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**Working Paper**

## Did the Tanzanian manufacturing sector rebound in the 1990s? Alternative sources of evidence

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# **Did the Tanzanian Manufacturing Sector Rebound in the 1990s? Alternative Sources of Evidence**

by

**Alan Harding**

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# **Did the Tanzanian Manufacturing Sector Rebound in the 1990s? Alternative Sources of Evidence**

by

**Alan Harding**

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**Acknowledgements**

The data for 1992-95 used in this report was collected by a team from the Helsinki School of Economics and University of Dar es Salaam. The 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). We would also like to thank the National Bureau of Statistics in Dar es Salaam and the regions for invaluable support and access to additional statistical data.

# **Did the Tanzanian Manufacturing Sector Rebound in the 1990s?**

## **Alternative Sources of Evidence**

by  
Alan Harding

### **Abstract**

This paper contributes to a statistical debate about the measurement of the size and growth of the Tanzanian manufacturing sector in the last decade. Evidence from official data sources shows a contraction of industrial output in the early 1990's but sustained expansion since 1995. There is a problem however in the coverage of the quarterly survey used to calculate these growth rates, which only includes a limited selection of firms with 50 employees or more. Evidence from panel survey data, which covers a more limited range of industries but all size categories, indicates a continuing decline in aggregate real output and employment levels since 1995. We present a number of descriptive statistics which seek to identify the potential sources of these differing pictures of trends in industrial growth. We show that large firms in our sample have performed differently from small firms, showing a sharp contraction in both real output and employment before 1995 and some signs of recovery from 1995-98, which is consistent with the trend observed in the official data. However, small firms (those with < 50 employees) have actually contracted more sharply since 1995. Hence, by ignoring these sustained declines in the small firm sector, official statistics are presenting an artificial picture of a rebound in the fortunes of the Tanzanian manufacturing sector since 1995. We discuss some possible explanations for the different responses of large and small firms to changing policy and business operating conditions during this period. These findings have relevance for Tanzanian policy-makers and researchers seeking to design policy towards the industrial sector.

### **Outline**

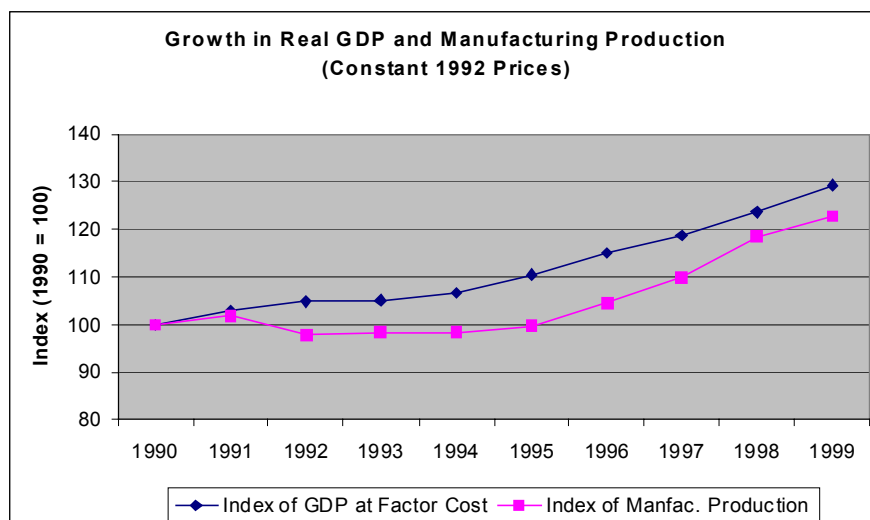
1. Introduction
2. Data
3. Overview of Trends in Manufacturing Sector 1966-85
4. Growth in the 1990s from Official Data Sources
5. Alternative Firm Survey Evidence on Growth Trends
6. Reconciling the Divergence
7. Conclusions



## 1. INTRODUCTION

There has been considerable interest amongst both policy-makers and researchers in the prospects of the Tanzanian manufacturing sector and its ability to contribute to economic growth and employment generation in Tanzania. The discussion has recently focused upon the ability of Tanzanian manufacturers to compete in an increasingly liberalised domestic market and also moves to closer integration within the East African region. According to official sources (National Bureau of Statistics) and the IMF (1999), Tanzanian industrial production has been expanding at an average rate of over 5% per annum since the mid 1990's, showing a marked rebound after nearly two decades of stagnation and decline. Figure 1 documents the growth of the official index of manufacturing production in comparison with the growth of GDP at factor cost over the period 1990-99. It can be seen that the two series exhibit a strong collinear upward trend since 1995, with manufacturing's share of national output consequently staying roughly constant at around 8% of GDP. A review of Tanzania's industrial and trade performance published by the Ministry of Industry and Trade and UNIDO (2000) reports signs of recovery in all sectors, except wood and paper products, and positive output growth in the food, textiles, clothing and beverage industries. Further, the World Bank's Country Economic Memorandum (2001) claims that "Despite the massive closure of failed public enterprises, industry has managed to continue posting a growth rate, on average, of 5 percent or more in the past decade, implying that new and surviving firms are growing much faster to more than compensate for failing firms". Such a positive view of Tanzanian industrial performance is claimed as evidence of the success of the wide-ranging policy reform programme implemented since 1986.



**Figure 1**

In this paper we wish to examine more carefully the basis for this optimistic picture and present a few possible caveats. We pose the question: has Tanzanian manufacturing really rebounded as strongly in the 1990's as is now widely claimed? We present available evidence on the growth trends of the Tanzanian manufacturing sector and its various component subsectors in the 1990's taken from a number of different sources. Our primary aim is to examine whether these sources present a consistent growth picture, and, if not, to seek to understand the nature of possible divergences. Specifically, we will compare data from official sources (on which the optimistic view is largely based) with data from firm-level sample surveys undertaken during the 1990's. These cover a narrower range of industrial activities, but cover firms across the full size distribution. Given that small firms dominate the frequency distribution of manufacturing firms in Tanzania, as well as in most LDC's (Tybout, 2000), we argue that omitting them from consideration in calculating aggregate growth trends can lead to distorted results.

The rest of the paper is structured as follows. Section 2 describes briefly the main data sources used in this paper. Section 3 contains a brief historical background for the period 1966-1985; Section 4 presents official data on trends in output, value added and employment in the 1990's; Section 5 presents the comparative survey-based evidence,

based upon matched sample estimates of growth rates by firm size and sector; Section 6 discusses possible sources of divergence with the official data and Section 7 concludes. Two appendices include further discussion of official data sources since 1978 and the price deflators used in calculating the various constant price series.

## **2. DATA**

The official aggregate and sectoral data for 1985 – 1995 is taken from the Tanzanian National Bureau of Statistics (NBS), as presented in Prins and Szirmai (1998). The main primary data source on manufacturing sector output and employment for this period is the NBS's Quarterly Survey of Industrial Production (QSIP) which has been implemented in Tanzania since 1986. This covers approximately 300 of the largest 50+ employee firms in Tanzania (for details, see Appendix A). The QSIP is obviously limited in its coverage of the actual size distribution of firms within the manufacturing sector. Two official informal sector surveys were undertaken by the Planning Commission in 1991 and 1995, but there do not appear to have been any other recent attempts to monitor the performance of small-scale formal and informal sector manufacturing enterprises in Tanzania.

For the period before 1995, these quantity-based series have been supplemented by a constructed series for the MVA of 10+ establishments calculated by Prins and Szirmai (1998) which covers the period 1961-95. The main source of data for this series were the Annual Surveys of Industrial Production (ASIP) implemented by the NBS up to 1990, covering a larger sample of firms than the QSIP, but discontinued thereafter. Further details of the sources of data and adjustments they have made to construct this MVA series are contained in Appendix A.

