Firm Growth, Productivity and Earnings in Tanzanian Manufacturing 1992-1999*

January 2002

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*This report has been prepared by Alan Harding, Godius Kahyarara and Neil Rankin with additional contributions from Francis Teal and Måns Söderbom**.** It is intended to provide a general overview of some of the main findings of Wave 4 of the Tanzanian Manufacturing Enterprise Survey (TMES). The data is still subject to revision in the light of new information being obtained. A final report will include more comprehensive information and additional topics. The opinions, figures and estimates set forth the report are the responsibility of the authors, and should not necessarily be considered as reflecting the views or carry the endorsement of CSAE, ESRF or UNIDO.

The data for 1992-95 which is used in this report was collected by a team from the Helsinki School of Economics and University of Dar es Salaam. These three surveys were part of the Regional Program on Enterprise Development (RPED) organised by the World Bank. The original questionnaire was designed by a team from the World Bank. The data for 1996-98 was collected by a team from the Centre for Study of African Economies, University of Oxford and the Economic and Social Research Foundation (ESRF), Dar es Salaam with funding from the UK's Department for International Development (DFID). The National Bureau of Statistics in Dar es Salaam and the regions provided invaluable support.

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1. Introduction

In this report we examine growth, productivity and earnings trends in Tanzania's manufacturing sector during the 1990s. One of the objectives of economic reforms towards the manufacturing sector in Tanzania, as in other African countries, is to reduce barriers to entry and increase competition in both output and input markets. One of the potential benefits of such reforms to firms is that they may induce a significant increase in firm-level productivity. We examine trends in both labour productivity and underlying productivity during this period. One potential benefit to workers of such reforms is that real wage rises will be possible. Wage rises that match rises in productivity provide the basis for gains for both firms and their workers. We also examine trends in real wages over this period.

The reform process is intended to do more than simply improve firm performance. It is intended to provide the basis for more rapid growth both for firms, in all sectors, and for employment. The survey data can provide information on the extent to which employment has been increasing or decreasing in the manufacturing sector. The link between productivity and real wages is a crucial one. The higher is labour productivity relative to wages the more profitable the firm and the greater its incentive to invest. Such investment will, if it is in sectors which employ a lot of labour, lead to increases in the demand for labour. Increasing the number of jobs as well as the wages of workers are important objectives of the reform process. The key to both is the ability of firms to improve their productivity and undertake profitable investments.

There has been an increase in interest in recent years in sources of productivity growth in a number of both industrialised and developing countries. One means by which the productivity of a sector might rise is if the firms which close down are the ones with particularly low levels of productivity. Studies on Columbia and Chile (Liu and Tybout, 1996; Pavcnik, 2000) find that productivity levels of exiting plants are lower than the average. Another means by which productivity in firms will be able to grow is if new firms arising in the market have, or can rapidly attain, higher levels of productivity than older ones. Such productivity growth may be associated with an increase in the market share of the firm. It might lead the firm to be able to enter the export market. It might provide the basis for increased profits and more rapid investment. All of these are potential sources of future gains for the firm as exports provide new markets and investment can take the form of new and better equipment. In the past firms in Africa's manufacturing sector have been inward focused, with low productivity and low levels of investment. With limited domestic demand their growth prospects were extremely poor. Can reforms which lead to higher productivity provide the basis for a permanent reversal of this history of limited achievement?

In examining firm performance we will address the issue of whether firms of different size, or in different sectors, differ either in efficiency or in other ways. Economies of scale are one potential factor determining observed variation in productivity levels within specific industries and across firms of differing size. This issue of scale is of importance since there has been a significant reduction in the average size of manufacturing plants in our sample of Tanzanian firms over the period observed. Downsizing of operations, through reductions in levels of plant utilisation, reductions in permanent employment levels and a move to the increasing use of casual piece-rate

labour, has been one of the main responses of Tanzanian manufacturing firms to the changing economic conditions faced during the 1990s. The question remains whether this is a beneficial or detrimental change? Will declining firms and sectors eventually be replaced by more productive and dynamic entrants?

In this report we use the sample of Tanzanian manufacturing enterprises covering 1992 – 98 to examine these issues. In the next section we describe the data used in this Report. The report is then structured to provide information on the following issues:

1. How fast have Tanzanian firms grown over this period?
2. What have been the trends in productivity?
3. Are small firms more likely to go out of business than larger ones?
4. Which kinds of firms export and what constrains others from entering the export market?
5. How have wages of workers grown over the 1990s?
6. How do productivity and earnings in Tanzania compare with other African countries?

We also provide a data appendix which gives further details about (a) the sample of firms included in the survey, (b) how the main variables have been obtained and (c) the price series used in the calculation of real output, value added and the capital stock.

2. Data Used in the Report

The data is drawn from a panel of Tanzanian manufacturing firms covered by the RPED surveys (for the 1992-95 period) and a follow-up survey conducted in 1999 which collected data for all surviving RPED firms for the period 1996-98 (a total of 89 firms) plus a further 106 replacement firms. The survey covered four main manufacturing sectors, which are the largest in terms of their contributions to manufacturing value added (MVA) and employment. Where possible we disaggregate into ten subsectors - food processing, bakeries, beverages, textiles, garments, shoes & leather products, wood processing, furniture, fabricated metal and machinery. Significant work has been undertaken to ensure the consistency of the main data series for the firms interviewed in both the earlier and later surveys. We have undertaken some revisions to the original RPED data in the light of subsequent more reliable information about individual firms in the sample. We have also excluded a limited number of firms from the original RPED sample where there was evidence that (a) they were not involved in manufacturing their own products, but rather were involved in trading or service provision or (b) they were not in fact commercial enterprises but rather government-sponsored training institutes.

Data was collected at the firm level on firm output levels and direct and indirect input costs, levels of employment and the replacement and resale value of plant, machinery and other fixed assets. Interviews with a sub-sample of the firm's workforce gathered information on their occupational categories, levels of education and experience. Together with information about the firm's overall employment structure, these were used in the construction of firm-specific average human capital measures. The structure of the survey questionnaire was designed to make it comparable with those undertaken

in other RPED countries, although there was some variation over the rounds of the survey.

While an attempt has been made to gather panel data by following the same, representative, sample of firms over time, the high degree of firm turnover means that the balanced panel number of observations is relatively small. Replacements for exiting firms were chosen to be representative of the stratification by sector, size and location of the original sample. Hence, we also believe that the descriptive statistics (e.g. of firm growth rates over the period) can claim to be broadly representative of changes in the wider population of firms. In the section on productivity determinants, we exclude 11 remaining 100% parastatal firms in the sample from our analysis, due to the range of non-market factors which have affected their performance in recent years (for example, some have temporarily ceased production while in an ongoing privatisation programme rather than closing down definitively).

The incorrect measurement of manufacturing value added (MVA) has been frequently raised as an explanation of conflicting findings concerning productivity growth rates in the USA and UK economies during the 1970's. Given that our focus is on the manufacturing sector, we are fortunately able to abstract from additional problems faced when trying to measure outputs and inputs into service industries and other sectors which do not involve physical products and transformation processes. However, care needs to be taken in using value added as a measure of firm productivity, its construction implicitly assumes competition and constant returns to scale (Basu & Fernald, 1995). The methods used to construct the value added series and the capital stock measure are described in the data appendix. For consistency, we use an imputed capital stock series which augments the firm's replacement value of plant and equipment with subsequent investments (while also allowing for depreciation).

The use of constant price series for gross output, value added and the capital stock presents an additional problem concerning the appropriate price deflators to apply to inputs and outputs. Our dataset covers a period during which Tanzania experienced substantial price inflation and a large nominal devaluation of the shilling (see Appendix tables A2 and A5). Consumer price inflation peaked at 33.1% in 1994. The Tanzanian shilling fell from an annual average of 297.71 against the US dollar in 1992 to 739.25 in 1999. However, high domestic price inflation means that the real exchange rate has appreciated by about 30% over this period. To the extent that inputs of manufacturing firms are imported, their domestic prices will have been additionally distorted by tariffs and other taxes, presuming that these were effectively implemented. We are able to use sector-specific producer price series to deflate gross output (Table A3). Due to lack of reliable input price series, we have chosen to deflate value added using the same index.

