Chapter 33

The Ethiopian manufacturing sector: Productivity, export orientation, and competitiveness[1]

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Abstract

Over the last two decades the Ethiopian manufacturing sector has experienced rapid expansion in terms of the number of firms, sales, and employment. This chapter examines the performance of the manufacturing sector using aggregate data and firm-level panel data compiled by the Central Statistical Agency (CSA) of Ethiopia. The focus is on three dimensions of performance: productivity growth, the extent of export orientation, and the competitiveness of domestic firms in the global context. Manufacturing remains a relatively small sector in terms of contributions to GDP and employment, and it has yet to become export oriented even by African standards. In examining productivity growth, the analysis addresses within-firm productivity growth and its heterogeneity across firms, as well as the role of resource reallocation from less efficient firms to more efficient ones.

Key words: Ethiopia, manufacturing, productivity, firm size, firm survival, firm performance

1 We are grateful to Christopher Cramer for insightful comments on draft versions of this paper. All errors are our own. Söderbom would like to dedicate this chapter to the memory of his friend Krister Backlund who passed away in May 2018.

Introduction

Ethiopia's agricultural sector has developed favourably over the past decade, but rapid population growth, limited access to fertile land, and volatile agricultural outcomes pose problems for the agricultural sector regarding its ability to deliver new jobs and sustained per-capita income growth in the medium term. Land is less of a constraint for growth in the non-farm sector, such as manufacturing, services, and trading, and non-farm production is typically associated with higher labour productivity and tends to be less exposed to severe shocks. For these reasons, diversification is often argued to be the way forward for Ethiopia and other countries in sub-Saharan Africa.

Ethiopia's manufacturing sector is small, even by African standards. For over 20 years, the share of manufacturing value added in total value added in Ethiopia has varied between 4 and 5 per cent. Compared to other countries in sub-Saharan Africa (SSA), this is a very modest contribution (see Figure 33.1). Like many other African countries, the industrial sector in Ethiopia is characterised by a large number of very small, typically informal, enterprises and a small number of large firms that account for the bulk of manufacturing output and employment. Micro and small firms tend to record low value added, low wages, virtually no exports, and little technological progress. Moreover, it is uncommon for small firms to transform themselves into large firms that invest, export, offer skilled jobs, and pay high wages (Shiferaw and Bedi 2013). The structure of the manufacturing sector, in particular the concentration of activity in very small firms and the small number of large firms, is an important reason for the modest contribution of manufacturing to Ethiopia's economy.

In this chapter we analyse productivity, exports, and competitiveness in Ethiopia's manufacturing sector. We will pay special attention to the structure of the sector, especially firm size distribution, and to dynamic patterns—in particular firm turnover (entry and exit) and productivity growth—and show that such dynamics can be important sources of aggregate growth. As we shall see, there exist rich firm-level data for Ethiopia and a relatively large number of studies have been produced accordingly.[1] We will not be able to survey the entire literature on Ethiopia's manufacturing sector in this chapter. Instead, our goal is to highlight the most salient features of the sector associated with firm growth and job creation. Our approach is entirely descriptive. We begin in the next section by reviewing aggregate data on Ethiopia's manufacturing and industrial sector, with sub-Saharan Africa as a benchmark. We go on to describe the firm-level data, which while not public is reasonably accessible for researchers, and focus on differences in performance and productivity across firms of differing size. We then use the firm-level data to study firm dynamics and productivity dynamics, again with some emphasis on firms of differing size. A discussion of the main development issues facing Ethiopia's manufacturing sector follows. We deliberately do not devote a lot of space to discussing industrial policy in this chapter. As already noted, our narrative throughout is primarily descriptive, and we are therefore not in a strong position to identify policy options. Readers interested in Ethiopia's industrial policies are referred to the excellent review by Gebreeyesus (2016).