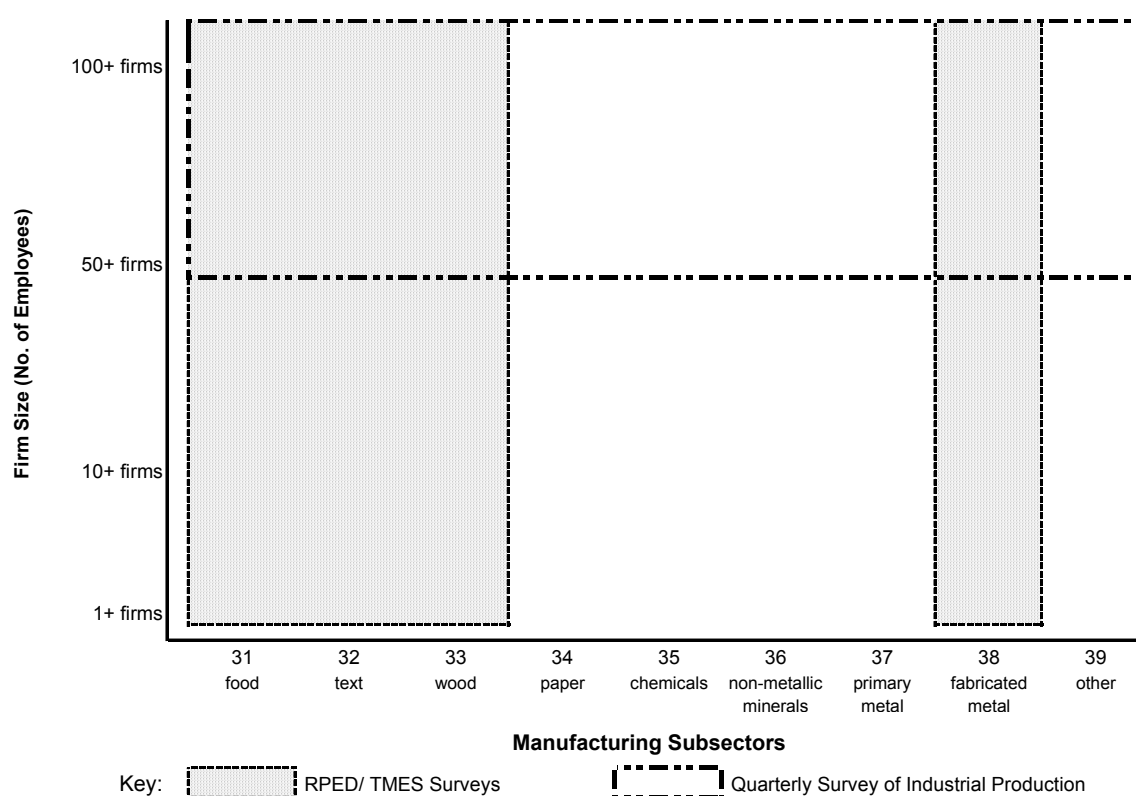
For the period since 1995, the only source of official data is the QSIP. We have obtained additional data for the period 1995-99 from NBS in order to be able to extend Prins & Szirmai's Revised Index of Industrial Production for these additional four years. The important point to note is that the official data for the late 1990's is exclusively based upon evidence from a sample of medium and large-scale manufacturing enterprises (those with more than 50 employees in the 1989 Industrial Census from which they were selected).

Another source of evidence for the period 1992-99 is a firm-level panel dataset which covers the four major subsectors of Tanzanian manufacturing and is taken from 4 waves of the Tanzanian Manufacturing Enterprise Survey (TMES). The first three waves of this survey (1992-95) were undertaken as part of the Regional Program on Enterprise Development (RPED) organised by the Africa Technical Department of the World Bank<sup>1</sup>. The fourth wave was conducted in 1999 by researchers from CSAE and the Economic and Social Research Foundation (ESRF) in Dar es Salaam and covers the period 1996-98.

**Figure 2**

***Size and Sectoral Coverage of Alternative Data Sources***

***Tanzanian Manufacturing Sector***



<sup>1</sup> The 1992-95 data was originally collected by a team from the Helsinki School of Economics, in conjunction with the Tanzanian Confederation of Industries and the University of Dar es Salaam.

A comparison of the coverage of the two main sources of data on manufacturing sector growth in the 1990's is shown in Figure 2. The basic difference that can be observed is that the official data (based upon the QSIP) gives broad coverage of all sectors of manufacturing<sup>2</sup> but lacks depth in the size coverage of firms. By comparison, the RPED/ TMES surveys only cover four of the nine main manufacturing subsectors, but they can claim greater coverage of the size distribution of firms, reaching down to sole traders and micro-enterprises. However, it should be noted that, due to stratification of the sample by sector and size categories, even the RPED/ TMES surveys greatly over-sample large and medium-sized enterprises compared with their relative frequency in the population of firms. Firms with greater than 30 employees represent 29% of the 192 firms interviewed in the Wave 4 survey.

### **3. OVERVIEW OF TRENDS IN MANUFACTURING SECTOR 1966-85**

Ndulu and Semboja (1992) present a review of Tanzania's experience of industrialisation from independence in 1961 until the late 1980's. There are several features which are of particular importance in order to understand the subsequent response of the manufacturing sector to the policy reforms which began to be introduced from 1986 onwards.

The process of industrialisation in Tanzania was characterised by extensive state intervention in both product and factor markets in the pursuit of rapid industrial growth, import substitution and self-sufficiency. These basic objectives were originally set out in the government's Long Term Plan 1964-80, implemented in the First Five Year Plan (1964-69) and Second Five Year Plan (1969-74) and further reinforced in the Basic Industrialisation Strategy launched in 1976. One of the immediate aims was to reduce the dominance of partly or wholly foreign owned firms in the manufacturing sector. Another was to reduce the previously high degree of dependence upon imported manufactured consumer goods and capital equipment.

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<sup>2</sup> Although it should be noted that some important subsectors which are dominated by relatively small-scale firms, such as furniture and garments, are excluded from the QSIP.

Table 1

**Summary of Manufacturing Growth and Factor Costs**  
**Tanzania, 1966-85**

Period	[1] Real Value Added (millions Tsh, 1966 prices)	[2] Growth Rate of Value Added (%)	[3] Capital Stock (millions Tsh, 1966 prices)	[4] Growth Rate of Capital Stock (%)	[5] Number of Employees (thousands)	[6] Growth Rate of Employment (%)	[7] Real Wage Rate (Tsh per employee, 1966 prices)	[8] Real Interest Rate (%), deflated by GDP deflator
1966	525.0		1,386.0		33.0		4,091.0	8.5
1967	572.0	9.0	1,470.0	6.1	34.5	4.6	4,428.7	8.5
1968	611.0	6.8	1,570.0	6.8	42.8	24.0	4,088.6	8.0
1969	672.0	10.0	1,698.0	8.2	43.8	2.3	4,443.4	7.7
1970	716.0	6.5	1,764.0	3.9	48.7	11.3	4,266.7	7.4
1971	784.0	9.5	1,957.0	10.9	50.9	4.5	4,245.8	7.0
1972	850.0	8.4	2,125.0	8.6	55.1	8.4	4,395.9	6.5
1973	888.0	4.5	2,203.0	3.7	63.4	15.0	4,466.0	6.1
1974	900.0	1.4	2,297.0	4.3	70.3	11.0	4,426.3	5.3
1975	903.0	0.3	2,459.0	7.1	74.4	5.7	4,042.4	4.9
1976	1,063.0	17.7	2,630.0	7.0	78.1	5.1	3,786.6	4.8
1977	1,152.0	8.4	3,018.0	14.8	84.2	7.7	3,464.5	4.4
1978	1,429.0	24.0	3,670.0	21.6	109.2	29.7	3,075.0	3.9
1979	1,259.0	-11.9	4,266.0	16.2	107.6	-1.5	2,931.9	3.4
1980	1,059.0	-15.9	5,015.0	17.6	103.9	-3.4	2,963.8	2.7
1981	970.8	-8.3	5,545.0	10.6			2,013.2	2.0
1982	915.6	-5.7	6,089.8	9.8				
1983	849.4	-7.2	6,595.2	8.3				
1984	970.8	14.3	7,210.6	9.3				
1985	794.3	-18.2	7,714.2	7.0	107.7			
<i>% change over five year period</i>								
1970-75	26.1		39.4		52.7		-5.3	-33.8
1975-80	17.3		103.9		39.7		-26.7	-44.9
1980-85	-25.0		53.8		3.7			

*Note:* Real value added, capital stock and employment in 10+ manufacturing firms. Capital stock for 1966-81 is estimated using perpetual inventory method using gross investment from the National Accounts and assuming a depreciation rate of 5% per annum.

*Sources:* Ndulu (1986) for 1966-81 figures, various tables, original data drawn from National Accounts and other official sources; real value added figures for 1981-85 extrapolated from the Ndulu series using the change in the Revised Index of Industrial Production (appendix table A1); capital stock figures for 1981-85 based upon real investment rates (GFCF/ MVA) for these years taken from Ndulu and Semboja (1992), Table 16.1; 1985 employment figure for 10+ manufacturing from Prins & Szirmai (1998).

The development of manufacturing during the period 1966-85 is shown in Table 1<sup>3</sup>. This highlights the rapid expansion of the sector in terms of real value added, capital employed and employment until the end of the 1970's, which was partly driven by sharp declines in the real factor costs facing industrialists, with real wages halving over this period and the real interest rate falling from 8.5% in 1966 to only 2% in 1981. It is particularly interesting to note the continued rapid expansion of productive capacity between 1976-80 (with the real capital stock almost doubling in five years), despite the onset of sharp declines in real value added from 1979, implying sharply declining levels of capacity utilisation and total factor productivity.

What were the distinguishing features of Tanzania's state-directed industrialisation programme during this period? Firstly, the prevalence of policies favouring the protection of infant industries. Investments in the development of local import-substituting industries were proposed. These new investments benefited from protection from import competition in the form of high import tariffs or licensing restrictions which would ensure their profitability. The main industries which were the focus of these development programmes included primary metals, textiles and garments and basic food products. As Ndulu and Semboja (1992) point out, this process of granting tariff protection on the basis of negotiation with individual investors resulted in a complex tariff structure which had no consistency or general objectives. There was also no clear timetable associated with the withdrawal of tariff protection once infant industries had become established.

