L). The isoquants depicted in the graphs show how firms can substitute capital for labour (and vice versa) while maintaining a constant output level. The rate at which firms can substitute one factor for another depends on the initial capital-labour ratio: for instance, the higher the capital-labour ratio, the smaller is the increase in labour required to compensate for a given decrease of capital. In addition, it is often assumed in the literature that, for a given capital-labour ratio, the substitution rate does not vary with size (this is an informal way of saying that the technology is *homothetic*). In the top panel of the figure we assume this to be the case, and consider the effects of letting the relative cost of labour increase with size. Assumed that firms maximise profits, they will select the factor combination at which the isoquant and the isocost curve are tangential (see points A, B and C in the graph). Because in this example labour is relatively more expensive for large firms, such firms choose more capital per employee than small ones. Hence factor price differentials across firms of differing size is one possible explanation for factor intensity differentials over the size range.

[4] These mechanisms have been extensively discussed in the literature on industry in developing countries, see e.g. Little, Mazumdar and Page, 1987.

FIGURE 3: CAPITAL INTENSITY AND FIRM SIZE



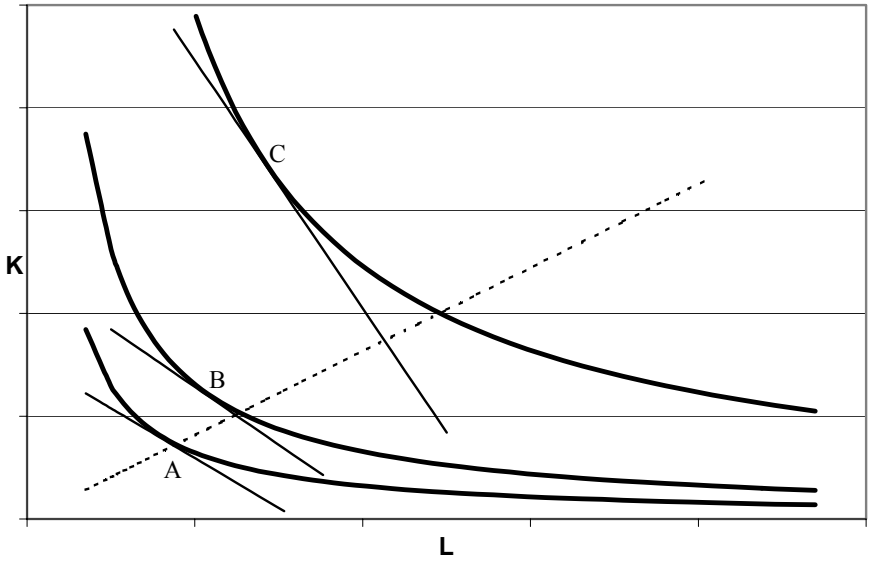
Note: The solid line shows the regression line of ln(*k*) on ln L. The kernel is Epanechnikov and the bandwidth is equal to 1.20. The thin lines indicate pointwise 95 per cent confidence bands, calculated from 800 bootstrapped replications. The dashed line shows the regression line of ln(*k*) on ln L when *k* is not adjusted for worker quality heterogeneity (see Söderbom and Teal, 2002a, for details).

In the bottom panel we consider the opposite case. Here we keep factor prices constant but assume that the technology is such that factor substitution rate for a given capital-labour ratio does vary with size (i.e. the production function is non-homothetic). Again the result is that large firms choose higher capital-labour ratios than small firms, but here this is caused by the technology rather than by factor price differentials.

