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Firm Size, Employment and Value-added in African Manufacturing Firms: Why Ghana needs its 1 per cent*

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Abstract

In this paper three censuses of manufacturing firms in Ghana for 1962, 1987 and 2003 are used to investigate changes in the firm size distribution and changes in the employment and value-added share across that distribution. It is shown that the censuses for 1987 and 2003 excluded self-employed enterprises with employees which were a rapidly growing part of the industrial structure over the period 1987 to 2003. Using a wider definition of firm, which includes those enterprises, there has been a substantial shift in employment to small firms where productivity is low. Using the wider definition of a firm in 2003 the top 1 per cent of firms produced 63 per cent of value-added. If the narrow definition of firm used in the manufacturing census is applied than the top 1 per cent of firms in 2003 were producing 72 per cent of value-added. These findings are related to the view there is a 'missing-middle' in the firm size distribution in Africa.

Key words: African manufacturing firms, missing-middle, census data.

JEL Categories: O14, O17, O55, J21.

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1. Introduction

That the urban landscape in sub-Saharan Africa (SSA) is dominated by large numbers of small enterprises co-existing with a few much larger ones, implying a 'missing-middle', is a common observation regarding industrial structure in SSA. There is in fact no evidence for this widely held view. We lack evidence because, until recently, the census data which would enable us to view the size distribution is available, if at all, only in the form of summary reports. A paper examining the firm size distribution for India, Indonesia and Mexico by Hsieh and Olken (2014) shows this distribution to be unimodal leading them to conclude there is a missing 'missing middle', the title of their paper. Pham and Takayama (2015, Figure 1) show that a similar pattern holds for Vietnamese firm data. The key feature of these firm data, for all these countries, is that the distribution is unimodal, there is no evidence for bimodality which Hseih and Olken assume to be the meaning of there being a 'missing middle'.

In a comment on the Hseih and Olken (2014) paper Tiebout (2014, p.235) challenges this interpretation of the term 'missing middle'. 'Hseih and Olken do not discuss whether unimodal distributions disprove the missing middle; they take this as axiomatic. But in my view, the central thesis of the missing middle literature is not bimodality. Instead, it is that policies and market conditions in some developing countries have discouraged production at mid-sized firms, as opposed to small or large firms, relative to an undistorted plant size distribution. By this definition, a missing middle is quite consistent with a unimodal shape, and the evidence presented by Hseih and Olken does not speak to the relevance of the earlier literature'. In a paper related to this comment Tiebout shows using the same data as in Hseih and Olken (2014) that in their three countries there is a 'missing-middle' in his sense of the term. Tiebout suggests that this missing-middle may result from policy distortions which disadvantage mid-sized firms.

The evidence that distortions, particularly in markets for finance, prevent smaller firms growing, thus potentially being the source of the 'missing middle as defined by Tiebout is surveyed in Beck and Demirguc-Kunt (2006) who argue 'there is substantial evidence that small firms face larger growth constraints and have less access to formal sources of external finance, potentially explaining the lack of SMEs' contribution to growth'. They conclude their review of the evidence by arguing that 'a focus on improving the business environment for all firms is more important than simply trying to promote a large SME sector which might be characterized by a large number of small but stagnant firms'. It was noted early in the discussion of the small firm sector that while they dominate the industrial landscape in terms of numbers, they do not in terms of either employment or output. In an early review of the literature Liedholm and Mead (1987) cite studies showing that small firms in several developing countries, which include Ghana, produce less than 30 per cent of manufacturing value-added.

In this paper we use manufacturing firm census data, some recently made available by the Ghana Statistical Office, to examine the size distribution of firms in Ghana for 1962, 1987 and 2003 and the distribution of employment and value-added across the size distribution. We begin in section 2 by using the 1987 and 2003 industrial census to show that the distribution of firms is very similar to that documented by Hseih and Olken (2014) for India, Indonesia and Mexico. In Section 3 the accounts data collected in Phase II of the censuses is used to show how employment and value-added is distributed across the size spectrum. The possible existence of a 'missing-middle' in employment is investigated in section 4. Section 5 provides a discussion and a longer term perspective by using the 1962 census. A final section concludes.

2. The 1987 and 2003 Industrial Censuses in Ghana

It is true small firms are the most numerous and this makes knowing the size distribution difficult as small firms are often not included in any regular census. One example is the Ethiopian annual census which includes only firms greater than 10, see Shiferaw (2007) and Söderbom (2012). Censuses of small firms are undertaken less regularly and suggest that small firms dominate. Gebreeyesus (2013,

p.10) provides a figure of 32,772 manufacturing firms in Ethiopia in 2001/02 of which 97.2 per cent have less than 10 employees. Another example where attention is focused on larger firms is work on the Côte d'Ivoire where researchers have created a panel of 5941 unique firms over the period from 1976 through 1997 from paper filing at the "Registrar of Companies for the Modern Enterprise Sector", Klapper and Richmond (2011). These numbers for Ethiopia and Côte d'Ivoire compare with the results of the 2003 census for Ghana of 23,012 manufacturing firms of which 85 per cent have less than 10 employees. Clearly any attempt to assess changes in the firm size distribution needs to make allowance for the coverage of any survey or census.

The 1987 Industrial Census was the first since 1962 and differed in scope and coverage from the earlier census. In particular the 1962 census had a much broader definition of enterprises to be covered and recorded for the manufacturing sector a total of 95,158 enterprises with an average size of 3 employees. In contrast there was a close similarity between the designs of the 1987 and 2003 censuses. We return to the 1962 census in Section 5 below. In Table 1 we show the firm size breakdown available from the official reports for the 1987 and 2003 censuses.