Another feature of the industrialisation process was direct ownership by the state of parastatal enterprises. This was either the result of nationalisation of previously privately-owned enterprises (e.g. Tanzania Breweries) or more commonly through the creation of new, mainly large-scale, enterprises in which the government was either the sole or majority owner. By 1988, it is estimated that 410 parastatals accounted for about 20% of production and two-thirds of employment in the formal industrial sector (IMF, 1999)<sup>4</sup>. In parallel with the creation of large parastatals was the growth of the cooperative movement, which dominated small-scale production of basic consumer

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<sup>3</sup> This table is based upon National Accounts and other official data for real value added, capital stock and employment in 10+ manufacturing contained in Ndulu (1986) for the period up to 1980. The real value added and capital stock series have been extrapolated to 1985 using more recent sources (see notes to table).

goods, such as clothing, furniture and household metal products, such as buckets and stoves. Both the parastatal and cooperative sectors were the subject of extensive involvement of foreign donors in the provision of technical assistance and other forms of support, including training and credit programmes, particularly to the small-scale industrial sector<sup>5</sup>.

A third feature was the rapid expansion of productive capacity, mainly in capital-intensive plants. Ndulu (1986) undertook the seminal analysis of the under-utilisation of productive capacity levels in the manufacturing sector in the 1970's and early 1980's. He argues that the over-expansion of the industrial sector was partly due to high levels of publicly financed investment in parastatal industries, but also due to artificially low real interest rates that lowered the cost of capital to favoured private sector industrialists. This is shown clearly in column [8] of Table 1. Subsequent wide-ranging defaults on loan repayments to state-owned finance institutions involved in lending to the industrial sector, such as the National Bank of Commerce (NBC) and the Tanzanian Investment Bank (TIB), exacerbated this situation even further.

The major constraining factor on the supply-side to continued expansion of industrial output in the early 1980's was the severe foreign exchange crisis and consequent limits on importation of raw materials and intermediate inputs, including maintenance equipment. This led to a dramatic decline in levels of capacity utilisation. Ndulu (1986) presents an estimation of the import requirements of industrial plants to operate at full capacity, compared to actual imports of intermediate inputs for the 1973-81 period, and shows that the ratio of actual to requirement fell steadily from 94% in 1973 to only 11% in 1981. One corollary of this situation is that we might expect reforms commenced in 1984 (with the introduction of the Own Funds Imports scheme) aimed at liberalising the allocation of foreign exchange to have an immediate positive effect on output growth through rapid increases in the utilisation of existing industrial capacity. This appears to have taken place in several of the more import-dependent subsectors of manufacturing in the late 1980's (see Table 2 below).

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4 Gibbon (1999) gives an overview of the parastatal sector and privatisation programme from 1992 until 1998.

<sup>5</sup> This is exemplified by the creation of the Small Industries Development Organisation (SIDO) in the 1970's with UNIDO, ILO and Swedish International Development Agency (SIDA) support. The subsequent withdrawal of donor support for this initiative in the 1990's has left most of these small-scale enterprises in an extremely precarious position. Both recently privatised firms and some remaining SIDO-sponsored firms are included in our survey sample.

#### 4. GROWTH IN THE 1990'S FROM OFFICIAL DATA SOURCES

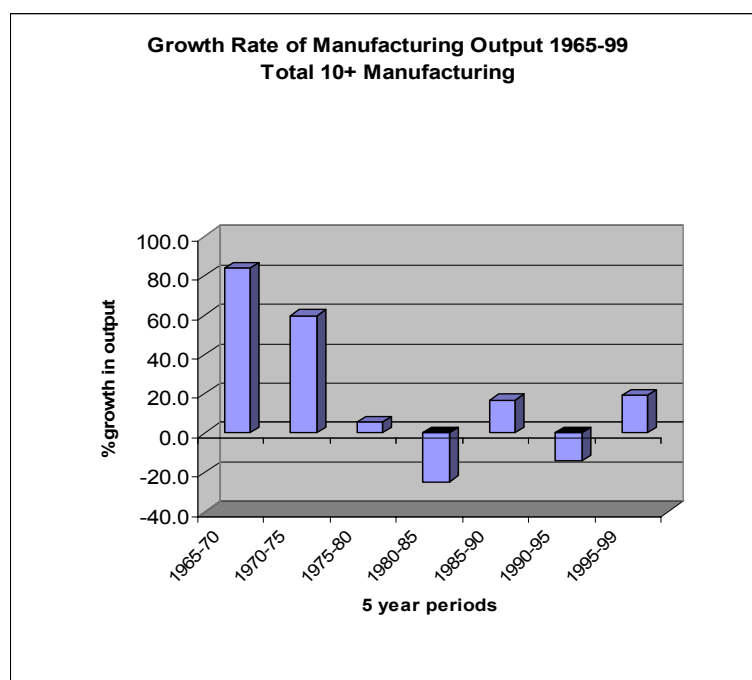
Having discussed the historical legacy, we now turn to an analysis of the aggregate performance of the manufacturing sector in the 1990's, when firms in theory faced a very different set of incentives due to changes in the policy environment, particularly the complete liberalisation of the foreign exchange market and significant trade liberalisation. The sequencing of the reform process is described in Ndulu and Semboja (1992), Bigsten, et al (1999), IMF (1999) and World Bank (2001).

**Table 2**  
**Revised Index of Industrial Production for 1985-99**  
**Total Manufacturing & Four Main Subsectors**

ISIC code	3 Total Manufactur.	31 Food, Bevs & Tobacco	32 Textiles, Garments & Leather	33/34 Wood Products, Furniture & Paper	37/38/39 Metal Products, Machinery & Other
1985	97.3	91.9	87.7	87.3	137.0
1986	98.6	87.1	89.2	116.9	152.0
1987	95.9	77.4	115.4	160.6	115.0
1988	101.4	91.9	126.2	156.3	102.0
1989	101.4	88.7	116.9	153.5	110.0
1990	113.5	100.0	118.5	142.3	141.0
1991	113.5	103.2	112.3	126.8	133.0
<b>1992</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
1993	101.4	104.8	104.6	142.3	88.0
1994	106.8	106.5	101.5	101.4	125.0
1995	97.3	111.3	89.2	93.0	69.0
1996	98.2	127.3	91.1	62.4	71.8
1997	103.8	145.4	83.8	58.4	87.3
1998	112.3	149.4	104.7	50.5	101.4
1999	116.0	146.4	99.2	100.9	111.2
<b>5 year growth pattern (%)</b>					
1985-90	16.7%	8.8%	35.1%	62.9%	2.9%
1990-95	-14.3%	11.3%	-24.7%	-34.7%	-51.1%
1995-99	19.2%	31.5%	11.2%	8.6%	61.2%
1992-98	12.3%	49.4%	4.7%	-49.5%	1.4%

*Source:* Prins & Szirmai (1998) revised index of industrial production for 1985-95 for 10+ manufacturing; National Bureau of Statistics unpublished data for 1996-99 for 50+ manufacturing; author's calculations to link series.



**Figure 3**

*Note:* See Appendix Table A1 for indices for total manufacturing and four main manufacturing subsectors.  
*Source:* Prins & Szirmai (1998), Revised Index of Industrial Production 1965-95 based upon estimates for 10+ manufacturing. Data for 1995-99 from National Bureau of Statistics (unpublished) for 50+ manufacturing.

Table 2 presents a revised index of industrial production calculated by Prins & Szirmai (1998) for the period 1985-95 which has been extended up to 1999 using additional data from the National Bureau of Statistics, based upon the Quarterly Survey of Industrial Production.<sup>6</sup> We also present the composite indices for the four main manufacturing subsectors for which we also have firm-level survey data, namely food and beverages, textiles and garments, wood products and furniture and fabricated metal products and machinery. The aggregate index shows a 14.3% contraction in total manufacturing output in the period 1990-95 followed by an expansion of 19.2% between 1995-99 (at an average rate of nearly 5% per annum over this 4 year period). The most significant contractions during the early 1990's period took place in the textile and garment sector

(-24.7%), the wood products and furniture sector (-34.7%) and the metal products and machinery sector (-51.1%). Since 1995, the main sectors showing expansion have been the food and beverage sector (31.5%) and the combined metal products, machinery and other manufacturing sectors (61.2%).

Figure 3 presents a summary of the official statistics on growth rates of total manufacturing sector output over the longer period 1965 – 1999. This shows clearly the rapid expansion of manufacturing output up to 1975 and its subsequent collapse during the economic crisis period from 1975-85. Following the commencement of the economic reform programme in 1986, the manufacturing sector expanded again up to 1990 but then suffered a 15% decline in the early 1990's before rebounding with nearly 20% growth in the 1995-99 period.

## **5. ALTERNATIVE FIRM SURVEY EVIDENCE ON GROWTH TRENDS**

In this section we ask how growth trends observed amongst firms in our survey sample compare with evidence on aggregate production and employment levels in these industrial subsectors from official statistics?