Table 1

Firm Growth Rate Calculations by Firm sector

Growth Rates using Matched Samples for Adjacent Years - Changes in Logarithmic Means

Real Output (1992 Shillings,millions)	**1992**	**1993**	**1995**	**1997**	**1998**	**% change over period**	**annual growth**
Food & beverages	1,520.0	1,600.5	1,328.4	1,446.7	1,410.5	-7.2%	-1.2%
Textile & garments	264.0	306.5	223.1	153.0	141.6	-46.4%	-7.7%
Wood & Furniture	36.4	40.1	41.6	28.1	24.5	-32.6%	-5.4%
Metal & Machinery	78.0	73.9	51.0	53.1	44.0	-43.6%	-7.3%
All Firms	361.4	382.7	323.0	279.7	248.7	-31.2%	-5.2%

Real Value Added (1992 Shillings,millions)	**1992**	**1993**	**1995**	**1997**	**1998**	**% change over period**	**annual growth**
Food & beverages	612.2	577.9	625.8	671.5	662.1	8.2%	1.4%
Textile & garments	106.3	108.0	94.2	42.9	40.6	-61.8%	-10.3%
Wood & Furniture	14.3	16.7	19.1	11.2	9.7	-32.2%	-5.4%
Metal & Machinery	33.4	29.9	30.9	35.2	29.0	-13.1%	-2.2%
All Firms	146.1	144.6	150.0	115.6	104.8	-28.3%	-4.7%

Employment No. employees	**1992**	**1993**	**1995**	**1997**	**1998**	**% change over period**	**annual growth**
Food & beverages	223	200	168	179	192	-14.2%	-2.4%
Textile & garments	252	220	210	188	183	-27.1%	-4.5%
Wood & Furniture	46	46	43	36	33	-27.3%	-4.5%
Metal & Machinery	48	42	36	32	30	-37.0%	-6.2%
All Firms	127	116	106	93	90	-29.1%	-4.8%

Real Capital Stock (1992 Shillings,millions)	**1992**	**1993**	**1995**	**1997**	**1998**	**% change over period**	**annual growth**
Food & beverages	4,334.6	4,226.2	4,226.2	4,399.5	4,188.3	-3.4%	-0.6%
Textile & garments	1,313.7	1,003.7	1,055.8	1,040.0	994.3	-24.3%	-4.1%
Wood & Furniture	65.6	48.5	51.0	49.2	48.8	-25.7%	-4.3%
Metal & Machinery	180.3	177.7	178.1	175.8	168.4	-6.6%	-1.1%
All Firms	1,158.9	989.7	1,019.4	977.6	945.3	-18.4%	-3.1%

Note: sectoral trends are based upon small sample sizes (for the 1995-97 period) and are hence indicative only

3. The Growth of Firms in Tanzanian Manufacturing

A summary of growth patterns observed in our sample is given in Table 1. Growth rates are calculated by matching observations on the maximum sample of firms in adjacent years and then using the change in the logarithmic mean of the relevant variables between periods to build up a pattern of growth over the period. Between 1992-98, real output levels are shown to have declined by 31% and employment levels by 29% in the sectors under consideration. Amongst private firms with more than 50 employees, aggregate employment levels have fallen even faster, by over 50% during this period.

One important consequence of the observed growth patterns for our analysis of productivity trends is the decline in average firm scale over this period, both within our sample and probably within the population of firms in these sectors. The effects on our sample composition are presented in Table 2 which gives a breakdown of average firm size and labour productivity levels by round of the survey. Mean employment levels have fallen from 96.9 in round 1 to 56.5 by round 6. This may be partly due to changes in the sample composition, but is broadly consistent with the growth trends described above. Given that labour productivity levels and degree of capital intensity are strongly correlated with firm size (see Table 3 below), this decline in firm scale may have implications for average industry productivity levels.

Table 2
Average Firm Size and Productivity Levels by Round of Survey

		N	Emp	Ln (Emp)	Vad/Emp	Ln (Vad Emp)	Capital/ Emp	Ln (Capital/ Emp)
1992	mean	198	98.6	2.89	467.4	12.23	2,391	13.14
	std		300.9	1.67	979.9	1.29	4,639	2.11
1993	mean	177	85.1	2.82	461.5	12.08	2,270	12.84
	std		262.4	1.57	1954.1	1.36	4,922	2.27
1994	mean	130	66.5	2.87	406.1	12.12	2,859	12.78
	std		218.3	1.35	1234.3	1.32	7,956	2.34
1995/96	mean	56	96.5	3.42	682.5	11.94	3,048	13.53
	std		257.4	1.50	1164.8	1.25	7,501	1.76
1997	mean	117	59.3	2.86	492.2	12.57	2,429	12.83
	std		187.8	1.42	112.4	1.27	6,158	2.18
1998	mean	182	55.4	2.67	424.3	12.08	2,282	12.63
	std		178.7	1.43	768.4	1.35	5,925	2.28

Note: Real Vad/Employee and Real Capital/Employee are measured in 1992 constant prices, thousands of Tanz. Shillings

The net effect of decline in the scale of firm activities of this kind on average productivity levels is not straightforward. We might expect to observe a decline in productivity levels in the short-run as firms reduce output, without commensurate

reductions in the level of labour and capital inputs, due for example to restrictive employment regulations or the lack of a market for second-hand capital equipment (making existing capital investments irreversible). However, firms might also respond to changing market conditions by changing their production technologies or by achieving higher efficiency levels with lower levels of inputs for given output.

4. Productivity by Firm Size and Sector

In this section we examine the distribution of productivity levels across firms of different sizes and sectors. We also examine other potential determinants of firm-level productivity including the degree of capital intensity, the level of human capital endowments of the firm's workforce and the degree of export orientation. We are particularly interested in examining whether there are any significant changes in average productivity levels within the manufacturing sector.

A rise in average productivity levels might be due to a number of effects including

a. increases in productivity levels of individual firms over the period attributable to firm learning or technical change,

b. the exit of low productivity firms and their replacement by new firms exhibiting greater productive efficiency levels,

c. changes in the size distribution of firms in industries where increasing returns to scale are an important factor,

d. increases in the output share of high productivity firms compared to low productivity firms.

In Tables 3 and 4 we present some descriptive statistics for the main variables of interest when considering these issues of productivity. These are real value added per employee (a measure of labour productivity), real capital per employee and total firm employment. We also include two measures of firm-level human capital, which are the average years of education of the firm's workforce, which proxies for skill levels, and the average length of tenure of workers within the firm, which proxies for experience.

Table 3 shows that labour productivity increases continuously with firm size, although small and medium sized firms are quite similar. It is clear from the Table that micro firms, those with less than six employees, are distinctive in having both very low labour productivity and small amounts of capital per employee. These firms are ones which generate large numbers of jobs for each shilling of capital. While small and medium sized firms use more capital per employee than micro ones (about twice as much) they use much less capital than large firms, those with more than 100 employees. If we compare small with large firms from Table 3 we see that value-added per employee (our measure of labour productivity) rises by some four times as does capital per employee. These findings are consistent with the existence of constant returns to scale, by which output grows in line with inputs. This means that large firms do not have

lower costs than small ones; they produce far more output per employee but they do this by using much more capital.

Table 3
Comparative Productivity Levels and Factor Endowments by Firm Size
Tanzania Pooled Data 1992-98

Sector		Value Added/ Employee (1992 Tsh '000)	Capital/ Employee (1992 Tsh '000)	Ave No. Employees	Ave. Worker Education (Years)	Ave. Worker Tenure (Years)
Micro	**Mean**	**228**	**954**	**5**	**6.6**	**5.7**
	Std	292	4,074	4	2.7	4.7
	N	*202*	*202*	*202*	*193*	*193*
Small	**Mean**	**377**	**1,965**	**15**	**7.2**	**7.2**
	Std	702	4,539	11	1.6	3.7
	N	*398*	*398*	*398*	*395*	*395*
Medium	**Mean**	**397**	**2,256**	**67**	**7.8**	**8.4**
	Std	546	3,058	58	1.6	4.5
	N	*157*	*157*	*157*	*156*	*156*
Large	**Mean**	**1,374**	**7,653**	**469**	**8.5**	**8.3**
	Std	2,323	11,734	549	1.7	4.6
	N	*103*	*103*	*103*	*98*	*98*
All firms	**Mean**	**465**	**2,462**	**76**	**7.3**	**7.2**
	Std	1,029	5,945	241	2.0	4.3
	N	*860*	*860*	*860*	*842*	*842*

Notes: Firm size categories are based upon number of employees in each firm in the year in which it was initially surveyed; this implies that some firms may have moved between size categories over the course of the sample period.
Micro 1-5 employees; Small 6-30 employees; Medium 31-100 employees; Large >100 employees.