Table 1 Changes in the Size Distribution of firms in Ghana: 1987 to 2003 from the Official Reports

	1987				2003			
	Firms	(%)	Employment	(%)	Firms	(%)	Employment	(%)
Small	6,275	75	28,664	18	22,181	85	84,816	35
Medium	1,834	22	43,251	28	3,656	14	75,997	31
Large	240	3	85,169	54	251	1	82,703	34
Total	8,349	100	157,084	100	26,088	100	243,516	100

Notes: A small firm is defined as one employing less than 11, a medium size is defined as one employing from 11 to 99 and a large firm as one employing 100 or more.
Source: Ghana Statistical Service, National Industrial Census, 1987, Phase 1 Report, and 2005 National Industrial Census Bulletin No. 1.

It is clear from these official reports that there were dramatic changes in both the number of manufacturing firms in Ghana and the size distribution. The number of small firms more than tripled while the number of large firms, defined as those employing more than 100, scarcely changed. The implication of the changes shown in Table 1 is that the average size of manufacturing firm in Ghana halved between 1987 and 2003.

These data have recently been made available in electronic form by the Ghana Statistical Office. While the data sets are described as Industrial Censuses no attempt was made to survey all firms for their accounts data. For both censuses there was a two stage procedure in carrying out the census. In Phase 1 a comprehensive listing of firms in the sector was obtained which contained basic information on its size measured by numbers of employees, its sector and location. In Phase 2 of the census in 1987 it was planned to survey all firms with more than 10 employees. On the basis of the listing obtained in Phase 1 there were 1,394 such firms in 1987 (Table 2 column (1)). A research project at the CSAE recreated an electronic version of this data which consists of a file of 1,132 firms (Table 2 column (4)). On the basis of the experience of the 2003 Census, see below, it seems most likely that the intention to survey all 1,394 firms fell short. The plan for the 2003 Census was different from that of the 1987 census in that after the Phase 1 listing was complete it was planned to survey a sample of those firms with less than 10 employees while again surveying all firms with more than 10 employees. This was a very important innovation as it is the first time in Ghana that such small firms have been surveyed as part of a census which would enable a full breakdown of both employment and output by firm size to be obtained.

In Table 2 we report the results of the Phase 1 and Phase 2 processes and the data which we propose to use in this paper. Columns (1) and (5) show the number of establishments found in the Phase 1 listing for the 1987 and 2003 censuses respectively. As will be seen these numbers almost exactly match the figures given in the official report for 2003 but the numbers in 1987 are some 7 per cent lower, a figure of 7,737 firms rather than the 8,349 given in the official report. In work on the electronic data a certain amount of cleaning was undertaken and it is possible that the figure of 8,349 in the official report contains duplicates.

Using the numbers from the listing Figures 1 and 2 replicate the distributions used in Hsieh and Olken (2014) for 1987 and 2003 respectively. As the sample is dominated by small firms the Figures show four distributions, those for firms between 1 and 200 employees (this comprises nearly 99 per cent of the sample), those having between 10 and 200 employees, those having between 50 and 200 and finally those between 200 and 3000 employees. The result is identical to that found by Hsieh and Olken (2014), for none of these distributions is there any indication of a bimodal distribution which is their interpretation of the term 'missing middle'.

Table 2 Number of Establishments in Ghana's Manufacturing Sector in 1987 and 2003

	1987				2003			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
No. of Employees	Phase 1 Listing	Phases 1 and 2	Using Weights	Phase 2 Survey	Phase 1 Listing	Phases 1 and 2	Using Weights	Phase 2 Survey
1-4	2,928	2,918	2,919	Na	14,159	14,148	10,750	439
5-9	3,415	3,391	3,391	Na	7,778	8,059	8,750	695
Small	6,343	6,309	6,310	Na	21,937	22,207	19,500	1,134
10-19	743	776	798	522	2,427	2,194	2,692	1,417
20-29	193	243	250	194	545	569	520	343
30-49	142	166	171	137	410	427	211	176
50-99	128	161	166	126	284	275	114	99
Medium	1,206	1,346	1385	979	3,666	3,465	3,537	2,035
100-199	83	83	86	66	128	124	67	51
200-499	56	57	59	47	93	93	65	54
500+	49	49	50	40	41	45	34	30
Large	188	189	195	153	262	262	166	135
Total	7,737	7,844	7,890	1,132	25,865	25,934	23,203	3,304

Table 2 columns (2) and (6) show the number of establishments when Phase 1 and 2 information is combined to check for duplicates and possible missed establishments. In Columns (4) and (8) we show the number of establishments surveyed in Phase 2 of the Census process. Columns (3) and (7) then show the implied total using the survey firms in Phase 2 applying weights. These weights were created for 1987 as part of the PEDL project on which the result reported here are based. The weights for 2003 were supplied by the Ghana Statistical Office when making the census data publicly available. Using the 2003 weights it is possible to replicate fairly closely the data given in the Official Report on the 2003 Census (see Appendix).