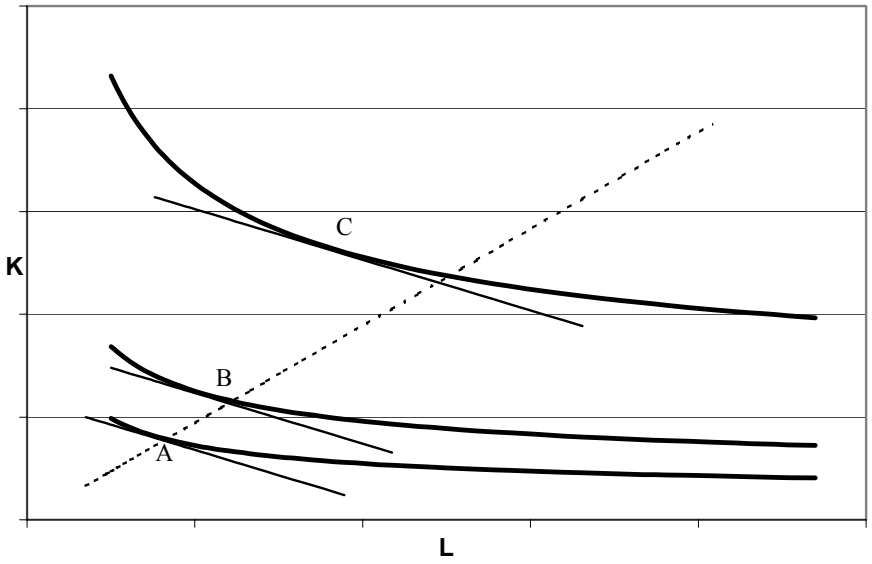
It follows from the previous discussion that patterns like that shown in Figure 3 can arise for very different reasons. If the reason is factor price differentials then policies designed to eliminate such differentials, e.g. labour market reforms, could be effective in creating more jobs. Such policies would not be effective, however, if the differing factor intensities are driven by technology differences of the kind illustrated in the lower panel of Figure 4. Söderbom and Teal (2002a) argue that the choice of higher levels of capital intensity as firm size increases is due to large firms facing higher labour cost relative to capital cost than small firms. The reasons why large firms may have access to lower costs of capital are very apparent. Many are foreign owned, banks are more ready to deal with larger firms which will have accounts that can be monitored. We have already mentioned that wages are higher in larger firms, and that this is cannot be attributed solely to differences in skills. The implications of these findings is that more jobs for a given unit of capital will be created the

FIGURE 4: TECHNOLOGY AND FACTOR PRICES

A. Homothetic Technology, Variable Factor Price Ratio



B. Non-Homothetic Technology, Constant Factor Price Ratio



Note: A, B and C indicate the points at which the isoquants and isocost lines are tangential.

lower are labour costs relative to capital. In addition, the price differentials lead to a form of allocative inefficiency, as the choice of large firms to` rely 'too much' on capital and 'too little' on labour is socially wasteful given the factor endowments of poor countries.

The analysis in this section has focused on technology choice, why more labour gets used per unit of capital in some firms than others. It highlights the nature of the problem faced by policy makers in seeking to create "good" jobs. High wage jobs go with low demand for labour so very few high paying jobs get created. How can many more high paying jobs get created?

5 Manufacturing Exporting Firms

We seek an answer to that question in two steps. The first is to consider where more jobs are going to come from. The second is how high wages can be linked to these new jobs. We would argue that the implication of the facts set out in section 2 above is that new jobs must come from exporting. Africa's domestic markets are simply too small. Thus in addressing the issue of the sources of jobs we need to address the issue of the determinants of exports. In addressing the issue of what determines exporting success we draw on two studies. Teal (1999) examines the manufacturing sector of Mauritius and Ghana while Söderbom and Teal (forthcoming) analyse the decision to export for five African countries - South Africa, Nigeria, Tanzania, Kenya and Ghana - and also consider the implications of exporting within and outside of Africa.[5]

Summary statistics of key variables from Söderbom and Teal (forthcoming) are shown in Table 2.[6] The average firm size ranges from 78 employees in Tanzania to 246 in Nigeria, and it is clear from the standard deviations that the size range is quite large. The smallest firm in the sample has one employee, while the largest employs more than 5,000 individuals. Labour productivity, measured by output per employee is highest in the South African sample and lowest in Ghana. These differences in labour productivity are mirrored in

[5] The comparison uses a sample of firms collated from various surveys of African manufacturing firms, see Rankin, Söderbom and Teal (2002) for a background to the Ghanaian data set, Söderbom (2001) for information on the Kenyan data set, Söderbom and Teal (2002b) for the Nigerian data and Harding, Söderbom and Teal (2002) for the Tanzanian data. The South African data comes from a joint World Bank / Greater Johannesburg Metropolitan Council survey conducted in 1999. This survey includes only firms with over 50 employees and was limited to the Greater Johannesburg Metropolitan Area. All data sets except the South African one contain multiple observations on the same firms over time, i.e. panel data.