As Table 3 also shows, these large firms have more skilled labour. We have two measures of skills of workers in the firms. The first is their average years of education. The second is how long workers have stayed with the firm, their tenure. Both of these measures of skills are higher for the larger firms. However, compared with the differences in capital per employee, the differences in skills across firms of differing size is modest; average education is between 8-9 years for all size categories. This implies that most production workers throughout the Tanzanian manufacturing sector have primary education (7 or 8 years), but relatively few have completed secondary education or further technical qualifications, even within the larger firms.

Table 4 shows the breakdown of productivity levels and factor endowments by the sector of firm operation. This serves to emphasise the heterogeneity of firms within these sectors. There is a significant variation in average performance, with the most productive firms concentrated in the food products, beverage and machinery sectors and the lowest productivity sectors being shoes, garments, wood products and furniture. These differences are accompanied by large variation in average firm sizes (in terms of employment levels) and capital/ labour ratios. Large firms in both

Table 4

Comparative Productivity Levels and Factor Endowments by Firm Sector
Tanzania Pooled Data 1992-98

Sector		Value Added/ Employee (1992 Tsh '000)	Capital/ Employee (1992 Tsh '000)	Ave No. Employees	Ave. Worker Education (Years)	Ave. Worker Tenure (Years)
Food products	**Mean**	**1,376**	**5,009**	**105**	**8.3**	**7.5**
	Std	2,276	6,423	149	1.7	4.5
	N	*95*	*95*	*95*	*96*	*96*
Bakeries	**Mean**	**534**	**1,847**	**23**	**7.3**	**7.2**
	Std	467	1,919	25	1.3	3.6
	N	*24*	*30*	*30*	*30*	*30*
Beverages	**Mean**	**2,894**	**18,268**	**489**	**8.9**	**7.7**
	Std	4,020	22,293	843	1.9	2.9
	N	*29*	*29*	*29*	*26*	*26*
Textiles	**Mean**	**406**	**2,746**	**289**	**8.8**	**8.9**
	Std	553	3,341	452	1.9	4.8
	N	*75*	*75*	*76*	*73*	*73*
Garments	**Mean**	**257**	**1,643**	**15**	**7.9**	**8.1**
	Std	321	7,964	20	1.7	3.9
	N	*72*	*77*	*77*	*77*	*77*
Shoes	**Mean**	**174**	**1,870**	**15**	**8.3**	**7.0**
	Std	151	4,985	23	1.8	3.5
	N	*52*	*51*	*52*	*51*	*51*
Wood Products	**Mean**	**228**	**1,166**	**65**	**7.2**	**10.0**
	Std	339	2,099	109	2.6	5.9
	N	*75*	*76*	*76*	*73*	*73*
Furniture	**Mean**	**227**	**922**	**25**	**7.9**	**7.4**
	Std	329	1,667	43	1.4	3.7
	N	*196*	*197*	*198*	*198*	*198*
Metal Products	**Mean**	**328**	**2,115**	**34**	**8.4**	**7.7**
	Std	487	4,548	84	1.7	3.5
	N	*187*	*190*	*190*	*186*	*186*
Machinery	**Mean**	**917**	**4,232**	**29**	**9.6**	**7.6**
	Std	1,702	7,416	28	2.0	3.7
	N	*74*	*76*	*76*	*76*	*76*
All firms	**Mean**	**457**	**2,576**	**73**	**8.3**	**7.8**
	Std	1,051	6,353	231	1.9	4.1
	N	*879*	*896*	*899*	*886*	*886*

Notes: Data is for all firms in sample and includes outliers (e.g. negative value added observations)
Capital measure is replacement value of firm's capital stock constructed using investment series (see data appendix)
Firm employment includes full-time permanent and casual plus part-time employees, but excludes seasonal workers
The data for this Table is based on a slightly different sample to that for Tables 2 and 3.

dimensions dominate the food, beverages and textile sectors; small firms the garment, shoes and furniture sectors. Education levels are highest in the machinery, textiles and beverage sectors, but lowest in wood processing, where conversely tenure levels are highest.

At the end of the previous section we noted the evidence in our sample that average firm size was falling. On average across our sample employment and output has been falling at very similar rates. This is consistent with there being no change in the average productivity of firms over the period of the surveys. The lack of evidence of productivity growth is important in the context of a wider discussion about the impact of the policy reform programme in Tanzania. Despite evidence of significant industrial restructuring during the 1990's in response to increased competition and changing relative price signals, why has this not resulted in the type of efficiency gains that promoters of these reforms expected? One possibility is that the reforms have not been fully implemented or had sufficient time to take effect. Hence, what we are observing is a transition period of stagnation in productivity levels which will eventually start to rise once more of the least efficient producers have been driven from the market. In this case, the main policy issue is how to speed up the adjustment process.

5. Firm Turnover and Size Distribution

The next feature of the response of firms to changing market conditions, which we examine over this period, is the question of firm survival and exit. As Table 5 shows, there has been a significant degree of exit by firms operating within all of the subsectors covered by our data. Only 59% of the firms which existed in 1992 were known to be still in existence in 1999[1] representing an aggregate exit rate of 40% of firms. Exit rates have been highest in the textile and metal-working sectors. There is a continuous decline in exit rates across the size distribution of firms from micro to large, as we would expect given the high degree of turnover traditionally observed amongst small-scale and informal enterprises. However, the rate of exit of large-scale enterprises at 29% demonstrates that such turnover has not been limited to small or inexperienced firms alone.

Is such a high rate of exit unusual? We can compare the overall exit rate of 40% of firms over a six year period (approximately 7% per annum) with recent data for other countries. Data for UK enterprises in 1990-92 using a total sample of 83,573 independent companies, shows that 21,404 or 25.6% closed down during this two year period. These deaths are heavily concentrated amongst micro and small-scale enterprises. The average exit rate for firms with 32 employees or less is 29.9% (16,163 deaths out of 54,084), whereas the exit rate for firms with 512 employees or above is 6.5% (110 out of 1683). High levels of per annum plant turnover have also been found in a number of developing countries, including 8.5% in Chile (1979-86), 11.9% in Columbia (1977-89) and 9.5% in Morocco (1984-90). Turnover rates for micro and small enterprises in several African countries of between 19-25% per annum have been found. [The figures for UK enterprises can be found in Hart and Oulton (1998), those for Chile, Colombia and Morocco are from Tybout (2000) and Liedholm and Mead (1995) present the African evidence.]

[1] The definition of firm exit used includes 28 firms which were not located in subsequent rounds of the survey (and are presumed to have ceased operations) but excludes 5 state-owned enterprises which are temporarily paralysed pending privatisation.