Firstly, we present some further details of the survey sample composition. Table 3 shows the distribution of firms in the Wave 4 sample by firm size and sector and by firm sector and location respectively. They also show the number of RPED firms (those interviewed in the first 3 waves) that remained in the sample.<sup>7</sup> The breakdown shows that nearly 70% of firms in the sample are small and micro-enterprises with less than 30 employees; they have a broadly even distribution among the four subsectors of manufacturing. In terms of geographical distribution, just over 50% of the firms are located in Dar es Salaam, with the other 50% evenly distributed among the other five main areas of industrial activity covered, namely Morogoro, Tanga, Arusha, Moshi and Mwanza. We hence believe that the sample is not unrepresentative of the distribution of firms within these four subsectors in terms of both size and location.

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<sup>6</sup> The complete index for 1965-95 as calculated by Prins & Szirmai (1998) is reproduced in Appendix Table A1. It should be noted that this index is based upon an estimate of 10+ manufacturing output, whereas the data for 1995-99 is based exclusively on a more limited sample of large firms with > 50 employees.

**Table 3**  
**Distribution of Firm Sample by Size and Sector**  
**Wave 4 TMES Sample (Total = 192 firms)**

		<b>Food &amp; Beverages</b>	<b>Wood &amp; Furniture</b>	<b>Textiles &amp; Garment</b>	<b>Metal &amp; Machinery</b>	<b>All Sectors</b>
<b>Micro (including informal)</b> [< 6 employees]	<b>No. Firms</b>	<b>4</b>	<b>15</b>	<b>18</b>	<b>18</b>	<b>55</b>
	<b>% all sectors</b>	7.3%	27.3%	32.7%	32.7%	100.0%
	<b>% all sizes</b>	9.8%	26.3%	46.2%	32.7%	28.6%
	<b>RPED firms</b>	1	7	8	4	20
<b>Small (including informal)</b> [6 - 30 employees]	<b>No. Firms</b>	<b>17</b>	<b>30</b>	<b>10</b>	<b>24</b>	<b>81</b>
	<b>% all sectors</b>	21.0%	37.0%	12.3%	29.6%	100.0%
	<b>% all sizes</b>	41.5%	52.6%	25.6%	43.6%	42.2%
	<b>RPED firms</b>	4	20	4	17	45
<b>Medium</b> [31 - 100 employees]	<b>No. Firms</b>	<b>9</b>	<b>8</b>	<b>5</b>	<b>11</b>	<b>33</b>
	<b>% all sectors</b>	27.3%	24.2%	15.2%	33.3%	100.0%
	<b>% all sizes</b>	22.0%	14.0%	12.8%	20.0%	17.2%
	<b>RPED firms</b>	4	4	3	6	17
<b>Large</b> [> 100 employees]	<b>No. Firms</b>	<b>11</b>	<b>4</b>	<b>6</b>	<b>2</b>	<b>23</b>
	<b>% all sectors</b>	47.8%	17.4%	26.1%	8.7%	100.0%
	<b>% all sizes</b>	26.8%	7.0%	15.4%	3.6%	12.0%
	<b>RPED firms</b>	1	2	3	1	7
<b>All size groups</b>	<b>No. Firms</b>	<b>41</b>	<b>57</b>	<b>39</b>	<b>55</b>	<b>192</b>
	<b>% all sectors</b>	21.4%	29.7%	20.3%	28.6%	
	<b>% all sizes</b>	100.0%	100.0%	100.0%	100.0%	
	<b>RPED firms</b>	10	33	18	28	89

*Note:* RPED firms indicate the number of firms in the Wave 4 sample which were previously interviewed in one or more rounds of the RPED surveys.

We now proceed to present the patterns of growth for all surveyed firms over the four waves of the survey, covering the period 1992-98. We focus upon growth rates of real output, real value added, employment and the real capital stock. We have up to a maximum of six observations on each of these variables for each of these firms. However, due to the unbalanced nature of our panel (including both variation in N across rounds and the significant degree of firm turnover), we unfortunately have

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<sup>7</sup> The number of firms which participated in all four waves of the survey were reduced mainly by the high turnover of firms (firm exits) during the early 1990's and the need to identify replacement firms. Where

relatively few firms with complete observations across all 6 rounds of the data on which to base our growth estimates. We hence adopt the methodology proposed in Teal (1998) of calculating growth rates from the maximum possible matched sample for each of the adjacent years. This also has the advantage of allowing us to include data on the firms which exit from the sample in the years prior to their demise, since their exclusion from a balanced panel approach would have resulted in a probable upward bias in the mean growth rates.

In order to take account of considerable non-normality in the distribution of the variables in which we are interested (characterised by high values of skewness and kurtosis and means significantly greater than median values), we look at changes in the means of the logarithmic values of the variables in each of the matched periods. Examination of the distributions of these transformed variables, not reported here, supports the hypothesis that they are log-normally distributed. This is principally due to the existence of a relatively small number of very large enterprises in the sample.

The sensitivity of our results to the use of alternative price deflators should also be highlighted. The growth results presented here are based on the use of individual producer price deflators for firms in different 4 digit ISIC categories. The capital stock deflator is a combination of the CPI and the nominal US dollar exchange rate as described in Appendix B. Alternative growth patterns resulting from the simple use of the CPI as a deflator for both real output and real value added series were calculated (not reported here) and did not fundamentally alter the results obtained.

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possible, replacements were chosen with similar characteristics (size, sector, location) as the exiting firm.

**Table 4**  
**Growth Rates of Real Output, Value Added, Employment and Capital Stock**  
**All Firm Size Categories - RPED/ TMES Surveys**  
**Tanz. Shillings, millions (1992 constant prices)**

<b>All Sectors (Tsh millions, 1992 prices)</b>						
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>
Real Output	361.4	382.7	323.0	279.7	248.7	-31.2%
Real Value Added	146.1	144.6	150.0	115.6	104.8	-28.3%
Employment	127.3	116.3	105.5	93.1	90.3	-29.1%
Real Capital Stock	1158.9	989.7	1019.4	977.6	945.3	-18.4%
<i>No. matched observations</i>		139	115	48	127	

<b>Food &amp; Beverage Sector (Tsh millions, 1992 prices)</b>						
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>
Real Output	1,520.0	1,600.5	1,328.4	1,446.7	1,410.5	-7.2%
Real Value Added	612.2	577.9	625.8	671.5	662.1	8.2%
Employment	223.4	199.5	167.6	178.8	191.7	-14.2%
Real Capital Stock	4334.6	4226.2	4226.2	4399.5	4188.3	-3.4%
<i>No. matched observations</i>		24	15	16	28	

<b>Textile &amp; Garments Sector (Tsh millions, 1992 prices)</b>						
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>
Real Output	264.0	306.5	223.1	153.0	141.6	-46.4%
Real Value Added	106.3	108.0	94.2	42.9	40.6	-61.8%
Employment	251.5	220.3	209.5	187.7	183.4	-27.1%
Real Capital Stock	1313.7	1003.7	1055.8	1040.0	994.3	-24.3%
<i>No. matched observations</i>		34	26	14	26	

<b>Wood Products &amp; Furniture (Tsh millions, 1992 prices)</b>						
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>
Real Output	36.4	40.1	41.6	28.1	24.5	-32.6%
Real Value Added	14.3	16.7	19.1	11.2	9.7	-32.2%
Employment	45.6	45.8	43.4	35.7	33.2	-27.3%
Real Capital Stock	65.6	48.5	51.0	49.2	48.8	-25.7%
<i>No. matched observations</i>		37	42	23	39	

<b>Fabricated Metals &amp; Machinery (Tsh millions, 1992 prices)</b>						
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>
Real Output	78.0	73.9	51.0	53.1	44.0	-43.6%
Real Value Added	33.4	29.9	30.9	35.2	29.0	-13.1%
Employment	48	42	36	32	30	-37.0%
Real Capital Stock	180.3	177.7	178.1	175.8	168.4	-6.6%
<i>No. matched observations</i>		45	34	13	34	

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*Notes:* Growth rates using matched samples for adjacent years (i.e. maximum number of matched firms). Number of matched observations refer to current period and previous adjacent period. Small matching sample sizes for the 1995-97 period mean that changes over this period are indicative only. Growth rate calculated from the change in the logarithmic mean of each variable between the two periods, in order to reduce the effect of outliers i.e. rapidly expanding or contracting firms within the subsample. Employment is average number of employees per firm; all other figures are in millions of 1992 constant price Tanz. Shillings.

*Source:* RPED Surveys (1993-95) and the TMES Wave 4 Survey 1999.