[6] In order to compare the data across countries constant price figures for each country are calculated and then converted to USD using the official exchange rates in 1992.

TABLE 2

MANUFACTURING FIRMS IN FIVE AFRICAN COUNTRIES: SUMMARY STATISTICS

	Ghana	Kenya	Nigeria	South Africa	Tanzania
A. All Firms					
Employment	82.86	110.07	246.31	206.09	77.64
	179.74	*247.39*	*753.79*	*289.43*	*226.87*
ln Ouput / Employment	8.15	8.90	8.46	10.55	8.23
	1.24	*1.28*	*1.48*	*0.67*	*1.36*
ln Capital / Employment	7.09	8.62	8.24	9.69	7.61
	2.01	*1.72*	*2.12*	*1.21*	*1.87*
Any Exports	0.19	0.35	0.08	0.70	0.17
Firm Age	18.37	20.98	20.19	76.56	16.50
	11.96	*13.66*	*10.44*	*17.62*	*13.23*
Any Foreign Ownership	0.21	0.18	0.24	0.22	0.21
Food	0.24	0.22	0.09	0.08	0.23
Metal	0.23	0.26	0.31	0.75	0.29
Textile	0.03	0.08	0.22	0.05	0.07
Garment	0.19	0.19	0.28	0.00	0.12
B. Exporters Only					
ln Capital / Employment	8.55	9.68	8.92	9.72	8.96
	1.49	*1.10*	*1.69*	*1.28*	*1.67*
Employment	209.39	231.09	1191.95	236.93	230.90
	252.66	*360.67*	*1902.44*	*300.97*	*456.20*
Observations	919	722	255	179	547
(Firms)	(202)	(321)	(109)	(179)	(198)

Note: All financial variables are measured in constant 1992 USD. Numbers in regular fonts are mean values and numbers in *italics* are standard deviations. Standard deviations are not reported for dummy variables.
Source: Söderbom and Teal (forthcoming).

capital intensity in that Ghana has the lowest level of capital per employee and South Africa the highest. The export intensity varies substantially across the countries. More than half of the South African firms are exporters, while only eight per cent of the Nigerian firms export. It can be seen in the lower part of the table that exporters are larger, and have a higher level of capital-intensity than non-exporters.

In the empirical analysis variable we model labour productivity as a function of factor inputs normalised by employment. The export equations are estimated by means of a model which allows us to show how various factors influence the chances of a firm being able to export (formally it is called a bivariate probit model). The productivity equation and the export equations are estimated together.[7] Results are presented in Table 3, where gross output per employee is modelled in column [1a], the export equations are in columns [1b] and [1c] and an equation describing the differences in capital intensity is presented in column [2].[8] The omitted country dummy in these regressions is Ghana and the omitted industry is wood.

In the output production function constant returns to scale at the 1 per cent level cannot be rejected. South African firms have the highest average total factor productivity, everything else equal, followed by Ghana. There is no significant difference in underlying productivity for Kenya, Nigeria and Tanzania. The productivity span across countries is such that the average productivity of South African firms is about 36 per cent higher than that of the Nigerian or Kenyan firms. There is no evidence that older firms, or firms with any foreign ownership, have significantly higher productivity.

The most important factor which determines whether or not a firm exports, whether regionally or internationally, is its size (Table 3 columns [1a] and [1b]). Most of the firms with more than 100 employees export, most of those with less than 100 employees do not.[9] This result is consistent with the low volumes of manufactured exports in Africa as most firms are not large. There is no evidence that firm age, which can be interpreted as a proxy for firms' learning, or having some foreign ownership, increases the probability of being in the export market. In contrast capital intensity is positively associated with being in the export market, even if we control for size.