Ethiopia's manufacturing sector: The aggregate view

Table 33.1 summarises key indicators of economic and industrial performance in 1993–2016 for Ethiopia and, for reference, SSA. Even though Ethiopia has recorded impressive growth in per-capita income since 2005 (column 1), the share of industry in total value added (GDP) has increased from 0.08 in 1993 to 0.16 in 2016. Manufacturing value added relative to GDP, however, has been between 4 and 5 per cent throughout the period (column 2), showing no signs of an increase despite rapid overall growth. While these figures imply that manufacturing output per capita has grown in *absolute* terms, had manufacturing actually *led* economic growth one would expect the sector to have become relatively larger over time. Hence, the period of rapid growth has not been accompanied by a 'take-off' in manufactured output in Ethiopia. Column 4 shows data on manufactured exports expressed in current USD per capita. While there has been some growth over the past decade, the volume of exports from Ethiopia has been strikingly low throughout the period. By 2014, manufactured exports per capita reached a mere US$ 3.9 in

[1] For example, Bigsten and Gebreyessus (2007) examine the relationship between firm-level productivity and firm growth; Shiferaw (2007, 2009) analyses the relationship between firm survival and productivity; Söderbom (2012) analyses the role of product choice for value added; Shiferaw and Bedi (2013) investigate the relationship between firm size and gross job flows; Shiferaw, Söderbom, Siba, and Alemu (2015) analyse the effects of road infrastructure on firm entry, location choice and growth; Bigsten, Gebreeyesus, and Söderbom (2016) examine the links between trade liberalisation and firm performance; Gebreeyesus and Siba (2017) study the causal links between exporting and productivity; and Shiferaw (2016) examines investment behaviour.

Ethiopia, far behind the average for SSA (US$ 101). Gebreeyesus and Siba (2017) use firm-level data and confirm that the proportion of firms that do any exporting is very low: between 4 and 6 per cent during the 1995–2009 period, and even lower than that for small firms. The authors point to very high entry and exit costs in the export market as an important explanation.

This pattern for Ethiopia of fairly strong economic performance combined with moderate progress in the industrial sector appears to be at odds with one of the most influential ideas in development economics, namely that the manufacturing sector will be the 'engine of growth' for low-income countries. However, the conventional notion has been disputed. Adrian Wood and collaborators have long argued that since Africa is abundant in natural resources and short on skills, and since manufacturing is intensive in the use of skills but not natural resources, Africa does not have a comparative advantage in manufacturing (Wood 1994). This argument, which is consistent with the fact that Africa tends to export mostly resource-intensive goods and imports skill-intensive ones, suggests that countries like Ethiopia should not design policies to prioritise industrial development. On the other hand, comparative advantages are not static. Relative prices change continuously; in agriculture, for example, increasing pressure on land makes manufacturing production more attractive, shifting resources towards industry. Moreover, policy can affect comparative advantages. For example, as noted by Collier (2000), poor institutions and poor infrastructure hurt manufacturers disproportionally since they are intensive users of these services. General improvements in the investment climate, therefore, can be expected to change relative prices in favour of manufacturing production. Krugman (1980, 1981) shows how comparative advantages in trade can arise as a result of exploiting economies of scale, clustering of production, learning, network effects, and spillovers.

Numerous surveys of the investment climate have been fielded, both of enterprises and industry analysts, generating data that enable us to assess Ethiopia's performance relative to other countries. These indicators suggest that, compared to other less developed countries, Ethiopia's business environment is in fact reasonably good. Table 33.2 shows how Ethiopia ranks in terms of ease of doing business and per-capita income among all countries in the world (column 1) and among sub-Saharan African countries (column 2).[2] With regard to per-capita income, Ethiopia is

[2] The data on per-capita income were obtained from the World Development Indicators. The 'doing business' rankings were downloaded from www.doingbusiness.org. The data is for 2010.

ranked 162 out of the 167 countries in the world for which we have data. In contrast, for the same group of 167 countries, Ethiopia ranks 97 in terms of overall ease of doing business. Focusing on sub-Saharan Africa only, Ethiopia ranks 37 out of a total of 42 countries with regard to per-capita income. The country is doing well particularly in the ease of starting a business. For example, the required procedure and time to start a business in Ethiopia is less than the sub-Saharan African average and almost equal to the average of OECD countries. With regard to ease of doing business, only eight sub-Saharan African countries are higher ranked than Ethiopia.

Thus, the manufacturing landscape of Ethiopia is somewhat unusual, compared to most other African countries. The business environment is reasonably favourable, but the sector is extremely small and, in relation to other sectors of the economy, not growing. In the next section we describe the data available on Ethiopia's manufacturing firms and show some descriptive statistics by firm size category.