Table 5

Survey Sample: Firm Exit & Entry Rates 1992-98

A. Number of firms in 4 waves of survey

343 firms in total
273 firms existing in 1992
70 new firms which have entered since 1992

Excludes 12 firms in Iringa region (not revisited in Wave 4)

Excludes 5 firms from RPED sample which were not manufacturing firms

B. Categorisation of Exit Dummy for Firms Existing in 1992

Firms Alive in 1999	157
Firms in Limbo 1999	5
Firms which exited 1992-95	29
Firms which exited 1996-99	54
Firms Lost/ presume exits	28
Total	273

Note: Shaded cells are exit categories: exit dummy=1

C. Proportion of Exits by Sector, Size & Location

	N	% exits		N	% exits
Food	42	0.33	Dar es Salaam	137	0.44
Textile	65	0.49	Morogoro	31	0.39
Wood	79	0.37	Tanga	24	0.33
Metal	87	0.41	Arusha	35	0.54
			Moshi	9	0.00
Micro	76	0.50	Mwanza	36	0.30
Small	119	0.39			
Medium	47	0.36			
Large	31	0.29			
All	273	0.41			

D. Proportion of Entries by Sector, Size & Location

	N	% entries		N	% entries
Food	65	0.35	Dar es Salaam	177	0.23
Textile	80	0.19	Morogoro	38	0.18
Wood	95	0.17	Tanga	32	0.25
Metal	103	0.16	Arusha	42	0.17
			Moshi	11	0.18
Micro	102	0.25	Mwanza	42	0.14
Small	140	0.15			
Medium	58	0.19			
Large	43	0.28			
All	343	0.20			

Note: entries are classified here as firms which commenced operations after 1992 and which have entered the survey sample as replacement firms for those that have exited

In a comparative perspective, the degree of firm turnover in Tanzania during this period is not particularly high for small and micro firms, but is certainly higher than expected for larger firms. Many of these large firms which have exited had a legacy of state intervention, which, together with other factors, probably reduced their capacity to respond to changing market conditions in recent years. Further, it has been argued that the degree of firm turnover is an indicator of market dynamism and may be an important contributor to economic growth through a process of "creative destruction". Hence, to the extent that the exit of old inefficient plants makes space for their eventual replacement by new more efficient entrants, high levels of firm turnover can be seen as a positive factor.

As well as exits, there has also been some degree of entry by new firms into all of the industries covered. In our sample, the aggregate entry rate of new firms as a proportion of all firms surveyed is 20% with the highest entry rate of 35% in the food sector. Given that the process by which these "new firms" (post-1992 start up firms) were selected was a random one, we believe that it is possible to draw some inferences from our sample about the characteristics, if not the aggregate level, of firms which have entered the manufacturing sector over this period.

Ongoing research at CSAE (not reported here) has been examining the relationship between the firm exit decision in Tanzania and evidence on the relative productivity levels of exiting firms, compared to survivors. We have found firm age effects to be important, with new firms being significantly more productive than old firms. However this effect does not appear to last, the relative efficiency of new firms appears to decline over time. We have already noted that, over time, there does not seem to have been any rise in average firm efficiency. This may suggest that the exiting firms were not always of lower productivity, but this is an issue which is currently under investigation.

6. Export Behaviour

We next turn to the export behaviour of Tanzanian firms. If we consider all firms which have been included in the survey, then the total proportion of firms surveyed who have engaged in any exporting activity during this period is 13 per cent, Table 6. This percentage is decomposed by the broad sector of the firm and by their size in Table 6. By far the most important sector for exporting is the food sector. The Table also shows that exporting is concentrated in relatively large firms, which are those with more than 100 employees, with 53% of large firms exporting some of their output. Most of the exporting that does occur is within Africa, almost certainly within the East African region. Only 5 per cent of firms export outside of Africa.

In Table 7 we present historical data to see if there have been any changes over the period that these surveys have been conducted. Table 7 shows there has been no real change over the period with the rate of exporting fluctuating around an average of 15 per cent - the large fall and rise shown in the period 1994-1995 is probably the result of the smaller samples over that period. Table 7 also presents evidence as to how specialised are the exporting firms. The evidence suggests that firms which export are

Table 6 Proportion of Firms Exporting by Firm Sector & Size

	N	Percentage exporting all destinations	outside Africa
Food	67	0.28	0.1
Textile	85	0.13	0.08
Wood	106	0.08	0.05
Metal	105	0.08	0
Micro	102	0.01	0.01
Small	155	0.07	0.02
Medium	60	0.18	0.1
Large	43	0.53	0.21
All	363	0.13	0.05

Notes: Firms which report at least one observation of exporting some proportion of their output during 1992-98

Table 7 Evolution of Export Behaviour 1992-98

	1992	1993	1995	1996	1997	1998
Percentage of firms exporting (%)	15.5	11.0	6.2	22.2	16.5	15.2
Percentage of output exported if a firm exports (%)	27.7	32.5	32.6	29.5	28.4	34.7
% of output exported to Africa				22.1	19.6	23.2
% of output exported outside of Africa				7.5	8.7	11.4

Table 8 Degree of Export Orientation in a Regional Context

	Cameroon	Ghana	Kenya	Zimbabwe	South Africa	Tanzania
No. Firms (N)	38	31	52	87	327	191
Percentage of firms exporting (%)	55	22	48	71	71	15
Percentage of output exported if a firm exports (%)	30	15	29	20	18	35

Source: Bigsten et al (1999) for Cameroon, Ghana, Kenya and Zimbabwe, and Rankin (2001) for South Africa.

relatively unspecialised and this has changed little over the period. On average about 30 per cent of output is exported.

In Table 8 we compare Tanzanian manufacturing export behaviour to that of five other African countries. Unlike countries such as Cameroon, Kenya, Zimbabwe and South Africa, Tanzania still has relatively few manufacturing firms that export. However, for the limited number of, mainly large, firms that do export, the proportion of export sales is broadly similar to that for the other countries.

7. Earnings of Manufacturing Sector Workers

So far we have considered several aspects of firm performance – growth, productivity and exports. We now turn to consider trends in the earnings of workers who were interviewed as part of the survey. In Table 9, we present the data for changes in the level of earnings (wages plus allowances) and how the characteristics of the workers have changed in the period of the surveys. We have five years of data. The first three years covering the period 1993 to 1995; the second covering the years 1998 and 1999.

Table 9 Average Earnings by Round of the Survey

		Earnings In Tanz. shillings	Real Earnings In 1994 Tanz. shillings	Earnings In US $	Education	Age	Tenure
1993	mean	19,639	26,866	48	8.7	36.1	7.8
	std	16,753	22,918	41	3.6	10.5	6.9
	N	1001	1001	1001	1016	1015	1016
1994	mean	29,369	29,369	58	9.0	34.8	8.0
	std	37,653	37,653	74	3.4	9.7	7.1
	N	647	647	647	571	572	570
1995	mean	41,102	31,666	72	8.3	35.9	8.8
	std	43,355	33,402	75.4	3.4	9.8	7.0
	N	324	324	324	254	254	253
1998	mean	59,940	29,469	90	8.5	33.8	6.8
	std	97,993	48,177	147	3.7	10.9	7.9
	N	830	830	830	928	928	928
1999	mean	66,745	30,408	90	8.5	34.8	7.8
	std	111,198	50,660	150	3.7	10.9	7.9
	N	888	888	888	928	928	928

Notes: All earnings are monthly and include worker's basic salary plus a number of allowances (transport, housing, clothing, food and any bonuses). Education, age and tenure are all measured in years.

Table 10 Average Earnings by Level of Education

		Real Earnings In 1994 Tanz. shillings	Earnings In US $	Education	Age	Tenure
University Completed	mean	87,614	219	16.0	39.5	5.7
	std	83,867	248		7.3	5.2
	N	168	168		178	178
Some Post-Secondary	mean	57,391	152	14.2	36.7	6.1
	std	98,626	294		8.4	5.6
	N	220	220		234	234
Secondary Completed	mean	35,078	84	11.8	34.7	6.2
	std	32,105	85		9.4	5.9
	N	719	719		742	741
Some Secondary	mean	23,459	56	8.8	37.0	9.5
	std	16,505	39		10.9	8.5
	N	611	611		623	621
Primary Completed	mean	19,203	48	7.0	29.9	6.4
	std	14,483	40.1		7.4	6.1
	N	1355	1355		1435	1435
Some Primary	mean	21,405	50	4.0	45.4	12.3
	std	19,771	47		11.3	9.6
	N	323	323		328	328
No Education	mean	18,027	44	0	45.3	13.6
	std	11,806	24		14.3	10.7
	N	145	145		156	157
All	mean	29,164	72	8.6	35.0	7.7
	std	40,366	112	3.6	10.6	7.4
	N	3690	3690	3697	3697	3695

Notes: All earnings are monthly. Education, age and tenure are all measured in years. Secondary completed refers to students who have achieved 'A' levels.