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[7] In doing so we assume all explanatory variables to be exogenous. While this may appear a strong assumption, perhaps particularly for the production function, the available evidence indicates that this is not so. Söderbom and Teal (2002a) estimate production functions based on Ghanaian manufacturing panel data and show that inputs can be assumed to be determinants of outputs. Bigsten et al. (2002) obtain a similar result for using data across four African countries.

[8] Value-added production functions appear to be more common in the literature, however research by Basu and Fernald (1995) shows that adopting a value-added production function can yield misleading results if there is imperfect competition or increasing returns to scale.

[9] Confining attention to firms with more than 100 employees, between 58 and 80 per cent of the firms in Ghana, Kenya and South Africa are exporters. For Tanzania and Nigeria, the corresponding numbers are 39 and 13 per cent, respectively. Pooling the sub-sample of large firms across countries, we find that 57 per cent of the firms do some exporting.

TABLE 3

FIRM-LEVEL ANALYSIS OF PRODUCTIVITY AND EXPORTING IN FIVE AFRICAN COUNTRIES

	[1a] Prod. Function	[1b] Export Probit Within Africa	[1c] Export Probit Outside Africa	[2] ln Capital / Employment
ln Capital / Employment	0.04	0.16	0.10	
	(4.31)**	(4.02)**	(2.32)*	
ln Raw Material / Employment	0.67			
	(43.31)**			
ln Indirect Costs / Employment	0.18			
	(14.43)**			
ln Employment	0.02	0.33	0.34	0.49
	(2.35)*	(5.52)**	(6.13)**	(12.02)**
Firm Age / 100	0.12	-0.10	-0.10	0.01
	(1.80)$^{+}$	(0.27)	(0.23)	(3.37)**
Any Foreign Ownership	0.04	0.22	0.14	0.49
	(1.46)	(1.21)	(0.96)	(3.52)**
Food	-0.01	-0.26	-0.85	0.59
	(0.13)	(1.21)	(4.27)**	(2.94)**
Metal	0.00	0.24	-1.47	0.18
	(0.04)	(1.25)	(7.38)**	(0.90)
Textile, SSA	-0.09	0.36	-0.93	0.19
	(1.48)	(1.35)	(3.39)**	(0.83)
Garment, SSA	0.04	0.16	-0.49	-0.69
	(0.81)	(0.67)	(2.00)*	(2.94)**
Textile, South Africa	-0.07	0.37	-1.51	-1.37
	(0.94)	(0.40)	(2.59)**	(3.04)**
Furniture	0.04	-0.23	-1.13	-0.55
	(0.73)	(0.86)	(4.87)**	(2.63)**
Kenya	-0.10	0.71	-0.31	1.39
	(3.16)**	(3.57)**	(1.75)$^{+}$	(9.76)**
Tanzania	-0.08	0.27	-0.27	0.59
	(2.57)*	(1.40)	(1.35)	(3.51)**
Nigeria	-0.10	-0.82	-0.71	1.01
	(2.45)*	(3.27)**	(2.39)*	(4.68)**
South Africa	0.22	0.93	0.92	0.90
	(3.71)**	(3.79)**	(3.07)**	(3.30)**
Residual Correlations[$]:	$\rho_{ac} = 0.08$	$\rho_{ab} = 0.05$	$\rho_{bc} = 0.46$	
	(2.38)*	(1.43)	(7.04)**	
Log likelihood value		-2679.2		
R^2				0.47
Observations		2662		2662

Table notes on the next page.

Note: The three equations [1a]-[1c] were estimated simultaneously using maximum likelihood, whereas equation [2] was estimated using OLS. Dummy variables for time are included in all regressions. The numbers in ( ) are t-statistics based on standard errors robust to heteroskedasticity and intra-firm autocorrelation. Significance at the 1 per cent, 5 per cent and 10 per cent level is indicated by **, * and + respectively.