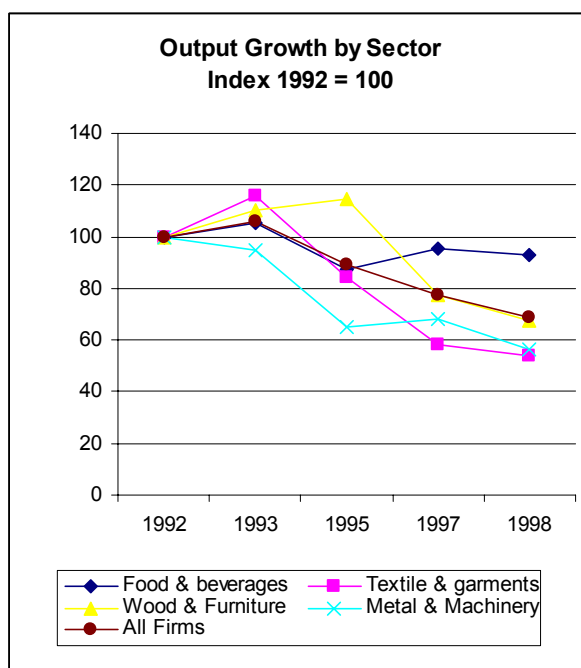
**Table 5**  
**Growth Rates of Real Output, Value Added, Employment and Capital Stock**  
**All Firm Size Categories - RPED/ TMES Surveys**  
**Indices (1992 = 100)**

<b>All Sectors (Index 1992=100)</b>								
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>	<b>Change 1992-95</b>	<b>Change 1995-98</b>
Real Output	100.0	105.9	89.4	77.4	68.8	-31.2%	-10.6%	-23.0%
Real Value Added	100.0	99.0	102.7	79.2	71.7	-28.3%	2.7%	-30.1%
Employment	100.0	91.4	82.9	73.1	70.9	-29.1%	-17.1%	-14.4%
Real Capital Stock	100.0	85.4	88.0	84.4	81.6	-18.4%	-12.0%	-7.3%
<i>No. matched observations</i>		139	115	48	127			
<b>Food &amp; Beverage Sector (Index 1992=100)</b>								
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>	<b>Change 1992-95</b>	<b>Change 1995-98</b>
Real Output	100.0	105.3	87.4	95.2	92.8	-7.2%	-12.6%	6.2%
Real Value Added	100.0	94.4	102.2	109.7	108.2	8.2%	2.2%	5.8%
Employment	100.0	89.3	75.0	80.0	85.8	-14.2%	-25.0%	14.4%
Real Capital Stock	100.0	97.5	97.5	101.5	96.6	-3.4%	-2.5%	-0.9%
<i>No. matched observations</i>		24	15	16	28			
<b>Textile &amp; Garments Sector (Index 1992=100)</b>								
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>	<b>Change 1992-95</b>	<b>Change 1995-98</b>
Real Output	100.0	116.1	84.5	58.0	53.6	-46.4%	-15.5%	-36.5%
Real Value Added	100.0	101.6	88.6	40.4	38.2	-61.8%	-11.4%	-56.9%
Employment	100.0	87.6	83.3	74.6	72.9	-27.1%	-16.7%	-12.5%
Real Capital Stock	100.0	76.4	80.4	79.2	75.7	-24.3%	-19.6%	-5.8%
<i>No. matched observations</i>		34	26	14	26			
<b>Wood Products &amp; Furniture (Index 1992=100)</b>								
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>	<b>Change 1992-95</b>	<b>Change 1995-98</b>
Real Output	100.0	110.1	114.4	77.3	67.4	-32.6%	14.4%	-41.1%
Real Value Added	100.0	116.5	133.4	77.9	67.8	-32.2%	33.4%	-49.2%
Employment	100.0	100.4	95.3	78.2	72.7	-27.3%	-4.7%	-23.6%
Real Capital Stock	100.0	73.9	77.7	75.0	74.3	-25.7%	-22.3%	-4.4%
<i>No. matched observations</i>		37	42	23	39			
<b>Fabricated Metals &amp; Machinery (Index 1992=100)</b>								
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>	<b>Change 1992-95</b>	<b>Change 1995-98</b>
Real Output	100.0	94.7	65.3	68.2	56.4	-43.6%	-34.7%	-13.6%
Real Value Added	100.0	89.4	92.4	105.2	86.9	-13.1%	-7.6%	-6.0%
Employment	100.0	87.8	74.8	68.1	63.0	-37.0%	-25.2%	-15.7%
Real Capital Stock	100.0	98.6	98.8	97.5	93.4	-6.6%	-1.2%	-5.4%
<i>No. matched observations</i>		45	34	13	34			

*Notes:* Growth rates using matched samples for adjacent years (i.e. maximum number of matched firms). Number of matched observations refer to current period and previous adjacent period. Small matching sample sizes for the 1995-97 period mean that changes over this period are indicative only. Growth rate calculated from the change in the logarithmic mean of each variable between the two periods, in order to reduce the effect of outliers i.e. rapidly expanding or contracting firms within the subsample.  
*Source:* RPED Surveys (1993-95) and the TMES Wave 4 Survey 1999.

The picture that emerges is one of a significant and sustained decline in both real output and value added levels over this period, accompanied by a contraction in employment levels and a decline in the real capital stock. Table 4 presents the pattern of growth of real output, real value added, employment and the capital stock by firm sector in constant price 1992 shillings. Table 5 presents the same information in the form of an index to emphasise the direction of changes between years. These tables show that all sectors contracted in real terms over this period, with an overall fall in real output of 31.2% and real value added of 28.3%<sup>8</sup>. Corresponding to this decline in outputs, factor inputs also contracted sharply, with an average 29.1% reduction in employment levels and an 18.4% decline in real capital stock. This can mostly be attributed to minimal levels of new and replacement investment, rather than to actual dis-investment as such, apart from firms which have exited.

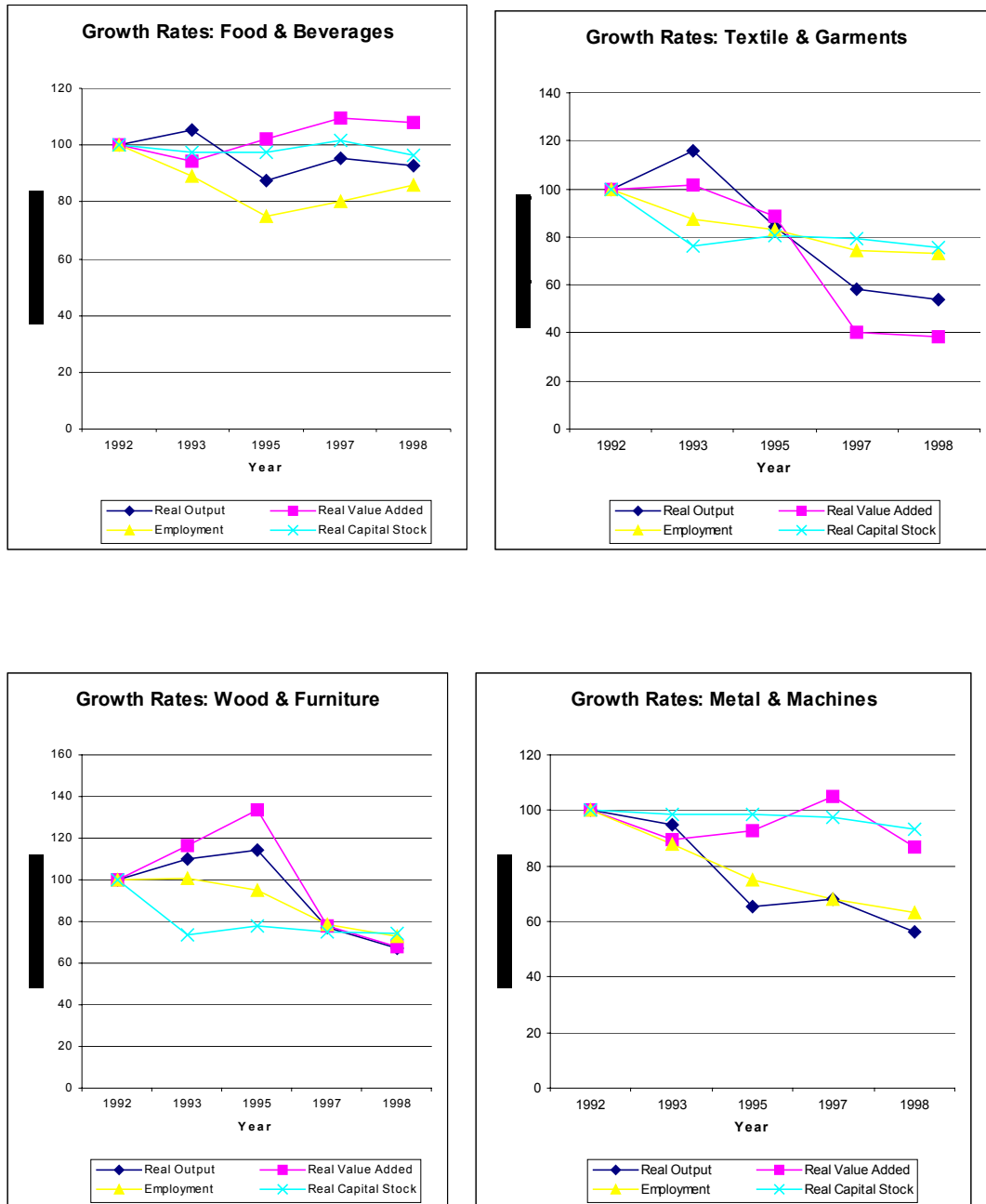
**Figure 4**  
**Growth Rate of Real Output**  
**All Firm Size Categories - RPED/ TMES Surveys**



<sup>8</sup> The similarity in the pattern of changes in output and value added series provides some reassurance of the accuracy of our value added calculations.