Over this period the average monthly earnings of workers rose from Tanz. Shillings 19,639 to 66,745. Allowing for inflation this represented a real increase of 13 per cent, see Table 9 column 2. It is also of importance to establish how much earnings have been changing in US dollar terms. As Table 9, column 3, shows these have risen substantially over the period form US$48 per month in 1993 to US$90 in 1999.

As for the average characteristics of the workers, these have remained essentially constant over the period. On average, the number of years of education of the

workforce is just under 9 years. This corresponds broadly with completion of some years of secondary school. Clearly this is an average of the class of workers who have completed only primary school and those who have completed secondary school. The average age of the workers has also changed little over the period and average tenure at the end was identical to that at the beginning.

In Table 10 we show how the distribution of earnings by level of worker education. We present earnings levels measured in both constant price Tanzanian Shillings and in US dollars. Looking at the US$ figures, which are the easiest to compare with data for other countries, we see that the range is large. For those with no education the average monthly wage is US$ 44. This rises to US$ 219 for those who have completed university education.

Finally we turn to a consideration of how earning vary by the size of the firm. In Table 11 we present the same information on the earnings of workers by the size of the firm from large, those with more than 100 employees, to micro those with less than six employees. Large firms have on average better educated workers, their average level of education is 10.4 years, while those in micro firms with 7.4 years. Workers are older and they have longer tenure. Earnings rise substantially by firm size. In moving from a micro to a large firm wages rise 2.5 times. Some part of this rise is clearly due to the higher levels of skills. However more formal analysis shows that even allowing for the rise in skills, larger firms pay more than smaller ones. Why this is so, and its implications for firm performance, are matters we are investigating.

Table 11 Average Earnings by Firm Size

		Earnings In Tanz. shillings	Real Earnings In 1994 Tanz. shillings	Earnings In US $	Education	Age	Tenure
Large	mean	74,653	47,322	120	10.4	36.9	8.7
	std	151,134	72,564	214	3.8	9.0	7.9
	N	696	696	696	707	734	707
Medium	mean	45,069	31,352	75	8.8	36.6	7.9
	std	56,586	35,722	87	3.6	10.3	7.7
	N	851	851	851	863	906	862
Small	mean	31,601	21,379	52	7.8	34.8	7.5
	std	26,309	17,765	41	3.3	11.3	7.1
	N	1562	1562	1562	1557	1666	1556
Micro	mean	28,336	20,206	48	7.4	33.2	5.6
	std	20,331	15,558	33.2	3.0	12.1	7.0
	N	381	381	381	373	455	373
All	mean	43,631	29,164	72	8.6	35.0	7.7
	std	77,465	40,366	112	3.6	10.6	7.4
	N	3690	3690	3690	3697	3697	3695

Notes: All earnings are monthly. Education, age and tenure are all measured in years.
Micro 1-5 employees; Small 6-30 employees; Medium 31-100 employees; Large >100 employees.

8. The Comparative Productivity of Tanzanian Manufacturing

In this section we present summary data on labour productivity levels and capital-labour ratios in the Tanzanian manufacturing sector for the period 1992-98 that allows comparison with other African countries. Results are presented in constant 1992 price shillings and purchasing power parity (ppp) US dollars to permit international comparability[2]. Labour productivity is measured as value added per employee, where value added represents the firm's output less raw material and indirect costs. The capital/ labour ratio is a measure of the relative capital or labour intensity of a firm. The capital stock measure used is the replacement value of the firm's plant and equipment, not including land and buildings which are measured separately.

Table 12 Comparative Data on Firm Performance in Six African Countries
All Figures in US ppp dollars except firm size which is number of employees

		Tanzania	Kenya	Ghana	Zambia	Zimbabwe	Cameroon
No. Firms		*206*	*199*	*230*	*98*	*261*	*170*
Employment	Mean	85	75	42	45	300	82
	Median	*14*	*30*	*17*	*19*	*110*	*25*
	Std	266	138	77	72	534	197
Value Added/ Capital	Mean	2.5	2.4	3.8	2.3	1.7	1.2
	Median	*0.4*	*0.6*	*1*	*0.5*	*0.8*	*0.6*
	Std	6.1	6.7	9.2	5.6	4.8	2.4
Capital/ Employee	Mean	15,623	18,593	5,585	17,023	21,000	19,854
	Median	*4,019*	*7,242*	*629*	*5,426*	*9,299*	*8,758*
	Std	28,806	28,490	12,565	29,409	36,695	26,319
Value Added/ Employee	Mean	4,989	24,101	4,868	4,706	14,373	14,335
	Median	*2,172*	*7,796*	*2,203*	*2,465*	*7,764*	*8,214*
	Std	11,427	87,263	7,171	6,271	36,185	19,994

Source: For countries other than Tanzania, Bigsten et al (1998); pooled data drawn from the respective RPED surveys for each country.

Table 12 shows the performance of Tanzanian manufacturing firms in comparison to those of five other African countries, in terms of average size, labour productivity (value added per employee), capital per employee and return on capital employed. It

[2] Purchasing power parity (ppp) exchange rates take into account differences in the cost of living between countries, such that the calculated ppp US dollar value equalises the "purchasing power" of each unit of currency across countries.

can be seen that labour productivity levels are amongst the lowest in the region at around US$ 5000 per annum, on a level with Ghana and Zambia and significantly lower than both Kenya and Zimbabwe. This does not necessarily imply that manufacturing firms in Tanzania are unprofitable. The mean ratio of value added to capital stock is 2.5 over the period. However, the median level, which shows a 40% return on fixed capital employed, is the lowest of the countries surveyed here. It would seem that many firms are able to make a more than adequate return on their capital, while still operating at very low labour productivity levels.

The comparative data in Table 12 shows that, with similar levels of capital per employee, Tanzanian workers are only one fifth as productive as their Kenyan counterparts. This may partly reflect a different pattern of industrial specialisation between the two countries, but must also be related to much lower levels of efficiency in the Tanzanian enterprises. Zimbabwean firms stand out as being much larger on average than those in other African countries, but with only marginally higher levels of capital per employee.

We next consider Tanzanian manufacturing performance in comparison to a manufacturing success – Mauritius. We have some evidence from Mauritius, which is the most successful exporter of labour-intensive manufactured goods in the region. This gives us some idea of the "productivity gap" currently facing Tanzanian manufacturers if they wish to successfully enter international export markets. The comparative figures shown in Table 13 are taken from a study of the manufacturing export performances of Ghana and Mauritius (Teal, 1999).

Table 13 Labour Productivity Levels in Tanzania and Mauritius

Value added per employee (US dollar ppp)	**Tanzania Ave. 96-98**	**Mauritius 1994**	
Micro	1,497		
Small	3,697	36,075	*
Medium	4,476		
Large	11,630	37,898	*
Food	10,375	41,405	
Textiles	1,985	13,396	
Wood	2,047	94,955	
Metal	3,857	43,264	
AllFirms	4,330	36,683	
No. Firms	*355*	*36*	
Ave. Emp	*61*	*133*	

*Source: Mauritian data from Teal (1999). * Size breakdown for Mauritius is between small firms (<100 employees) and large firms (>=100 employees) only*

It is interesting to note that the garment and textiles sector, for which Mauritius is particularly recognised, has the lowest labour productivity. This shows that the key to

efficiency is not simply raising labour productivity but doing it with as little capital as possible. Raising efficiency is both the key to more rapid growth and very hard to bring about.

9. Overview of the 1992-99 Period and Conclusions

Tanzania commenced its economic reform programme in 1986 and has since undertaken a number of policy and regulatory changes to liberalise a previously highly protected and centrally planned economy. Measures which have particularly impacted upon the industrial sector include the introduction of a market-based foreign exchange system, liberalisation of trade policy, privatisation of state-owned enterprises and fiscal policy reform. In this Report, we have sought to examine the responses of a sample of firms in the manufacturing sector to these reforms and other changes in their operating environment over the period 1992-98, which is the period covered by our data. We have focused upon the inter-related questions of growth, productivity, firm turnover (entry and exit), scale, exports and earnings.