Figure 1 The Distribution of Manufacturing Firms in the 1987 Census

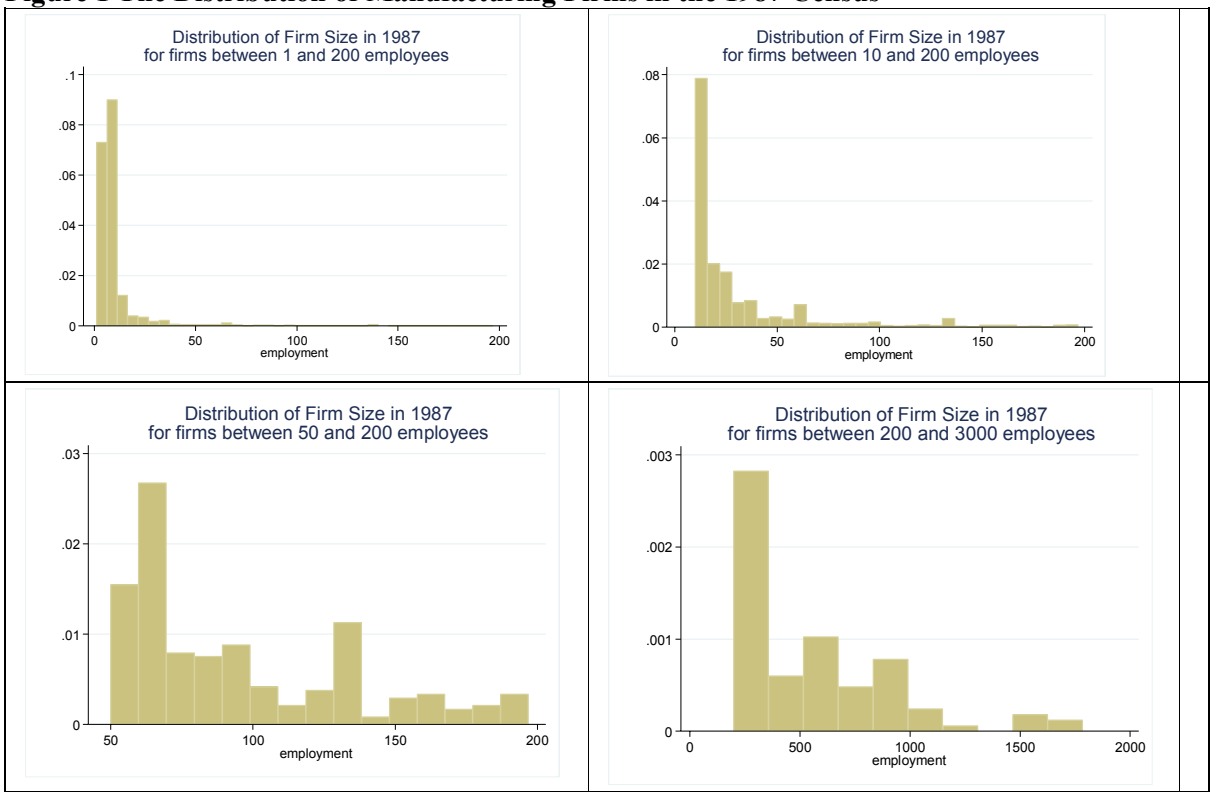
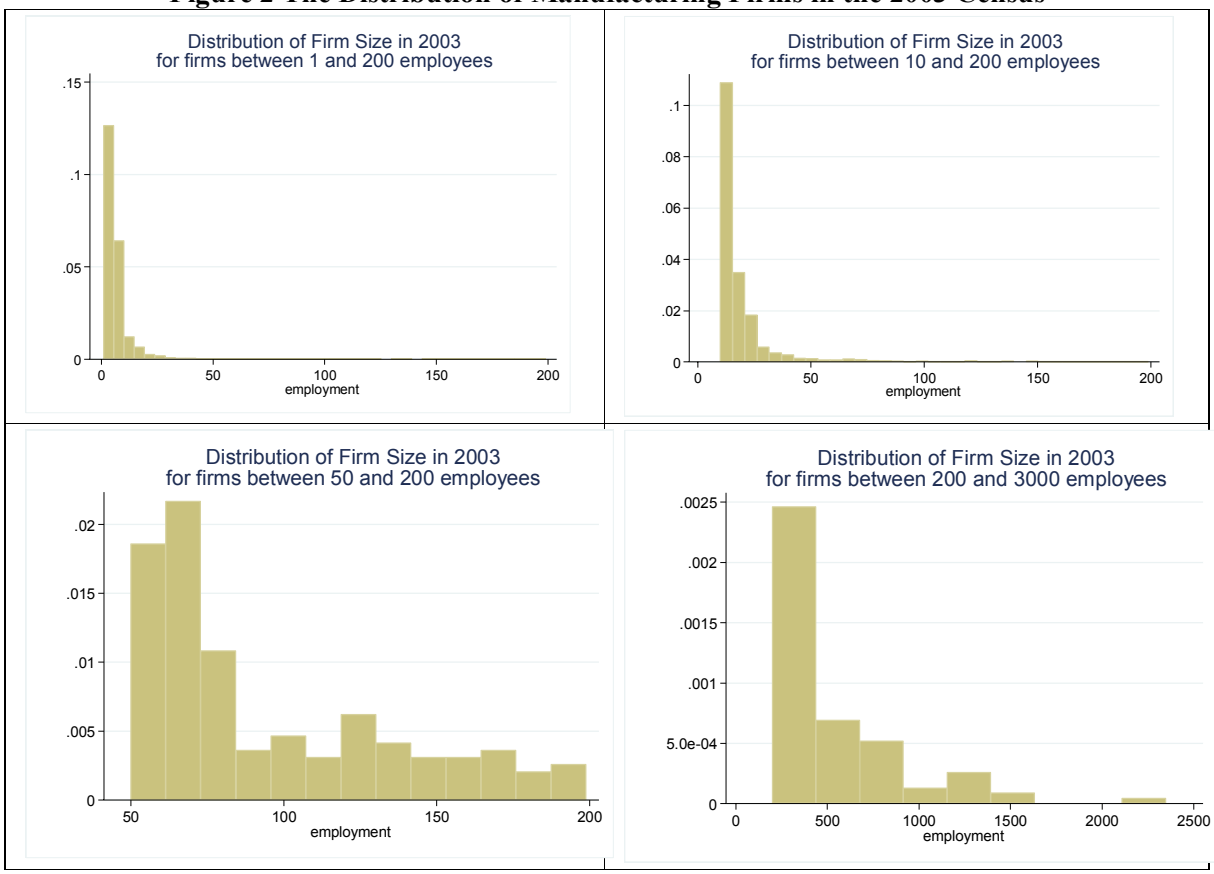


Figure 2 The Distribution of Manufacturing Firms in the 2003 Census



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The result in Columns (2) and (6) is a slight rise in the number of firms enumerated for 1987 and a rather larger fall for 2003. While none of these differences between the sources changes the overall picture for changes between 1987 and 2003, which is one of a massive expansion of small firms, the number of large firms obtained by weighting the Phase II data for 2003 is 10 per cent lower than the figures given in Table 2 Column (6). We have no information that would enable us to reweight the observations but as the weighting is understating the number of large firms the findings in this paper of the dominance of large firms in value-added may well be an understatement of their importance.