~~3.~~ Ethiopia's manufacturing firms

Research on the constraints, characteristics, and performance of the enterprise sector in low-income countries is often constrained by scarcity of data. In Ethiopia, the data on the formal manufacturing sector is unusually rich, compared to other African countries. Most of the existing data derive from surveys conducted by the Central Statistical Agency (henceforth CSA) of Ethiopia. The most comprehensive survey is the Large and Medium Manufacturing Industries Survey, which attempts to cover all manufacturing establishments in the country that employ ten persons or more and use power-driven machinery. The survey covers both public and private industries in all regions, and is often referred to as a census of manufacturing firms, because of its universal coverage. There is information in the data on output, inputs (local and imported), sales (local and export), employment, location, ownership type, costs, etc. The survey is fielded every year, and the different waves of data can be combined into a panel dataset. The data are not in the public domain, but the CSA has generously been granting access to the data for researchers who want to use it to study the Ethiopian economy. The most recent survey for which detailed data are available on the website of Ethiopia's Central Statistical Agency (CSA), http://www.csa.gov.et, covers 2010/11. In that year, the sector consisted of 2,170 firms and employed 175,698 workers. Average value added per worker was approximately 70,000 birr (4,100 US$).

As noted, the Large and Medium Manufacturing Industries Survey only covers manufacturing firms with at least ten employees. Manufacturing enterprises (including grain mills) that use power-driven machinery and that engage less than ten people, including owners and family workers, are covered in the Small-Scale Manufacturing Industries Survey. Reports from five survey rounds are currently available: 2001/02, 2005/06, 2007/08, 2009/10, and 2013/14. This sector consisted of 116,606 enterprises in 2013/14, and employed a total of 1.7 million workers. Annual value added per worker was 6,240 birr (328 US$), which is less than 10 per cent of the value added per worker in the sector of larger firms (see above) and considerably lower than Ethiopia's GDP per capita. There is not enough information in these data to enable researchers to construct a panel dataset; however the repeated cross-sections can be used to study some dynamic aspects of the sector, e.g., growth of employment and output, and investment. More details about these data, and survey reports, can be obtained at the CSA's website.

The two surveys described above cover Ethiopia's power-driven manufacturing industry.[3] Next, we combine the data from the surveys to show how value added per worker and average wage vary across the enterprise size range, for the year 2007/08.[4] The data indicate very large productivity differences across firms of differing size. In the category of micro firms, total value added per person engaged is 8,200 birr (US$ 854). This is more than twice as high—17,400 birr—for the category of firms with 10–19 employees. Among firms with 20–49 employees, value added per worker is 27,200 birr, while for the group of firms with more than 50 employees it reaches 79,400 birr (US$ 8,271). The magnitude of these differences is quite striking: a worker in a firm with 50 or more employees produces as much value added in an hour as does a worker in a micro enterprise in a day, on average. Wages exhibit a similar pattern, although the rate of increase with firm size is much more modest than for value added. The average wage in small firms with 10–19 workers is fairly similar to that in micro firms. In the group of firms with 50 or

[3] In addition, there exist enterprises that do not use power to produce output. This class of enterprise, known as the cottage and handicraft sector, is the technologically least sophisticated segment of manufacturing and engages substantially more people than manufacturing firms with power-based production. We abstract from this sector in the current chapter.
[4] This is the most recent year for which it is possible to obtain comparable data.

more employees, the average wage is 11,700 birr across all workers. Important reasons for these large differences between firms of differing size are that larger firms have better technology (capital–labour ratios in the group of firms with 50 or more employees are about ten times higher than that of the micro sector; see Table 33.3), more skilled workers, and better management.

How do wages in the manufacturing sector compare with other sectors? Table 33.3 shows that the annual average labour cost per paid employee in the micro enterprise sector is 3,144 birr (US$ 328). Consistent with this, Rijkers et al. (2010) report survey data indicating that the going daily wage rate for a casual agricultural worker in Ethiopia was then around 9 birr. This suggests that, whether you are a casual worker in a micro enterprise being paid piece rates or a casual agricultural worker, your earnings are similar. It would thus appear unlikely that a transfer of workers from agriculture into the micro enterprise manufacturing sector (in its current form) can generate jobs that result in economic growth. Self-employment in the manufacturing micro enterprise sector offers somewhat better prospects, in terms of earnings. If we subtract labour costs from value added we obtain a basic measure of the surplus that accrues to owners—let us refer to this quantity simply as profits. The data from the small-scale manufacturing industry survey indicate that the total profit divided by the number of owners and unpaid workers (the latter are typically family workers) is equal to about 14,000 birr, which is 4.5 times higher than the average earnings for paid casual workers in this sector. This suggests that individuals equipped with the human and physical capital necessary to run a micro manufacturing enterprise can generate levels of income significantly higher than what casual workers get. However, the available data suggest the amount of installed physical capital is not negligible in the micro manufacturing enterprise sector, averaging 23,300 birr per firm. Few unskilled people can access that sum of money, pointing to the importance of financing for enterprise start-up.