We have found that, for our sample of firms, output has been declining over the period. This decline in output has been broadly matched by declines in employment and the capital stock. Thus, on average, firms have been getting smaller. As such firms have lower labour productivity than larger ones, these findings imply that labour productivity will have been falling over the period. However, there is no evidence that underlying productivity – the efficiency with which all inputs, including capital, are turned into outputs – has fallen, but there is also no indication it has been rising. We have also shown that there are large differences in labour productivity across firms in different sectors. Further research is being undertaken to compare the growth and productivity trends in our survey sample, with evidence from the National Bureau of Statistics' official data on industrial sector performance during this period.

There has been a substantial turnover of firms in Tanzanian manufacturing. While such large rates of turnover are common for small firms, the rate of turnover for large ones in Tanzania seems particularly high. There are many possible reasons for this and the expectation must now be for a period of greater stability in this area. We have found that new entrants to the sector have higher productivity levels than older incumbent firms. There is therefore some evidence that the reforms are being effective in promoting a more efficient production structure via a reallocation of capital and labour into more productive plants, which should form the basis for improved growth potential in the future.

Tanzanian firms remain strongly oriented to the domestic market. While some large firms do export regionally, these are the exception. We have also found that such firms tend not to specialise in exporting. This is a similar finding to other recent studies of firms in Africa and may be related to the fact that much of this exporting is for regional rather than international markets. It remains a key challenge for many firms both to enter, and expand in, regional and international export markets.

We have also examined the earnings of workers in the firms in the survey. We have found that average wages have risen over the course of the surveys, by some 13 per

cent in real terms. In US dollar terms the rises have been greater, reflecting the real appreciation of the exchange rate that occurred over the period. Workers with completed secondary education (that is those with 'A' level) earn about 75 per cent more than those who have completed primary school. Those who have completed university education earn 2.6 times those with completed secondary education. Thus our data confirms what is known from other data sets on Africa, that the wage gains from education increase with the level of education. In contrast the difference in wages for those with no education, or only some primary, differ little from those with completed primary. Finally we have shown that wages rise with firm size and, while large firms do have more skilled workers than smaller firms, this rise of wages with firm size cannot be completely explained by the increase in skills.

Finally we have presented some comparisons with other African countries. Of particular interest for Tanzania is a comparison with Kenya. Labour productivity is much lower while capital per employee is rather similar. This indicates that in terms of producing value-added Tanzania is less efficient than Kenya. Mauritius, which is the only country in Africa which has been able to rapidly expand its exports of manufactures, has far higher labour productivity than other African countries. Here is a key challenge for Tanzania.

Declines in average firm scale of operations (in terms of levels of capital and labour inputs) for Tanzanian firms over the period in response to a more competition confront many firms with a challenging environment. There is evidence that high productivity sectors (food processing and beverages) have resisted the overall contraction in manufacturing activity and are now expanding, both within domestic markets and in export markets, mainly within the East African region.

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Data Appendix

A. Survey Sample Information

RPED surveys (1993-96):
The three RPED surveys collected one year of data, plus historical data for some of the key variables. Wave 1 was undertaken in August 1993 (data relates to 1992); Wave 2 was undertaken in October 1994 (data relates to 1993); Wave 3 was undertaken in January 1996 (data is from 1995 for some firms, 1994 for others). The time inconsistency of the data has been taken into account when constructing the constant price series, by identifying the year to which the data given by each firm refers and deflating by the respective year's price index.

Total sample size was 217 firms in Wave 1, 213 firms for Wave 2 and 152 firms for Wave 3. No replacement firms were selected in Wave 3, which accounts for the fall in sample size. Missing data from the relevant production section of the questionnaire and subsequent investigation of the data consistency has led us to exclude a number of firms from the analysis. The original sampling frame was the 1989 Industrial Census (for formal sector firms) which nominally included all manufacturing establishments with 10 employees or more. A sample of informal sector firms were also chosen randomly by the interview teams in the locations in which the survey was conducted[3].

TMES Wave 4:
The Wave 4 Tanzania Manufacturing Enterprise Survey (TMES) attempted to revisit all of the firms which had been interviewed as part of the RPED surveys and for which there was no clear evidence that these firms had ceased to exist (a total of 189 enterprises). From this list, 89 survivors were identified and re-interviewed plus a further 106 additional enterprises, chosen randomly using a directory of establishments compiled by the National Statistics Bureau in 1997/98. Where possible, data was collected for 1996, 1997, 1998 on a total of 195 firms, of which 192 firms have available data on firm production and cost structures. We are thus able to construct an unbalanced panel with a maximum of six rounds of data for firms which participated in all four waves of the survey, covering a seven year period from 1992-98 inclusive.

Changes in the survey sample:
There has been a considerable degree of turnover in the sample during the four waves of the survey. As can be seen below, the dominant sources of turnover are due to confirmed firm exit or inability to trace the firm in subsequent rounds of the survey (which is interpreted to imply probable firm exit). This is documented in Table A1 below. Consequently the number of firms for which we have either 5 or 6 rounds of data is relatively small (45 firms out of a total of 341). There are a total of 89 firms which were interviewed during at least one of the 3 rounds of RPED surveys and also during the Wave 4 survey. For some of the firms still in existence in 1999, data is missing for one of more rounds due to problems with scheduling interviews or lack of information, rather than due to exit or refusal.

[3] Details of the sampling process for the RPED surveys can be found in Blanc (1997), Report on the Third Wave of the RPED survey in Tanzania.

Table A1: Sample Sizes

	Alive	Dormant	Exit	Lost	Total
All Firms	**226**	**6**	**83**	**28**	**343**
6 rounds data	15	0	0	0	**15**
5 rounds data	30	0	0	0	**30**
4 rounds data	26	1	0	0	**27**
3 rounds data	57	2	23	5	**87**
2 rounds data	43	1	30	6	**80**
1 round data	55	2	30	17	**104**

Levels of exit and entry:
These are documented in the main text of the paper for our survey sample (see Table 4.1). We do not know of any published source of evidence on the aggregate entry and exit rates from the Tanzanian manufacturing sector during this period. Prins and Szirmai (1998) present a reconstruction of the official industrial output and employment indices which attempts to make adjustments for non-coverage and non-response.

Reasons for exit:
In the majority of cases, it has not been possible to obtain further information about the causes of firm exit from the owners or managers of these enterprises. For obvious reasons, they are often unwilling to discuss these reasons even when they can be traced and contacted. It is possible that the exits observed among smaller entrepreneurial firms actually result directly in the generation of new firm entries, as entrepreneurs transfer their resources into alternative sectors or other locations. Some of the exits by foreign-owned firms may represent a relocation of firms to other countries (this is particularly the case for firms owned by East African Asians, who often have a network of business activities throughout the region).

B. Main Continuous Variables

Value Added Exclusions:
In the production functions presented using value added, we have excluded a small number of outlying values. These include negative value added observations, which tend to be associated with recent firm entrants or impending exits and which do not represent the steady state performance of the firm in question. We also exclude observations where the ratio of VAD/CAP is greater than 50 or less than 0.01 since these are believed to be driven by measurement errors in these two variables, particularly the firm's physical capital stock (due for example to the use of tools or machinery which does not belong to the firm).

Construction of Capital Stock Series:
The real capital stock (CAP) series used here is based upon an initial observation on the firm's replacement value of plant & machinery which is then augmented with

subsequent investments in plant & machinery made by the firm. This series was preferred to the use of individual round observations on the capital stock because it was found to be more consistent over time.

For firms which were only interviewed in the RPED surveys, it was assumed that the earliest round of data was the most reliable and hence the procedure involves taking the earliest CAP observation and working forward in time using available investment data to impute a nominal price series the capital stock, which is then deflated by a capital deflator to generate a constant price series. We also allow for 5% depreciation per annum of the per period capital stock. For firms interviewed in Wave 4, we implemented the same process but commencing with the most recent observation on the nominal capital stock which was judged to be the most reliable,

Construction of Human Capital:
The firm-level human capital measures which are included in the analysis are average worker education (EDUCWGT) in years and average worker tenure (TENWGT) in years. Total human capital (HCAP) is the sum of these two values. We also experimented with other potential components of workforce capabilities including age and previous experience, but these were not found to be significant determinants of firm-level productivity differentials. We also attempted to construct a specific measure of managerial capabilities (based upon an index including various measures of managerial education, experience and training) but this was also not significant, due probably to lack of observable data on underlying aspects of managerial quality.