It is not simply the unimodal nature of the distributions that is striking but the apparent dominance within the distribution of very small firms, a dominance which has increased substantially over the period from 1987 to 2003 with the results that the average size of firm has halved in this period. Before turning to the argument advanced by Tiebout (2014) for a 'missing-middle' in employment outcomes we use the accounts data from the censuses to show how employment, value-added and productivity vary across the size distribution

3. The Distribution of Employment, Value-Added and Productivity Across Firms

The lack of census data on small firms has meant that their productivity compared with larger firms has depended on survey evidence where it is difficult to have an up-to-data sampling frame for such firms thus leaving doubts as to how representative are the surveyed firms. As in the Ghana 2003 census the second stage of the census procedure took a sample of small firms based on the initial listing it is possible to compare these firms with the larger ones. In Table 3 we use the data from Phase 2 of the Census to show total employment, value-added and labour productivity by the same size categories as those already used. Table 4 then shows that distribution of firms, employment and value-added in percentage terms.

Table 3 Employment, Value-added and Productivity: 1987 and 2003

	Total Employment			Value-added in US$ (millions)			Value-added per Employee in US$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	1987	2003	Annual% change	1987	2003	Annual% change	1987	2003	Annual% change
1-4	7,283	29,296	8.7	14.6	49.2	7.6	2,000	1,715	
5-9	21,214	57,237	6.2	42.4	57.5	1.9	2,000	986	
Small	28,497	86,533	6.9	57.0	106.7	3.9	2,000	1,388	-2.3
10-19	10,474	35,092	7.6	15.3	56.8	8.2	2,145	1,660	
20-29	5,891	12,314	4.6	4.7	30.2	12.4	1,028	2,447	
30-49	6,354	7,858	1.3	4.5	25.2	10.8	944	3,205	
50-99	11,455	7,709	-2.5	17.6	58.5	7.5	1,983	6,853	
Medium	34,174	62,973	3.8	42.1	170.7	38.9	1,736	2,037	1.0
100-199	12,269	9,548	-1.6	21.4	101.0	9.7	2,106	10,116	
200-499	17,671	19,010	0.01	74.3	321.0	9.1	4,943	17,141	
500+	44,661	30,226	-2.4	179.0	289.0	3.0	5,448	10,406	
Large	74,601	58,784	-1.5	274.7	711.0	5.9	3,852	12,930	7.6
Total	137,272	208,290	2.6	373.8	988.4	6.1	2,003	1,568	-1.5

Table 3 columns (1) and (2) shows the employment total across the size distribution. We use the imputed employment from using the weights to ensure consistency across the measures shown in the table. Table 3 columns (3) and (4) show value-added in US$ and columns (5) and (6) show productivity.

Table 4 Percentages of Establishments, Employment and Value-added by Firm Size: 1987 and 2003

	Number of Establishments		Employment		Value-added	
	(1)	(2)	(3)	(4)	(5)	(6)
	1987	2003	1987	2003	1987	2003
Small	81	86	21	42	19	16
Medium	17	13	25	30	8	12
Large	2	1	54	28	73	72
Total	100	100	100	100	100	100

Turning to Table 4 we see that the growth in the number of small establishments means their share, already high at 81 per cent in 1987, increased further to 86 per cent while the share of large firms already small in 1987 at 2 per cent, halved to 1 per cent. It is important to note that the pattern shown in employment share (Columns (3) and (4) of Table 4) appears to be similar to that documented by Tiebout (2000, p.16) for 2003 but not for 1987 where the share of employment in medium sized firms is higher than for small firms, defined here as those employing less than 10. We now want to consider if this picture does imply a 'missing middle' in employment outcomes.

4. A 'missing-middle' in employment?

Tiebout (2014) argues that a more useful definition of a missing middle is that the distribution is far from that predicted by an undistorted policy environment. He compares actual employment shares with those that would be predicted by a Paretian distribution arguing that such a distribution is a reasonable assumption of what an undistorted policy environment would produce. He takes the data from the Hseih and Olken (2014) paper and shows that the share of employment in middle sized firms is lower than would be predicted by a Paretian distribution for India, Indonesia and Mexico but is higher in the US.

The Tiebout procedure is to assume a Paretian distribution of the form:

$$F(x) = 1 - x^{-k}$$

where x is plant size measured as number of workers, and Tiebout assumes the smallest feasible plant has a single worker. As Tiebout notes with information on the number of plants of each size in a particular country, one could readily investigate whether deviations from the Pareto shape imply a missing middle by his definition. However as it is easier to obtain data on the share of the work force in different plant size categories, Tiebout proceeds by examining deviations of these shares from the shares implied by a Pareto shape. Specifically, if plant sizes are distributed Pareto, the share of the work force employed at plants in the size range $l_i \; to \; l_j$ should be:

$$\hat{s}(l_i, l_j | k) = l_j^{1-k} - l_i^{1-k}$$

Using the share data reported in Hsieh and Olken (2014), as well as data from the U.S. (as a reference point) and India (as a robustness check), Tiebout calibrates this equation country by country, choosing k to minimize the Euclidean distance between the log of the vector of actual shares and their predicted

values. He notes that *k* is monotonically and negatively related to per capita GDP, reflecting the well-known fact that small firms are relatively common. Table 5 replicates the analysis from the Tiebout (2014) paper and uses the same size classification and extends it to include the two Ghana censuses for 1987 and 2003.