**Figure 5**  
**Growth Rates by Manufacturing Subsector**  
**All Firm Size Categories - RPED/ TMES Surveys**

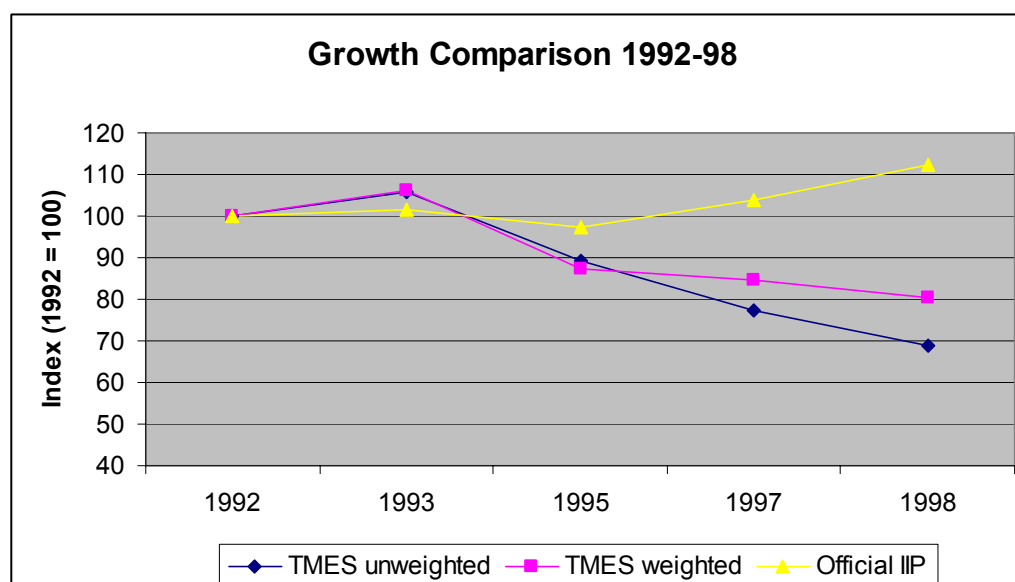


The sectors which have experienced the most dramatic declines are textiles and garments and the wood processing sector (particularly since 1995) and the metal fabrication and machinery industries (in the early 1990's). Sectoral trends are presented graphically in Figures 4 and 5. The only sector which has performed differently is the food processing and beverages. After contracting in the first half of the 1990's, firms in this sector have begun to expand, both in terms of value added and employment since 1995. Growth has been particularly strong in the beverage industries, including beer and soft drinks, and in the production of basic food products, such as wheat flour, biscuits and pasta.

Our results are consistent with the official statistics for the period up to 1995, but thereafter there is sharp divergence, with our survey data showing no evidence of the strong upturn which is the main feature of the aggregate official data. If anything, our data shows an acceleration of the decline after 1995, particularly in the textiles, garments, wood products, and furniture subsectors. Based upon our sample, the recovery in the food and beverage sector has not been sufficient, at least up until 1998, to compensate for the dramatic declines in these other sectors.

A potentially important issue here concerns the percentage contribution of these subsectors to aggregate manufacturing activity and hence the appropriate weighting of the composite index of industrial production. Without doubt, there have been significant changes in the sectoral composition of manufacturing in recent years, as well as significant declines in the contribution of large firms to total manufacturing activity, given the level of industrial restructuring that is obviously taking place. The lack of an industrial census since 1989 makes estimates of these sectoral and size contributions in the late 1990's very difficult, and hence attempts to weight the composite index of industrial production probably inaccurate.

**Figure 6**  
**Comparison of Growth Trends**  
**Total Manufacturing, Index of Real Output (1992 = 100)**  
**Official Data vs Weighted and Unweighted Survey Data**



*Notes:* the official Index of Industrial Production (IIP) is that presented by Prins & Szirmai (1998) using data from the Tanzanian National Bureau of Statistics (see Table 2); the unweighted Tanzanian Manufacturing Enterprise Survey (TMES) is presented in Tables 5 and 6; the weights used in the weighted series are the contribution of the four subsectors covered in the TMES surveys to Adjusted Nominal Value Added in aggregate manufacturing for 1995 (see Table A2); the greater weight given to the food & beverage sector, which is the only expanding sector in the late 1990's, accounts for the dampened decline in the weighted TMES index.

Figure 6 presents a comparison of the trend in the official index of industrial production (presented in Table 2 above) with the real output index from our firm sample (presented in Table 5). The latter is an unweighted aggregate index of the growth of firms in the four subsectors for which we have evidence. We also present a weighted index, where the weights are based upon the contributions of these four sectors to adjusted nominal value added in total manufacturing in 1995, as calculated by Prins & Szirmai (1998) and presented in appendix Table A2. The result of this weighting process is to reduce the decline in the real output series over the period 1992-98 from -31.2% to -20%. This is still in sharp contrast to the official series which rises by 12.3% over the same period. Hence, we do not believe that the explanation for the divergence between the two sources of evidence is due to weighting issues.

## 6. RECONCILING THE DIVERGENCE

One possible source of divergence between our results and the official data is obviously the more complete coverage of our survey in terms of the size distribution of firms within the sector. We investigate this possibility in Table 6 (with results summarised in Figure 7) where we disaggregate the growth patterns for sample firms with an average of >50 employees and <50 employees respectively. We also exclude a limited number of parastatal enterprises from our analysis, since their decline or paralysis due to other non-economic factors may be serving to bias our results downwards. The results for large firms need to be treated with some caution due to the relatively small matched sample sizes for some of the time periods. We are also unable to report sectoral growth patterns due to the lack of sufficient observations in some of the years.

**Table 6**  
**Growth Rates of Surveyed Firms in 1990's**  
**Large vs Small Private Firms**

<b>Large Private Firms in Sample [50+ Employees]</b>								
Index (1992 = 100)								
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>	<b>Change 1992-95</b>	<b>Change 1995-98</b>
<b>Real Output</b>	100.0	115.0	69.8	65.3	66.8	-33.2%	-30.2%	-4.3%
<b>Real Value Added</b>	100.0	112.8	90.7	74.2	80.4	-19.6%	-9.3%	-11.3%
<b>Employment</b>	100.0	65.8	49.6	46.1	43.7	-56.3%	-50.4%	-11.9%
<b>Real Capital Stock</b>	100.0	95.7	94.6	96.7	95.9	-4.1%	-5.4%	1.3%
<i>No. matched observations</i>		25	17	17	27			

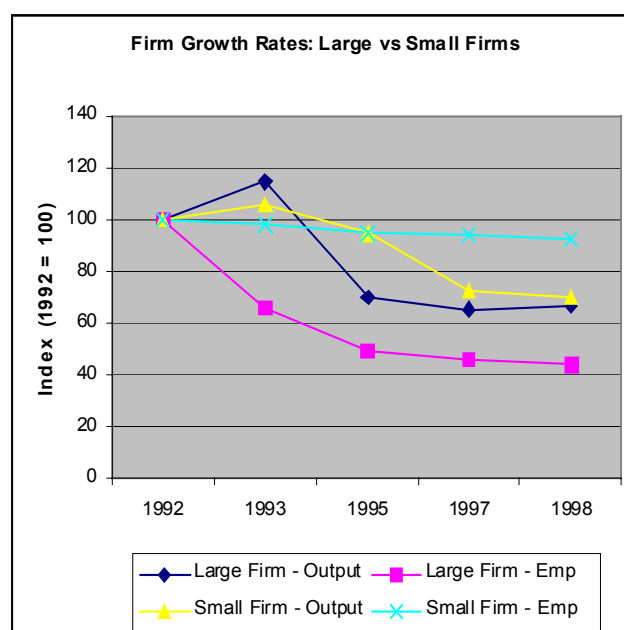
  

<b>Small Private Firms in Sample [&lt; 50 Employees]</b>								
Index (1992 = 100)								
	<b>1992</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>	<b>Change over period</b>	<b>Change 1992-95</b>	<b>Change 1995-98</b>
<b>Real Output</b>	100.0	106.0	94.3	72.6	70.0	-30.0%	-5.7%	-25.8%
<b>Real Value Added</b>	100.0	102.0	116.0	74.9	71.2	-28.8%	16.0%	-38.6%
<b>Employment</b>	100.0	98.3	94.4	94.3	92.8	-7.2%	-5.6%	-1.7%
<b>Real Capital Stock</b>	100.0	85.1	88.7	86.9	84.4	-15.6%	-11.3%	-4.8%
<i>No. matched observations</i>		97	90	41	96			

*Notes:* Growth rates using matched samples for adjacent years (i.e. maximum number of matched firms). Number of matched observations refer to current period and previous adjacent period. Small matching sample sizes for the 1995-97 period mean that changes over this period are indicative only. Growth rate calculated from the change in the logarithmic mean of each variable between the two periods.

*Source:* RPED Surveys (1993-95) and the TMES Wave 4 Survey 1999.