Average human capital measures (i.e. average years per employee) are derived from the worker level data, which includes information on educational achievements and years of tenure for a sample of the firm's workers. These values are then weighted by the proportion of workers in a given occupational category in each firm to derive a weighted average for each firm. Occupational categories included managers, administration, sales, clerical, supervisors, technicians, production workers and support staff.

Capacity Utilisation:
The measure of capacity utilisation is firm-specific and time-variant. It is calculated based upon the relationship between actual and potential production levels in each period, given the levels of capital and labour inputs that the firm has available. Potential output is estimated by the firm's managers during the interview and is hence based upon subjective judgement, rather than any attempt to objectively measure input-output coefficients for the firm.

Debt levels:
The level of indebtedness is based upon the ratio between total net financial liabilities/fixed assets. Total net liabilities = (trade creditors + overdraft + formal loans + informal credit) - (trade debtors + informal debtors). The measure of fixed assets used was the replacement value of the firm's plant and machinery (cap).

C. Firm Characteristics

Firm sector:
Firms have been coded according to their main area of activity; in some cases there are firms which produce a range of products which fall into two or more sectors e.g. firms making a combination of wooden and metal household items and in these cases a judgement has been made about which type of product is their major source of revenue.

The survey covers four main manufacturing sectors: food and beverages (FOOD), textiles and garments (TEXT), wood processing and furniture (WOOD) and fabricated metal and machinery (METAL). For analytical purposes, where possible firms are further disaggregated into a total of ten subsectors:

Food products	ISIC 3110 - 3129 (exc. 3117)
Bakeries	ISIC 3117
Beverages	ISIC 3130 - 3135
Textiles	ISIC 3210 - 3219
Garments	ISIC 3220
Footwear	ISIC 3240
Wood Products	ISIC 3310 - 3319
Furniture	ISIC 3320
Fabricated Metal	ISIC 3810 - 3819
Machinery	ISIC 3820 - 3850

There are three firms included in the survey whose activities technically fall outside of the four main sectors we are covering - these are firms 702 and 922 (foam mattresses and cushions) and firm 756 (chemicals); for analytical purposes we include 702 and 922 in the furniture sector and 756 in the wood processing sector.

ISIC Codes:
Four digit International Standard Industrial Classification (ISIC) codes have been included in the Section 1 data file; again these refer to what appears to be the main type of production activity of each firm, although many firms with diversified production structures are in fact producing a range of products which might encompass more than one of these categories. Further information can be gained by consulting the listings of firm products in Section 3 of the questionnaire. We have used this ISIC coding as the basis for deflating each firm's output and value added by the appropriate producer price deflator.

Firm Location:
Firms are classified into 6 locations (compared to only 5 in the main questionnaire): DSM = 1, Morogoro = 2, Tanga = 3, Arusha = 4, Mwanza = 5, Moshi = 6. The variable CAPCITY is a dummy = 1 if the firm is based in Dar es Salaam.

Legal Status:
Firms are classified according to their current legal status where data was available on this; firms with some form of government ownership (parastatals, municipal bodies) are classified as Corporations = 6; private companies which are not sole proprietorships, partnerships or cooperatives are classified as Limited Liability Enterprises = 4, unless they are clearly 6 = Subsidiary of a MNC.

Ownership structure:
The issue here mainly concerns the treatment of firms which are wholly or partially owned by Indians/ Asians of Tanzanian origin who are based outside of Tanzania e.g. in the United Kingdom and whether this constitutes foreign ownership of these firms. In some cases, it is not clear whether these "expatriate" owners hold Tanzanian, as compared to Kenyan or Indian, citizenship? For consistency, it has been decided to categorise only those cases where there is evidence that the owners are not of Tanzanian origin as "foreign ownership".

The variable ANYFOR is a dummy variable = 1 if the firm has any foreign ownership including joint ventures; the variable ANYSTAT is a dummy variable = 1 if firm has any state ownership, including ownership by provincial level public corporations. Anystat includes 100% parastatal firms, as well as joint ventures, unless these are specifically excluded from the analysis

Year Business Founded (T2Q19):
This is the year in which the firm as it is currently constituted was founded and/or commenced operations; there are a number of firms, including those that have been privatised or which have undergone other significant changes in ownership structure, for which this year does not correspond to the year in which the firm originally started trading i.e. its "start-up" year; to distinguish between these cases we have created two additional variables:

- *Start Year Dummy (T2Q19A):* Dummy = 1, if the answer to T2Q19 represents the year in which the firm first started operating; Dummy = 2, if the answer to T2Q19 does not represent the firm's start-up year.

- *Year Originally Started (T2Q19B):* Where T2Q19A = 2, additional information about the year in which the business originally commenced its operations, where available.

Firm Age Categories:
These are based upon the year in which the firm originally started up operations i.e. not necessarily the year in which the firm as currently constituted was founded. Hence, recently privatised firms are categorised according to when the firm was created, not when they were privatised. The categories are New = up to 5 years; Young = 6-10 years; Mature = 11-20 years; Old = greater than 20 years. There are a total of 11 privatised firms within the Wave 4 sample, plus another five firms from the RPED sample which are currently temporarily paralysed pending privatisation or liquidation.

Given the interest in examining the effects of firm turnover (entry and exit) on productivity and growth, the production function estimations were undertaken using

both measures of firm age. This did not significantly affect the basic result, which shows that younger firms are significantly more productive than those in the old/ mature categories.

D. Price Deflators Used

In order to construct the constant price series for gross output (OUTPUT) and value added (VAD), we have experimented with the use several alternative price deflators.

Consumer Price Index:
We initially used the consumer price index (CPI) for mainland Tanzania as our price deflator. The trend path of this index is shown in Table A2. Price inflation was an important factor throughout the survey period, peaking at 33.1% in 1994, hence our results are potentially sensitive to price changes. It is believed that changes in prices faced by domestic producers for their inputs and outputs may differ considerably from levels of consumer price inflation, due to increased competition in most product markets and a number of additional price distortions facing domestic producers (including indirect taxation and tariffs on their imported inputs).

Table A2: National Consumer Price Index, Mainland Tanzania

	CPI (1992=100)	% change	Food (1992=100)	% change	Non-Food (1992=100)	% change
1988	36.0					
1989	47.0	30.3%				
1990	63.8	35.8%				
1991	82.1	28.7%				
1992	100.0	21.8%	100.0		100.0	
1993	125.3	25.3%	120.1	20.1	133.8	33.8
1994	166.7	33.1%	167.1	39.1	165.8	23.9
1995	216.4	29.8%	216.7	29.7	208.9	26.0
1996	259.0	19.7%	260.9	20.4	254.8	22.0
1997	300.6	16.1%	306.5	17.5	288.0	13.0
1998	339.1	12.8%	351.6	14.7	311.3	8.1
1999	365.8	7.9%	382.5	8.8	328.7	5.6

Source: IMF International Financial Statistics; Bank of Tanzania Economic Bulletin 2000 Q1

An earlier version of this paper (June 2000) presented a series of production functions run using the CPI deflator. This resulted in a negative and significant time trend in the pooled production function. To take account of possible inter-sectoral inflation differentials, a re-estimation of the production function was undertaken using the food and non-food components of the CPI index (for firms in the relevant sectors). This had no significant effect on the results obtained, particularly the declines in average productivity observed. However, it can be observed that food prices have risen faster in Tanzania since 1992 than prices of a basket of non-food products.

Available producer price data shows that the rate of increase of producer prices has been below the CPI changes for this period. Hence, the use of the CPI as a price deflator will have introduced an artificial downward bias into our calculations of real

output and value added for the later years, thus resulting in the appearance of a downward trend in productivity levels.

Producer Price Deflators:
In this paper we have used 45 producer price series at the 4 digit ISIC level as a set of deflators for firms' real output and value added. This price data was obtained from the National Bureau of Statistics (NBS) in Dar es Salaam and is based upon price indices taken from returns to their Quarterly Survey of Industrial Production (QSIP). This producer price index was last published in 1996 but has now been updated to June 1999. These indices are presented in Table A3 below.