Table 5 Comparing Actual Distributions with a Paretian one

	India 2011	Indonesia 2006	Mexico 2008	Ghana 1987	Ghana 2003
Distribution of Firm Size					
1-9	97.88	96.78	91.74	81.98	84.84
10-49	1.85	2.83	5.85	13.93	13.04
50+	0.28	0.39	2.41	4.08	2.11
Distribution of Employment					
1-9	64.77	53.95	22.45	20.76	41.54
10-49	12.10	12.04	10.55	16.55	26.53
50+	23.13	34.01	66.99	62.69	31.92
Value of k	1.39	1.30	1.11	1.15	1.15
Implied Distribution of Firm Size from Paretian					
1-9				93.0	
10-49				6.0	
50+				1.0	
Predicted versus actual Employment Shares					
1-9	0.073	0.061	0.005	-0.084	-0.15
10-49	-0.084	-0.085	-0.030	0.015	0.12
50+	0.011	0.024	0.134	0.069	0.03

Sources: Hsieh and Olken (2014), Tiebout (2014) and author's calculations from the Ghana censuses.

The results are rather striking in that the share of employment in the 10-49 category, the focus of the discussion on the existence of a 'missing middle', is far *higher* in Ghana than in any of the other countries. The value of *k* for Ghana is obtained by a maximum likelihood estimate from the size distribution and shows a value of *k* similar to that for Mexico. Indeed the share in this size class increased by 10 percentage points when the number of firms in the small category, those employing less than 10 more than tripled (see Table 2) and its share in the total number of firms increased from 82 to 85 per cent. The arithmetical reason is clear in that the share of employment in large firms, here those employing more than 50, halved from 63 to 32 per cent, while the small firm share, here those employing less than ten, doubled from 21 to 42 per cent. It appears from this census data that using Tiebout's criterion there is no missing middle in either of these Ghana censuses.

5. Discussion and a Longer Term Perspective: The 1962 Census

The results shown above are so at variance with what is currently assumed above Africa's industrial structure that some comment is clearly required as to what can explain the divergence between the results of this analysis of the censuses and commonly held views.

While small firms dominate the industrial landscape in Ghana the key point that emerges from Table 5 is that they are far *less* dominant than is the case in the other countries shown in the comparison. The most obvious reason for this outcome is that the Ghana censuses are greatly understating the number of small firms. As noted in Section 2 above the 1962 census had a much broader definition of enterprises to be covered and recorded for the manufacturing sector a total of 95,158 enterprises with an average size of 3 employees.

The 1987 and 2003 census used the same definition of firm and had the same geographic coverage so while they are directly comparable it is far from clear that the definitions used are comparable with those in the other countries reported in Table 5. There were two exclusions from the definition of establishment used in 1987 and 2003 which are important.

'Though coverage of all recognisable establishments was the objective of Phase I household industries were not included in the census … However, where a sign board indicated an establishment was located in a house, it was treated as a "recognisable establishment" and included. Enumeration was also generally confined to urban area except for establishments listed in the interim register (a preliminary listing of possible establishments to be surveyed) that were located in rural areas' GSS (2006, page 4). The explicit exclusion of household enterprises and a possible under-enumeration of rural enterprise is certainly consistent with a substantial under reporting of the small scale enterprises that feature in, for example, the Indian data.

To assess the possible importance of this issue we use data from the Population Census both as a check on the employment data and to take some steps to make the Ghana data more comparable with that of India. Population Censuses were conducted in Ghana's population in 1984 and 2000, sufficiently close to the years of the Industrial Census to provide some of the additional information we need. Table 6 presents the data for those classified as in manufacturing employment.

Table 6: Manufacturing Employment in Ghana's Population Census

	1984		2000		Proportion	Growth
	Employment	Share	Employment	Share	Urban	Rate
Wage employees						
Public	27,172	4.6	34,275	4.3		1.5
Private	65,931	11.2	100,174	12.7		2.6
Apprentices	25,332	4.3	78,834	10.0		7.1
Other	18,684	3.2	15,873	2.0		-1.0
Total Employed	137,119	23.3	229,156	29.1		3.2
Self-Employed						
Without Employees	430,029	73.1	490,276	62.2	58.3	0.8
With Employees	21,270	3.6	68,636	8.7	76.4	7.3
Total Self-Employed	451,299	76.7	558,912	70.9	60.5	1.3
Total	588,418	100.0	788,068	100.0		1.8

Source: Author's calculations based on published statistics from population census reports (Ghana Statistical Service, 1984, 2005).

It will be noted that the numbers of wage employment from Table 6 are very close to those from the manufacturing census reported in Table 3 above. Manufacturing employment in the 1984 population census was 137,119 while the 1987 manufacturing census gives a figure of 137,272. For the 2000 population census manufacturing employment was 229,156 and from the 2003 manufacturing census it was 208,290. It is the self-employed who, almost certainly, constitute those missing from the manufacturing censuses in 1987 and 2003 but for whom a substantial number were included in the 1962 census and also in the Indian manufacturing census figures reported in Table 5. In the population census for 2000 a breakdown is available for the self-employed between rural and urban areas. As is shown in Table 6 some 76 per cent of the self-employment enterprises with employees were located in urban areas. In order to establish as much comparability as possible between the 1962 census and the two later ones we proceed in Table 7 to consider only urban areas and we add to the census data for 1987 and 2003 an estimate for the number of self-employment establishments with employees.