**Figure 7**  
**Changes in Real Output and Employment in 1990's**  
**Large vs Small Private Firms**



*Notes:* The very sharp contraction in both output and employment of large firms in the sample up to 1995 can be seen. This contraction has slowed since 1995 and there are some signs of positive growth between 1997-98. By contrast, small firms have adjusted with a lagged response, but their contraction has accelerated since 1995.

We observe some interesting differences between the patterns of growth of these two sub-samples. In terms of real output, large firms contracted sharply in the early 1990's, but have stabilised in the late 1990's, which at least reflects the pattern observed in the official statistics for some of these subsectors. By contrast, the decline in small firm output and value added has mainly occurred since 1995. Another interesting contrast is the significant degree of employment reduction (-50.4%) amongst large firms in the early 1990's, in comparison to the smaller firms (-5.6%). This can be seen as evidence of (a) significant differences in the timing of the responses of small and large firms to the policy reforms of the late 1980's (b) differences in the nature of the response, with large firms cutting their employment levels significantly, while smaller firms have resisted downsizing, but have rather shifted the types of employment contracts offered to more casual, often piece-rate based, arrangements and (c) as a result, a probable bias in industrial growth calculations (both of output, value added and employment) that are

largely based upon the performance of a relatively limited number of large manufacturing firms.

It could be argued that our results are biased downwards by the inclusion of only declining sectors within manufacturing. Is there any evidence of other rapidly expanding sectors that we are overlooking? Table 7 presents a breakdown of expanding and contracting sectors within manufacturing based upon the QSIP data from 1992 to 1999. This demonstrates the strong performance of the beverage sector which grew by 177.8% during this period and which is included in our analysis. Other expanding sectors which are not covered by the TMES include chemicals, plastics, ceramics. However, their contribution to total manufacturing activity remains relatively small (10% in total). The rise in the overall index seems to be being driven by rapid rises in a small number of sectors, which throws some doubt upon the weightings used to construct the aggregate index.

**Table 7**  
**Expanding and Contracting Sectors 1992 - 99**  
**Production Indices (1985 = 100)**

ISIC	Sector	1992 index	1995 index	1999 index	Change over period	% contrib. To total manufac.
<b>Expanding Sectors</b>						
39	Other manufacturing	7	23	44	528.6%	1%
313	Beverages	90	161	250	177.8%	9%
356	Plastic Products	239	205	411	72.0%	1%
352	Other Chemicals	135	173	227	68.1%	5%
383	Electrical Machines	134	113	196	46.3%	2%
36	Pottery, China etc	163	171	201	23.3%	4%
314	Tobacco	128	140	136	6.3%	11%
<b>Contracting Sectors</b>						
311/2	Food	95	63	82	-13.7%	18%
321/2	Textiles & Garments	147	112	126	-14.3%	17%
353	Petroleum Refining	92	103	74	-19.6%	2%
37	Primary Metals	99	63	75	-24.2%	4%
355	Rubber Products	134	121	81	-39.6%	1%
331	Wood Products	135	70	76	-43.7%	4%
341	Paper & Paper Products	129	139	55	-57.4%	6%
382	Machinery exc. Electrical	39	45	15	-61.5%	1%
351	Industrial Chemicals	37	16	14	-62.2%	5%
324	Footwear	15	23	4	-73.3%	1%
384	Transport Equipment	35	15	8	-77.1%	5%
381	Fabricated Metal	195	19	37	-81.0%	3%
3	Total Manufacturing	110	104	124	12.7%	100%

*Notes:* The percentage contribution of sectors are based upon the breakdown of MVA contained in the 1989 Industrial Census (which covered 118 commodities); shaded lines are those sectors are those covered by the TMES survey.

*Source:* NBS Quarterly Survey of Industrial Production

Appendix Table A2 presents available evidence on the contribution of the four sectors covered to total manufacturing employment and value added from 1985-95. The four sector share of total employment was 92% in 1990 and the share of MVA was 72.9% in 1995. As pointed out above, the lack of reliable information about the population of manufacturing firms in Tanzania since 1989 and the degree of firm turnover observed in the 1990's (Harding, et al 2002) means that an accurate assessment of changes in sectoral contributions is problematic. However, we would argue that the four main sub-sectors covered in our survey are still the major areas of both manufacturing employment and output in Tanzania and hence growth trends in these sectors are good indicators of the health of the industrial sector overall.

One important consequence of the observed growth patterns is the decline in average firm scale over this period, both within our sample and probably within the population of firms. Large firms within our sample have on average halved their total employment levels. Several recent studies have found that productivity levels and degree of capital intensity are strongly correlated with firm size, hence this decline in average firm scale may have important implications for levels of efficiency, which will itself impact upon the ability of surviving firms to compete both within the domestic market and also internationally.

## **7. CONCLUSIONS**

The World Bank (2001) review of Tanzanian economic prospects at the turn of the century rightly emphasises the central role of higher levels of private sector investment and productivity growth as a key engine of wider economic growth and poverty reduction. It identifies mining and tourism as the two most dynamic sectors, but also points out that the private investment response to policy reforms in other sectors has been weak. The report further discusses the response of the industrial sector, which in the 1990's has undoubtedly experienced significant restructuring, both as a result of the privatisation programme and in response to other policy reforms, including greater openness to competition from imports and new entrants. The report concludes that "what appears to be emerging is that the surviving older firms and the new firms have more than covered for losses from firms folding up" and that "this sets up the basis for a much more efficient and robust private sector". This paper has presented micro firm-level

evidence which partly confirms these assertions, but also presents a warning that the restructuring and “downsizing” period is likely be more sustained and potentially more costly, in terms of output and employment reductions, than commonly assumed.

Some of the observed responses of Tanzanian firms to the economic reform programme have been (a) significant downsizing of scale of operations through reductions in permanent employment levels, (b) a move to the increasing use of casual piece-rate labour, (c) reductions in levels of plant utilisation and (d) substantial levels of firm turnover, including a high exit rate across the size distribution. This is consistent with similar patterns observed in other African countries e.g. Kenya (Soderbom, 2001) and Ghana (Teal, 1998).

Our results also demonstrate the potential costs of excluding the small-firm sector and the informal sector from official coverage of industrial production statistics. The bias introduced into estimates of total output and manufacturing value added may also be increasing over time, given that there is substantial evidence that one of the main responses to the policy reform programme has been the increasing “informalisation” of manufacturing activity in Tanzania, at least for firms oriented towards the domestic market. These problems are certainly not exclusive to Tanzania, but affect many other developing countries which have limited financial and technical resources to devote to the collection of economic data from firms.

What is it that explains the divergence of the performance of large firms (here identified as those with >50 employees) from smaller firms over the periods 1992-95 and 1995-98? Large firms experienced a sharp contraction in the early 1990’s and have shown signs of stabilisation since 1995, with the only sector showing positive growth being food processing and beverages. Both the textile sector and wood processing sector, which are dominated by relatively large firms, show sustained decline throughout this period. By contrast smaller firms slower to adjust to changing economic conditions in the early 1990’s, but have subsequently begun to contract sharply in all sectors, including furniture, garments and metal fabrication.

We advance here one possible explanation for the differential growth performance of firms in different size categories, based upon a range of conditions particular to Tanzania



during this period. This and other possible explanations merit further empirical investigation, both in the form of quantitative analysis of survey datasets but also in the form of more detailed case studies of specific firms and sub-sectors.

Historically, large industrial firms in Tanzania were overcapitalized and operating at low levels of capacity utilization. The economic reforms and liberalisation of the late 1980's and early 1990's forced these large firms to rationalize their activities in order to be able to compete. The "downsizing" pressures of increased competition were exacerbated by a decline in domestic demand due partly to a sharp contraction of the money supply in the late 1980's in order to achieve the government's macroeconomic stabilization commitments. Some sectors of manufacturing (and specific domestically-owned firms) were also negatively impacted by declines in public sector employment and spending, which affected firms relying heavily on government contracts and demand from households headed by public sector workers. By contrast, smaller firms were shielded from the initial reforms, due to their more limited dependence upon imported raw materials and capital inputs and the fact that at least some of their products were non-tradable and hence not subject to direct competition from imports. However, these firms are particularly vulnerable to fluctuations in levels of domestic demand, competition from imported goods in some sectors (particularly garments) and low levels of technical efficiency. In the face of declines in demand for their products, small firms have responded, not by cutting aggregate employment levels (due to both onerous labour regulations, but also to the more informal/ traditional approaches by small-scale entrepreneurs to human resource management) but by moving to more informal labour contracts, involving casual workers employed on a piece-rate basis. In an uncertain business operating environment, there is a premium placed upon the flexibility with which firms can respond to exogenous shocks. In these circumstances, perhaps small is beautiful after all.

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### **Appendix A: Summary of Primary Data Sources on Tanzanian Manufacturing (1978 onward)**

Official data on the size, composition and growth of the Tanzanian manufacturing sector is both incomplete and sometimes contradictory. The major omissions stem from the lack of coverage of micro and small-scale manufacturing enterprises in the regular data gathering procedures. There are also some questions about the treatment of new firms entering the sector, which are not accurately reflected in the list of firms surveyed.