$ ρ_{ac} is the estimated correlation between the residuals in equation [1a], i.e. the production function and [1c], the probit for exports outside Africa. Similarly ρ_{ab} is the estimated correlation between the residuals in equation [1a] and [1b], the probit for exports within Africa and ρ_{bc} is the estimated correlation between the residuals in equation [1b] and [1c].

Source: Söderbom and Teal (forthcoming)

Finally the estimated ρ_{ac}, which measure the correlation between the unobserved component of productivity and the unobserved component driving *international* exports, is positive and highly significant. This indicates that, even conditional on factor inputs and control variables, international exports and productivity are correlated. This is consistent with there being a link between unobserved efficiency and exporting. It will be noted that while there is a positive correlation between efficiency and exporting within Africa it is not significant.

Economic theory suggests that African countries should export labour rather than capital intensive manufactures. There has been dispute as to whether Africa's factor endowment does permit it to compete in international markets for labour-intensive goods, see discussion below. Table 3 equation [2] shows that the sectors which have the lowest capital intensity (i.e. are the most labour intensive) are the textile sector within South Africa and the garment sector in the other SSA economies.[10] However it is clear that capital intensity increases with firm size. Further controlling for size, older firms and those with some foreign ownership are more capital intensive. The table shows that firms in the garment sector are more likely to export to international markets than all sectors except the omitted one, which is wood. The wood sector may be exploiting Africa's natural resources, the garment sector its potential cost advantage in labour-intensive products. This pattern is not observed for the propensity to export regionally. Here there are no significant differences across sectors in the propensity of firms to export.

There is here clearly some evidence that some African firms are able to export internationally. However we know from the macro data we have surveyed how limited has been success in this area. Only Mauritius has been able to create manufacturing jobs of a major scale. What is stopping other countries in Africa from being equally successful?

[10] The South African data set does not distinguish between textiles and garments, hence we define three dummy variables: Garments, SSA; Textile, SSA; Textiles and Garments, South Africa.

Answering that question takes us back to where we began because if such jobs can be created then the impact on poverty will be immediate and dramatic.

6 A Virtuous Circle: Exporting, Productivity and Real Wages

What will provide the key to success in Africa's manufacturing sector? We have argued there is a linkage from the productivity with which firms operate to the decision to export. There are two main reasons why exporting and productivity may be positively correlated: first, relatively productive firms may self-select into the export market; second, firms may become more productive as a result of exporting through a process of learning (see Clerides, Tybout and Lach, 1998). It is the possibility of learning through exporting that provides the key to a possible virtuous circle by which more efficient firms are able to export, such exporting leads to learning, i.e. decreasing average costs, which makes possible further profitable exporting. The work of Bigsten et al. (2002) deals with many of the econometric problems that make identifying this effect difficult and shows that learning by exporting is a real possibility for African economies. Söderbom and Teal (2000) provide more detailed analysis for Ghana and show that the efficiency with which a firm operates appears to be important in continuing in the export market. They do not investigate the possibility of feed-back between exporting and efficiency. It was shown in Section 5 that, in a large and more comprehensive data set than that used by Bigsten et al. (2002), there is a strong correlation between exporting *outside of Africa* and productivity.

Even if this evidence for a two-way link between technical efficiency and exporting is accepted it does not, of course, answer the more fundamental question as to what gets this virtuous circle started. One of the rather striking finding from the production function estimates reproduced in Table 3 is that while, at the 10 per cent significance level, there is some evidence of firm learning with age this effect is very small. Ownership also does not affect the underlying efficiency with which the firm operates. So it looks as though there are no quick fixes. It appears not to be true, in our data, that ownership has powerful effects on productivity or that firm learning is an important source of productivity growth. However both these conclusions may be suspect. Our sample may be confined to countries whose policies have made failure inevitable.