Table 7 Firms and Self-employment Establishments with Employees (SEEE): An Urban Based Estimate

	Number of Firms			Employment		
	(1)	(2)	(3)	(5)	(6)	(7)
No. of Employees	1962 (a)	1987 (b)	2003 (b)	1962 (c)	1987 (d)	2003 (d)
Firms 1-4		2,919	14,067		7,283	29,296
SEEE 1-4		16,250	52,438		40,625	157,314
Total 1-4	19,900	19,169	66,505	21,227	47,908	186,610
5-9	1,561	3,391	8,036	8,586	21,214	57,237
Small	21,461	22,560	74,541	29,813	69,122	243,847
10-19	765	775	2,160	8,415	10,474	35,092
20-29	246	243	559	5,909	5,891	12,314
30-49	132	166	425	4,921	6,354	7,858
50-99	105	161	276	7,212	11,455	7,709
Medium	1,248	1,345	3,420	26,457	34,174	62,973
100-199	58	83	121	7,840	12,269	9,548
200-499	38	57	90	11,000	17,671	19,010
500+	14	49	44	14,045	44,661	30,226
Large	110	189	255	32,885	74,601	58,784
Total	22,819	24,094	78,216	89,155	177,897	365,604

(a) The 1962 data is from Ghana Central Bureau of Statistics (1965). The 1962 Industrial Census recorded a total of 95,167 establishments which included enterprises run by the self-employed within households of which 72,348 were located in rural areas. As the 1987 and 2003 Industrial censuses did not cover the rural areas these have been excluded to ensure as much comparability across the censuses as possible.

(b) The number of Self-Employment Enterprises with Employees (SEEE) is taken from the population census data in Table 6 where it has been assume that 76.4 per cent of these enterprise wee located in urban areas.

(c) A total employment figures of 89,155 for urban areas is available from Ghana Central Bureau of Statistics (1965). The figure for small firms is then a residual where it has been assumed all firms with more than 20 employees are located in urban areas.

(d) To establish the employment patterns in the classification which includes the self-employed enterprise with employees it is necessary to know how many employees such enterprise have. In 2004 the CSAE carried out a labour market survey in urban Ghana which recorded the number of workers engaged as self-employed and asked them if they did employ workers. The results are as follows:

Percentage of Self-employed who employed workers	16	
Conditional on employment how many workers did you employ?	Mean	2.5
	Median	2
	Minimum	1
	Maximum	10
	Standard Deviation	1.72

The proportion of the self-employed who hired workers at 16 per cent in the CSAE survey is higher than the 12 per cent recorded in the population census for 2000 across both rural and urban areas. However as the CSAE survey was confined to urban area the implication of the data in Table 6 is that 18 per cent of the self-employed had employees in urban areas slightly higher than the number reported in Table 8 from the CSAE survey. Using the average number of employees of 2.5 based in the CSAE survey we have imputed employment in the Table.

The notes to Table 7 explain the basis of the adjustment to the data for the three censuses. Once the censuses are presented on a consistent basis, which can only be done if attention is confined to urban areas, it is seen that the number of firms actually changed very little between 1962 and 1987 with stagnation in the small firm category being modestly offset by growth in firms larger than 20. Table 8 presents the data from Table 7 in terms of growth rates of firms and employment. The patterns observed from 1962 to 1987 and from 1987 to 2003 are mirror images of one another. In the earlier period growth rates in both numbers of firms and employment are highest among large firms (those employing more than 100). In the latter period growth rates were massively higher among small firms in both their number and in generating employment. Small enterprise responded to adjustment with a massive burst of growth in terms of their numbers, see Steel and Webster (1992) for an early study of which firms benefited from the policies introduced in the early 1990s.

Table 8 The Growth in the Number of Firms and Self-employment Establishments with Employees (SEEE): An Urban Based Estimate

	Growth in Number of Firms (Annual % Change)			Growth in Employment (Annual % Change)		
	(1)	(2)	(3)	(5)	(6)	(7)
No. of Employees	1962-1987	1987-2003	1962-2003	1962-1987	1987-2003	1962-2003
Firms 1-4		9.8	na		8.7	Na
SEEE 1-4		7.3	na		8.5	Na
Total 1-4	-0.01	7.8	2.9	3.3	8.5	5.3
5-9	3.1	5.4	4.0	3.6	6.2	4.6
Small	0.2	7.5	3.0	3.4	8.0	5.1
10-19	0.01	6.4	2.5	0.9	7.6	3.5
20-29	-0.05	5.2	2.0	0.0	4.6	1.8
30-49	1.0	5.9	2.9	1.0	1.3	1.1
50-99	1.7	3.4	2.4	1.9	-2.4	1.1
Medium	0.2	5.8	2.5	1.1	1.0	2.1
100-199	1.4	2.4	1.8	1.8	-1.6	0.5
200-499	1.6	2.9	2.1	1.9	0.5	1.3
500+	5.0	-0.7	2.8	4.6	-2.4	1.9
Large	2.2	1.9	2.1	3.3	-1.5	1.4
Total	0.2	7.3	3.0	2.8	4.5	3.4

In Table 9 we present a breakdown by the same size categories as used in Table 5 above and re-examine the issue of a 'missing-middle' as defined by Tiebout (2014). Table 9 reveals the sources of the differences been the Indian data and that reported for Ghana above for the 1987 and 2003 censuses. The 1962 manufacturing census for Ghana included both the rural sector and self-employed enterprises with employees. As can be seen from Table 9, Column (2) where this definition of a firm is used and the geographical coverage includes the rural area the Ghana distribution is very similar to that reported for India in 2011 (rather remarkably) and implies a 'missing-middle' in the sense that Tiebout (2014) defines the term.