There are firms in our survey which fall within 4 digit ISIC product groups for which there is no price series available in the NBS indices, presumably because there are no firms in their sample producing these products. One example of this is the lack of a price index for furniture (ISIC 3320) in the NBS data, since their survey excludes furniture producers which are mainly small-scale enterprises. In these cases we have used the price index for the ISIC category which is closest to the missing category e.g. we have used the wood products (ISIC 3319) price index to deflate the outputs of furniture firms in our sample. This is obviously not an ideal solution and we hope in the future to develop firm-specific price deflators using internal price data from our survey.

Some data on prices of firm outputs and material inputs were collected in all four rounds of our survey. In the three RPED surveys, product prices can only be derived from data on quantities of products produced and the total value of output or sales. In the Wave 4 survey, firms were explicitly asked for unit sale prices and input prices. It is intended that this data will be used in later versions of this paper to construct a set of alternative producer price series for comparison with the NBS price indices. Other studies have also emphasised the importance of allowing for differential changes in firms' output and input prices when constructing real VAD series.

Table A3

Producer Price Series by 4 Digit ISIC Categories

ISIC	Activity	1992	1993	1994	1995	1996	1997	1998	1999
3111	Meat products	100	114	152	201	214	230	239	254
3112	Dairy products	100	113	145	174	251	321	331	304
3113	Fruit & Veg Canning	100	90	119	142	134	155	146	160
3114	Fish & sea products	100	114	152	201	243	310	337	354
3115	Vegetable oils & fats	100	119	127	161	195	225	260	286
3116	Grain Mill products	100	110	129	168	175	165	166	178
3117	Bakery products	100	124	168	231	253	226	213	242
3118	Sugar refineries	100	108	166	215	237	249	238	243
3119	Confectionary	100	117	134	147	153	163	190	207
3121	Food products & animal feed	100	139	138	223	221	220	250	283
3122	Food products & animal feed	100	139	138	223	221	220	250	283
3131	Distilled spirits, wine & beer	100	110	140	156	179	188	207	212
3132	Distilled spirits, wine & beer	100	110	140	156	179	188	207	212
3133	Distilled spirits, wine & beer	100	110	140	156	179	188	207	212
3134	Soft drinks	100	129	179	210	327	401	399	391
3140	Tobacco & cigarettes	100	117	179	210	260	261	263	264
3211	Spinning & weaving	100	101	114	186	209	217	220	221
3212	Made up textiles	100	132	187	266	292	346	360	357
3213	Knitting mills	100	104	119	191	227	202	180	197
3214	Carpets & rugs	100	104	119	191	227	236	241	246
3215	Cordage, rope & twine	100	126	180	240	299	328	351	371
3219	Other textiles	100	104	119	191	227	236	241	246
3220	Garments	100	104	119	191	227	236	241	246
3233	Leather products	100	104	119	191	227	236	241	246
3240	Footwear (exc rubber & plastic)	100	104	119	191	221	268	269	280
3311	Sawmills	100	147	156	194	233	241	256	249
3312	Wood products	100	147	156	194	233	241	256	249
3319	Other wood products	100	147	156	194	233	241	256	249
3320	Furniture & fittings	100	147	156	194	259	311	295	295
3511	Industrial Chemicals	100	101	155	184	198	217	247	339
3513	Plastics & Foam	100	101	155	184	198	217	247	339
3811	Cutlery, tools & hardware	100	116	165	241	272	276	278	269
3812	Metal Furniture	100	116	165	241	272	276	278	269
3813	Metal structures	100	119	154	222	282	292	316	319
3819	Fabricated metal products	100	119	154	222	282	292	316	319
3821	Engines & Turbines	100	110	132	159	169	160	160	159
3822	Agric. Machinery	100	105	120	143	241	235	251	251
3823	Metal & wood machinery	100	105	120	143	241	235	251	251
3824	Industrial Machinery	100	105	120	143	241	235	251	251
3829	Other machinery	100	105	120	143	241	235	251	251
3831	Electrical machinery	100	110	132	159	169	160	160	159
3833	Electric appliances	100	110	132	159	169	160	160	159
3839	Other Electrical mach.	100	110	132	159	169	160	160	159
3843	Motor vehicles	100	115	140	156	151	152	152	162
3844	Bicycles & motorcycles	100	115	140	156	151	152	152	162
3849	Transport equipment	100	115	140	156	151	152	152	162

Source: NBS Producer Price Indices, unpublished data (1996-99)

Table A4

Alternative Indices for deflating capital stock series

	ER		CPI		Cap Defl 1		Cap Defl 2		Cap Defl 3	
					0.5 ER/0.5 CPI		0.8 ER/0.2 CPI		0.2 ER/0.8 CPI	
1988	99.29	*1.00*	56.52	*1.00*	77.91	*1.00*	90.74	*1.00*	65.07	*1.00*
1989	143.38	*1.44*	73.62	*1.30*	108.50	*1.39*	129.43	*1.43*	87.57	*1.35*
1990	195.06	*1.96*	100.00	*1.77*	147.53	*1.89*	176.05	*1.94*	119.01	*1.83*
1991	219.16	*2.21*	128.70	*2.28*	173.93	*2.23*	201.07	*2.22*	146.79	*2.26*
1992	297.71	*3.00*	156.80	*2.77*	227.26	*2.92*	269.53	*2.97*	184.98	*2.84*
1993	405.27	*4.08*	196.40	*3.47*	300.84	*3.86*	363.50	*4.01*	238.17	*3.66*
1994	509.63	*5.13*	261.40	*4.62*	385.52	*4.95*	459.98	*5.07*	311.05	*4.78*
1995	574.76	*5.79*	339.30	*6.00*	457.03	*5.87*	527.67	*5.82*	386.39	*5.94*
1996	579.27	*5.83*	406.10	*7.19*	492.69	*6.32*	544.64	*6.00*	440.73	*6.77*
1997	612.12	*6.16*	471.40	*8.34*	541.76	*6.95*	583.98	*6.44*	499.54	*7.68*
1998	664.67	*6.69*	531.70	*9.41*	598.19	*7.68*	638.08	*7.03*	558.29	*8.58*
1999	739.25	*7.45*	573.60	*10.15*	656.43	*8.43*	706.12	*7.78*	606.73	*9.32*

Note: Shaded area shows price deflator used in constant price capital stock calculations

Capital stock deflator:
We do not have a reliable measure of changes in the domestic prices of firm's plant and machinery and other capital goods. A considerable proportion of these capital goods are imported and hence their shilling value depends partly on changes in nominal exchange rate. The capital stock deflator we have used is a weighted average of the national CPI (weight = 0.8) and the nominal US dollar exchange rate (weight = 0.2). We have some evidence from the producer price series for domestically-produced machinery that capital goods prices have risen in line with changes in the CPI. A comparison of alternative deflators is presented in Table A4.

Table A5: Tanzania Nominal and Real Exchange Rates

	Nominal Exchange Rate Tsh/US$	**Index 1992=100**	**Real Exchange Rate (a) Tsh/US$**	**Index 1992=100**
1986	32.7	11.0		
1987	64.26	21.6		
1988	99.29	33.4	193.06	88.4
1989	143.38	48.2	219.69	100.6
1990	195.06	65.5	222.17	101.8
1991	219.16	73.6	195.66	89.6
	297.71	**100.0**	**218.35**	**100.0**
1992				
1993	405.27	136.1	238.13	109.1
1994	509.63	171.2	229.86	105.3
1995	574.76	193.1	209.71	96.0
1996	579.27	194.6	177.59	81.3
1997	612.12	205.6	159.20	72.9
1998	664.67	223.3	149.51	68.5
1999	739.25	248.3	154.14	70.6

(a) RER = Nominal exchange rate * (US Export Price Index/ Domestic CPI)

Exchange Rates:
Table A5 shows trends in the nominal exchange rate of the Tanzanian Shilling against the US dollar (the benchmark currency for cross-country comparative work to date). There has been a substantial devaluation since 1992, although the major nominal devaluation took place from 1988-92 with the move from a fixed to floating rate mechanism. We also calculate a simple real exchange rate measure which suggests an appreciation over the survey period, due to the high levels of domestic price inflation. This will have served to make production for the domestic market more attractive, in comparison to export markets.