Tanzania's first post-independence industrial census in 1978 aimed to cover all establishments employing 5 or more people and found that 90% of the 1282 establishments covered had less than 10 employees. The most recent industrial census was commenced in 1989 with completion of the data collection process only in March 1993. The 1989 Industrial Census aimed to cover all mainland establishments with 10 or more employees and a sample of establishments with less than 10. A total of 886 establishments were registered in the 1978 census (a decline of one third from 1978). The results of this census were used as the sampling frame for the initial round of the RPED survey in October 1993 and have formed the basis for the Bureau of Statistics subsequent annual and quarterly surveys.

Based upon the results of the 1989 Industrial Census, a "Directory of Industries with >50 Employees" (Bureau of Statistics, September 1992) lists a total of 412 industrial establishments, where regional branches of a single firm may be included as separate establishments. Of these, 365 are manufacturing establishments and a total of 280 fall within the four subsectors which are the focus of our surveys.

Industrial production statistics have been gathered by the Bureau of Statistics on a regular basis, but for a number of reasons cannot be considered to be comprehensive in their coverage. Data is collected on the basis of a written questionnaire which is mailed out or delivered to firms for voluntary completion. The two main data collection instruments are:

- an annual survey was conducted between 1965-1990 and aimed to cover all industrial establishments employing 10 or more workers; the listing of

establishments is taken from the last Industrial Census (1989) with attempts made on an ad hoc basis to update the listing for subsequent entry and exit of firms;

- a quarterly survey conducted since 1986 which focuses only upon manufacturing sector establishments employing 50 or more workers.

Returns received from the quarterly survey form the basis for the production and employment indices published by the Statistics Bureau. This however is an obvious understatement of the true size of the manufacturing sector to the extent that it only includes approximately 300 of the largest firms in Tanzania. In the absence of a more recent industrial census, we do not have any convincing method for estimating the contribution of these firms to total manufacturing sector output and employment in Tanzania, although it is certainly the case that these firms are likely to account for a dominant share of total manufacturing output, if not employment<sup>9</sup>.

Recent work by Prins and Szirmai (1998) has attempted to construct a new index of industrial production and employment to take account of some of these deficiencies. They have included estimates for the contribution made by the small & medium scale firms of 10-50 employees who are excluded from the quarterly survey but included in the annual survey. Along with several other modifications (see below) this has resulted in (a) a new volume-based index of industrial production and (b) a new time series for 10+ manufacturing value added (MVA) which is considerably above the official series by a ratio of 1.5 - 2 times the original. These two series are reproduced in Tables A1 and A2 below.

Deficiencies identified in the official data gathering and statistical analysis procedures used by the National Bureau of Statistics during this period include:

- The number of establishments covered vary greatly between census years and other survey years; this is presumably because some of the firms on the census list exit and they are not replaced by new entrants (*non-coverage*).
- Some sectors, particularly those dominated by small-scale enterprises have been

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<sup>9</sup> According to statistics published using the 1989 census, firms employing more than 50 employees contributed approximately 85% of total manufacturing output at that point in time.

deliberately excluded from the annual/ quarterly surveys e.g. furniture making and tailoring (*omitted establishments*).

- No allowance was made before 1971 in calculating aggregate statistics for non-response by firms to the survey instruments; thereafter adjustments were made by simply repeating the data for the firm given in previous years, with no allowance for price inflation (*treatment of non-response*).
- Mistreatment of interest payments, which were mistakenly included as an intermediate cost in the value added calculations, thus biasing the MVA series downwards, particularly for the textiles sector (*cost adjustment*).

The Prins & Szirmai series are undoubtedly the most reliable estimates for the pattern of growth of the Tanzanian manufacturing sector, in aggregate and for the relevant subsectors of interest, over the period 1965-95 and we have used their figures in our comparative analysis. We have extended their production index for the period 1995-99 using unpublished data from the NBS's Quarterly Survey, in order to be able to compare trends in this series with the results from the TMES sample survey carried out in late 1999.

Additional available data sources are two Informal Sector Surveys (1991, 1995) undertaken by the Planning Commission and input-output tables for 1976 (published in 1986) and 1992 (published by National Bureau of Statistics in 1999). Further general information on industrial data availability can be obtained from the IMF's General Data Dissemination System website at <http://dsbb.imf.org/gddsindex.htm>

**Table A1**  
**Revised Index of Industrial Production 1965-95**  
**(1976 = 100)**

ISIC code	3	31	32	33/34 Wood Products, Furniture & Paper	37/38/39 Metal Products, Machinery & Other
	Total Manufactur.	Food, Bevs & Tobacco	Textiles, Garments & Leather		
1965	31	37	24	100	24
1966	37	37	30	114	27
1967	38	41	31	101	24
1968	48	43	45	116	33
1969	52	51	47	124	29
1970	57	51	63	123	29
1971	65	59	62	145	48
1972	84	84	80	141	61
1973	93	86	90	159	81
1974	93	81	94	142	91
1975	91	78	92	123	92
<b>1976</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
1977	105	92	105	151	112
1978	107	103	97	124	133
1979	103	90	104	100	138
1980	96	77	99	108	130
1981	88	67	90	97	114
1982	83	64	83	91	132
1983	77	67	62	68	167
1984	88	62	60	58	194
1985	72	57	57	62	137
1986	73	54	58	83	152
1987	71	48	75	114	115
1988	75	57	82	111	102
1989	75	55	76	109	110
1990	84	62	77	101	141
1991	84	64	73	90	133
1992	74	62	65	71	100
1993	75	65	68	101	88
1994	79	66	66	72	125
1995	72	69	58	66	69
<b>5 year growth pattern (%)</b>					
1965-70	83.9	37.8	162.5	23.0	20.8
1970-75	59.6	52.9	46.0	0.0	217.2
1975-80	5.5	-1.3	7.6	-12.2	41.3
1980-85	-25.0	-26.0	-42.4	-42.6	5.4
1985-90	16.7	8.8	35.1	62.9	2.9
1990-95	-14.3	11.3	-24.7	-34.7	-51.1

Source: Prins & Szirmai (1998), Appendix K

**Table A2**  
**Adjusted Nominal Value Added & Employment 1985-95**  
**Estimates for Tanzanian 10+ Manufacturing**

<i>Value Added (Tsh millions)</i>						
ISIC code	3	31	32	33/34	37/38/39	4 Sector
	Total	Food, Bevs &	Textiles,	Wood Products,	Metal Products,	Share of
	Manufactur.	Tobacco	Garments &	Furniture &	Machinery &	Total (%)
			Leather	Paper	Other	
1985	9,812.2	3,148.2	2,238.4	870.4	1,772.5	81.8%
1986	12,359.7	3,099.1	2,577.5	1,107.3	2,469.3	74.9%
1987	21,679.3	5,157.9	5,331.6	1,546.2	3,503.2	71.7%
1988	26,641.9	7,666.6	6,865.4	2,044.6	3,774.8	76.4%
1989	32,652.9	12,441.8	5,826.6	3,017.3	5,042.9	80.6%
1990	38,681.4	17,149.5	5,597.2	3,755.9	5,570.0	82.9%
1991	48,128.4	21,232.5	6,459.2	4,328.1	7,105.1	81.3%
1992	53,473.0	25,522.9	7,033.2	4,138.8	7,318.0	82.3%
1993	63,535.1	30,743.4	7,567.2	7,639.4	7,154.9	83.6%
1994	82,159.2	43,203.0	8,666.8	6,716.7	9,873.7	83.3%
1995	98,817.6	53,931.3	12,258.0	8,543.6	8,030.2	83.8%

<i>Total Employment</i>						
ISIC code	3	31	32	33/34	37/38/39	4 Sector
	Total	Food, Bevs &	Textiles,	Wood Products,	Metal Products,	Share of
	Manufactur.	Tobacco	Garments &	Furniture &	Machinery &	Total (%)
			Leather	Paper	Other	
1985	107,721	29,138	42,191	13,722	12,402	90.5%
1986	120,168	38,641	43,499	14,452	11,303	89.8%
1987	120,096	39,858	43,426	14,211	11,041	90.4%
1988	121,642	43,200	41,069	15,229	10,919	90.8%
1989	125,879	45,282	38,128	16,930	13,793	90.7%
1990	134,413	47,397	37,674	24,360	14,211	92.0%

*Note:* Nominal value added series has been adjusted from the original NBS series to take account of a number of methodological problems in its construction. Employment figures are only available up to 1990.

*Source:* adapted from Prins & Szirmai (1998)

## Appendix B: Price Deflators Used

### Real Output and Value Added

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 B1. 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 B1: National Consumer Price Index, Mainland Tanzania**

	<b>CPI (1992=100)</b>	<b>% change</b>	<b>Food (1992=100)</b>	<b>% change</b>	<b>Non-Food (1992=100)</b>	<b>% change</b>
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

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.



*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 B2 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 B2****Producer Price Series by 4 Digit ISIC Categories**

<b>ISIC</b>	<b>Activity</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>
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)

### 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 B3.

**Table B3**  
Alternative Indices for deflating capital stock series

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

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

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