However once the data is confined to urban areas the issue of a 'missing middle' is more complex. Assuming a value of k of 1.39 we see in Table 9 that in the 1962 census for urban areas there was no 'missing middle' while one then developed over the period to 1987 which continued, but less pronounced, in 2003. What has happened over the period from 1987 to 2003 is that the growth in employment in the small firm sector has meant that in 2003 the share of employment in both the middle

and larger firms is below the levels predicted by a Paretian distribution with a $k = 1.39$. There was in 2003 no 'missing middle' but an excess of employment in the small firm sector. The longer run of data shown in Table 9 for Ghana demonstrates that there is no basis for any general belief in their being a 'missing middle' in any sense of the term. The policy issue is rather explaining a growing excess of employment in the small firm low productivity sector.

Table 9 Distribution of Firm Size and Employment with a Wider Firm Definition

	India 2011	Ghana 1962 All	Ghana 1962 Urban	Ghana 1987	Ghana 2003
	(1)	(2)	(3)	(4)	(5)
Distribution of Firm Size					
1-9	97.88	97.9	94.0	94.0	95.3
10-49	1.85	1.8	5.0	5.0	4.0
50+	0.28	0.3	1.0	1.0	0.7
Distribution of Employment					
1-9	64.77	73.3	33.4	38.9	66.7
10-49	12.10	11.0	21.6	12.8	15.1
50+	23.13	15.7	45.0	48.5	18.2
Value of k	1.39				
Predicted versus actual Employment Shares					
1-9	0.073				
10-49	-0.084				
50+	0.011				

Notes: By a wider firm definition is meant that the data reported for Ghana for 1987 and 2003 includes self-employment enterprises with employees. For both the Ghana 1987 and 2003 censuses the data collection was confined to urban areas.

The next issue addressed in this section is the implication for the distribution of value-added from the wider definition of firms used in Tables 7 and 9. In Table 10 we rework the presentation given in Table 3 of the distribution of employment and value-added across the size distribution. There is a more than threefold rise in employment for small firms, those employing less than 10, and a close to doubling for the middle size category (10-99 employees) while employment in the large firm sector actually fell by some 20 per cent. Given the pattern of productivity shown in Columns (4) and (5) of Table 10 the growth rate of value-added for small firms was actually lower than that for medium sized firms and only marginally higher than that for large firms.

Finally in Table 11 we bring together the results of Tables 7 and 10 to show changes in shares of firms, employment and value-added over the period from 1960 to 2003. While there has been extensive discussion of why the firm size distribution might look as it does, Tiebout (2000) provides a survey, there has been less as to how that firm distribution has been changing, due primarily to data limitations. Sandefur (2010) has a partial panel linking the 1987 and 2003 distributions and shows, using this limited panel, that within firm growth plays no role in the changing size distribution. Large firms start large and stay large. Sandefur (2010) also considers the possible role of credit constraints in limiting small firm growth. Clearly if credit constraints play any role in firm formation it is limited given the scale at which small firms were formed over the period from 1987 to 2003. Further, once founded, credit constraints may limit the speed at which a firm can grow but, in the longer term, profitable firms would be able to invest their profits. If sixteen years is regarded as a reasonable approximation to the long term and it is correct that very few, if any, of the small firms formed did grow over the period 1987 to 2003 then it is their profitability that must be the underlying reason for their inability to grow. The evidence we have from the 2003 census suggests that labour productivity is actually lowest in the 5-9 size range,

Table 10 Employment, Value-added and Productivity: 1987 and 2003: Using the wider definition of firm

	Total Employment			Value-added per Employee in US$			Value-added in US$ (millions)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	1987	2003	Annual% change	1987	2003	Annual% change	1987	2003	Annual% change
1-4	47,908	186,610	8.5	2,000	1,715		95.8	320.0	7.5
5-9	21,214	57,237	6.2	2,000	986		42.4	57.5	1.9
Small	69,122	243,847	7.9	2,000	1,388	-2.3	138.2	377.5	6.3
10-19	10,474	35,092	7.6	2,145	1,660		15.3	56.8	8.2
20-29	5,891	12,314	4.6	1,028	2,447		4.7	30.2	12.4
30-49	6,354	7,858	1.3	944	3,205		4.5	25.2	10.8
50-99	11,455	7,709	-2.5	1,983	6,853		17.6	58.5	7.5
Medium	34,174	62,973	3.8	1,736	2,037	1.0	42.1	170.7	8.7
100-199	12,269	9,548	-1.6	2,106	10,116		21.4	101.0	9.7
200-499	17,671	19,010	0.01	4,943	17,141		74.3	321.0	9.1
500+	44,661	30,226	-2.4	5,448	10,406		179.0	289.0	3.0
Large	74,601	58,784	-1.5	3,852	12,930	7.6	274.7	711.0	5.9
Total	177,897	365,604	4.5	2,003	1,568	-1.5	455.0	1,259	6.4

Table 11 Percentages of Establishments, Employment and Value-added Using the wider definition of firm: 1962 to 2003 Urban Sector only

	Number of Establishments			Employment			Value-added	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1962	1987	2003	1962	1987	2003	1987	2003
Small	94.0	93.6	95.3	33	39	67	30	30
Medium	5.5	5.6	4.4	30	19	17	10	14
Large	0.5	0.8	0.3	37	42	16	60	56
Total	100	100	100	100	100	100	100	100

implying that over the range 1-10, which covers the vast majority of firms, there is no evidence of rising labour productivity.

The evidence we have presented suggests that not only do small firms have much lower labour productivity than large ones but the gap between them grew substantially over the period 1967 to 2003. So much so that as Table 11, columns (5) and (6), shows the share of small firms in producing value-added did not change. In terms of their share in value-added medium sized firms (those employing 10-99) did best increasing their share from 10 to 14 per cent. It was true for both 1987 and 2003 that large firms, despite being less than 1 per cent of the total of firms, produced in excess of 55 per cent of value-added.