Accounts of the success of the Mauritian economy (see Dabee and Greenaway, 2001) highlight the role of several factors very specific to that economy. The first is the switch from a focus on import substitution to one of export orientation, a second is the introduction of new industries in an EPZ (Export Processing Zone) and a third was the protection offered by the MFA (Multi-Fibre Arrangement) which limited competition from other low cost producers. Possibly of particular importance in the case of Mauritius was the advent of new expertise. Durbarry (2001, p. 122) notes that "another factor that played a part in favour of Mauritius

was political uncertainty in some potential competitor countries. For instance, the political situation in Hong Kong attracted many businessmen to Mauritius in search of a safe haven for their capital and manufacturing operations. These entrepreneurs not only brought capital, but also know-how and a marketing network with them". Teal (1999) has data which shows the much higher levels of technical efficiency in Mauritian than Ghanaian firms. There are numerous reasons why the figures may exaggerate the differences but they are consistent with a key to Mauritian success being the much higher levels of technical efficiency. It is far from clear which, if any, of these factors were the key one in enabling Mauritian firms to grow and their exports to expand. One lesson of the experience may well be that many of these policies are linked, that favourable tax treatment for exports, macroeconomic stability, technical expertise to raise the efficiency of firms, trade preferences and knowledge of export markets are all elements of a successful mix of policies.

There are other possible ways the virtuous circle could start. We have argued that labour and capital costs do differ significantly over firms of differing size. Again Mauritius may be a useful example. It is clear that employment expansion came from female workers who previously had not been manufacturing sector employees. This labour was cheaper than male labour. In other words lowering labour costs - which is clearly one way that incentives to use a more labour intensive technology can be put in place - does not necessarily mean reducing wages. It can mean allowing workers excluded from the market to enter. Possibly the policy choices which would be most effective would be those which made possible both lower capital and labour costs with the latter being lowered relative to the former at the same time. High capital costs will limit investment and growth and it is quite possible that lower labour costs are insufficient by themselves to make additional investment profitable.

Clearly what underlies the export decision is the profitability of exporting relative to other activities. The profitability of exporting will depend on the productivity with which the firm operates and its cost. If it is in a labour intensive sector then its profitability will be high relative to other sectors if labour cost are low relative to capital. We would argue that the key to success in an area where Africa has a potential cost advantage – labour intensive garments – is to enable large firms to use a more labour intensive technology than is the case at present. The policies that can bring that about are likely to be specific to country and time. However the experience of Mauritius indicates the magnitude of the gains that are available if a successful mix of polices can be found.

7 An Overview

In this section we provide an overview of our argument and highlight the nature of the issues that policy makers need to address.

- There is essentially only one way that industrial policy can impact on poverty and that is through the creation of more and higher wage jobs.
- The process of creating more jobs depends on rapid growth in the economy. The poverty reduction aspects of industrial policy operate through workers getting access to more better paying jobs. Without such access poverty reduction on anything but a very modest scale is simply impossible.
- Why could the jobs not be in mining, the services, agriculture, or in informal self-employment? What is so particular about manufacturing? The answer is that manufacturing is one of the few sectors which is export focused and can be labour intensive. Tourism is another but that is outside the scope of this paper.
- Research shows that there are close links between exporting and success. Countries which have grown rapidly have had rapid export growth. In the case of Mauritius a large part of that success was in manufacturing exports.
- One key to such success is the efficiency with which firms operate.
- In this paper we identify the possibility of a virtuous circle by which more efficient firms enter the export market and such firms in turn learn from exporting thus increasing their technical efficiency.
- So the policy question is how to get this virtuous circle stated.
- We argue that there is no magic formula. In our sample of firms there is little evidence that foreign ownership has very much impact on efficiency or that firms can lower costs over time, i.e. they learn from experience.
- Our sample may be too limited to pick up such effects. Mauritius offers an interesting case history. One lesson of their experience my well be that a mix of policies is required.
- Favourable tax treatment for exports, macroeconomic stability, technical expertise to raise the efficiency of firms, trade preferences and knowledge of export markets were all elements in the mix of policies adopted by Mauritius which proved successful.
- For countries wishing to emulate their success we argue that a focus on how to export and how to make those exports labour intensive is a key to linking industrial policy to poverty reduction.

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