The longer term perspective shown in Table 11 cautions against assuming the pattern we observe between 1987 and 2003 is a general one. The pattern from 1962 to 1987, where we can trace it which is for urban areas and only for the number of establishments and employment, is quite different from what occurred after 1987. Between 1962 and 1987 the share of employment in large firms increased by 14 per cent, in the period from 1987 to 2003 the share more than halved. As policies changed dramatically from the late 1980s with the liberalisation of the exchange rate regime such reversals are not unexpected. Indeed the data suggests that the view that the new policies benefited small firms seems amply confirmed by the data. The puzzle the data presents is why large firms chose to invest in higher productivity rather than growth in employment and, to a lesser extent, why the growth in their numbers was so very modest compared with the explosion of numbers in the small firm sector.

6. Overview and conclusions

The contribution of this paper has been to document changes in the manufacturing firm population in Ghana over the period from 1962 to 2003. In doing that it has proved possible to investigate a range of questions of importance for understanding the evolution of its industrial structure and the implications of such changes for employment patterns and productivity.

The belief that this industrial structure is characterised by a 'missing middle' where a large number of small firms co-exist with a few much larger ones is, as noted in the introduction, a common observation regarding industrial structure in SSA. The work of Hsieh and Olken (2014) and Tiebout (2014) has clarified that there are, at least, two interpretations of the term 'missing middle'.

In this paper it has been shown that there is no evidence for a 'missing middle' in the sense used by Hsieh and Olken (2014) in that across all the censuses the distribution is unimodal, there is no evidence for bimodality, their definition of a 'missing middle'. In contrast if Tiebout's definition is used, namely a divergence from a Paretian distribution, the issue is more complex. If the data from the Ghana 1987 and 2003 census is used not only is there no 'missing middle' as Tiebout defines the term but there is a substantial over-representation of employment in middle size firms, here defined as employing from 10-49 (Table 5). It has been shown that these censuses, by excluding enterprises run by the self-employed who have employees which were clearly included in the 1962 census, may seriously understate the number of small firms. Using this wider definition of firm does then show some evidence for a missing middle in Tiebout's sense of the term in the 1987 and 2003 censuses. However the most striking aspect of the data is the changes in the distribution over this period which sees not only a 'missing middle' but by 2003 a missing 'large firm' sector. The share of employment in large firms (those employing more than 50) is some 4 percentage points lower than would be predicted by a Paretian distribution (Table 9). Whatever the nature of the policy distortions they are affecting all firms employing more than 10 not simply middle ranking ones.

As Tiebout stresses our interest in the firm size distribution stems from a wish to understand how policy can improve outcomes for both firm growth and employment creation. His suggestion that a Paretian distribution would be produced by an undistorted policy environment is one approach to that question. In this paper by showing both the distribution of firms on a consistent basis and their productivity over a long time period it is possible to extend that policy discussion. What is striking is how substantial have been the changes in the distribution of employment across the size distribution. Using a finer graduation in size categories than has been used in the cross country comparisons it has been shown that while small firms, those employing less than ten, have remained a relatively constant share of the number of firms over the period from 1962 to 2003 their share of employment has doubled from 33 per cent in 1962 to 67 per cent in 2003 (Table 11). This change in the employment structure has occurred over the same period as the gap in productivity between these small firms and large ones (those employing more than 100) has increased from a twofold difference in 1987 to a nine fold difference in 2003 (Table 10). The implication is that a far larger proportion of the labour force was working in the low productivity part of the distribution in 2003 than was the case in 1987.

While the share of employment in these smaller firms has risen substantially their falls in both relative and absolute productivity has meant that their share in value added has not changed between 1987 and 2003 at 30 per cent. Large firms, those employing more than 100, produced 60 per cent of value added in 1987, when they were 0.8 per cent of firms, and 56 per cent in 2003 when they were 0.3 per cent of the number of firms (Table 11). Another way of showing this dominance of larger firms in producing value-added is to note that in 2003 the top 1 per cent of firms produced 63 per cent of value-added (Tables 7 and 10). All these comparisons are based on the wider definition of firm that has been introduced which includes self-employment enterprises with employees. If the narrow definition of firm used in the manufacturing census is applied than the top 1 per cent of firms in 2003 were producing 72 per cent of value-added (Table 4).

The longer run perspective made possible by the comparative data presented in this paper has shown that a policy focus on the failure of small firms to fill a 'missing middle' is an incomplete statement of the policy problem. It is the inability of larger firms, particularly those employing more than 100, to grow in numbers and employment that needs to be explained if the inability of Ghana to produce more productive jobs in its manufacturing sector is to be understood.

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Appendix Replication of 2003 National Industrial Census Report

Class Size	No. of Establishments		Employment (No. of employees)		Output (Cedis '000)	
	(1) Report	(2) Weighted	(3) Report	(4) Weighted	(5) Report	(6) Weighted
1-9	20,004	19,498	88,778	86,530	1,798.4	1,739.7
10-19	2,742	2,696	35,742	35,148	1,072.7	1,065.9
20-29	535	520	12,659	12,305	453.8	439.0
>30	517	490	84,774	74,306	23,051.3	20,400.0
Total	23,797	23,204	221,952	208,290	26,376.1	23,700.0
Class Size	Wages and Salaries (Cedis)		Costs of Input (Cedis '000)		Value-added (Cedis '000)	
	(1) Report	(2) Weighted	(3) Report	(4) Weighted	(5) Report	(6) Weighted
1-9	100,872	96,618	833.4	807.5	965.2	932.3
10-19	137,463	136,625	575.3	571.2	500.1	494.6
20-29	37,880	35,937	250.0	241.3	196.8	197.7
>30	1,376,853	1,145,593	15,038.8	13,400.0	7,990.6	6,984.6
Total	1,653,068	1,414,773	16,697.5	15,100.00	9,652.7	8,621.3

Notes: The columns labelled Report give the figures from the 2003 National Industrial Census Main Report: Table 17. The columns labelled Weighted show the results the same aggregates from using the surveyed firms and weighting the observations.