The dynamics of firms and productivity

In this section we use data from the Large and Medium Manufacturing Industries Survey to document dynamic patterns of firm turnover, productivity levels, and growth rates during the period 1999–2007. The aggregate data discussed above suggest that manufacturing is a small, stable, and slow-changing sector. However, to a considerable extent, the aggregate data mask dynamics and heterogeneity across firms. Table 33.4 shows a breakdown of the number of firms, distinguishing surviving, entering, and exiting firms. In the first year of the sampling period there were 587 firms. Of these, 251 firms (43 per cent) survived throughout the entire sampling period and were thus operative in 2007, while 336 firms (57 per cent) exited from the market at some point between 1999 and 2007. In 2007 there were 1,141 firms in total, of which 890 had entered the market at some point after 1999. Hence 78 per cent of the firms in the 2007 cross-section had a firm age of less than 8 years. These figures suggest that entry barriers to Ethiopian manufacturing are not very high, while surviving in the market is quite challenging.

Table 33.5 shows descriptive statistics for the different types of firms.[5] The first column shows unweighted mean values of log (real) value added per worker, a standard measure of labour productivity. For the group of firms that survived throughout the sample period (1999-2007), average labour productivity grew from 7.42 (which corresponds to US$ 1,312) to 7.743 (US$ 2,305). The group of entering firms had considerably lower average labour productivity than surviving firms, but somewhat higher than exiting firms. Similarly, surviving firms are generally larger than entering firms, and entering firms tend to be larger than exiting firms. There is a strong positive relationship between employment and capital intensity (capital per worker) in the data, and labour productivity differentials across firms of differing size are to a substantial extent due to differences in capital intensity.

In the remainder of this section we discuss in more detail the broad patterns of firm turnover (exit and entry) and productivity dynamics that can be observed in the data.

Firm exit and firm size

Table 33.4 documents significant entry and exit rates in Ethiopia's manufacturing sector. Exit rates are especially high among small firms. To illustrate the importance of firm size for firm survival, we use probit to model exit as a function of log employment, firm age, and total factor productivity (more details about the latter variable will be provided below). The only statistically significant variable in these models is firm size, which has a negative and quantitatively large effect on the probability of exit. We omit the probit results to conserve space (they are available on request). Instead, based on the probit estimates, we compute predicted exit probabilities for two

[5] For this analysis, all financial values are expressed in constant US$ with base year 2006.

hypothetical firms: one with ten employees and one with 100 employees. These probabilities are shown in Table 33.6. The likelihood that a firm with 100 employees exits from the market one year after it has been surveyed as part of a baseline (in 1999) is just 0.03. For the firm with ten employees, the exit probability is 0.35. Hence, one out of three small firms in the cross-section will exit over the next year, and one out of 30 large firms. Eight years after the baseline year, the exit probability is 0.72 for the small firm and 0.33 for the large firm. It should be noted that productivity is controlled for in the probit regressions and held constant across the predictions. Hence, productivity differentials are not the reason for the much higher risk of exit among small than among large firms. There is some other factor at play in this context.

It is reasonable to suppose that small firms are more vulnerable to adverse shocks than large firms. Using the Ethiopian firm-level data, Page and Söderbom (2012) highlight that the exit risk for small firms is especially high in the first three years after start-up. Using a subsample of new entrants in Ethiopian manufacturing over the period 1995/6–2005/6, Page and Söderbom model firm exit as a function of size at start-up, firm age, and an interaction term between initial employment and firm age. They find that the interaction term is positive and highly significant, indicating that the adverse effect of small size is particularly pronounced for young firms. Figure 33.2, which reproduces Chart 9 in the study by Page and Söderbom, shows predicted exit rates based on the probit results. It shows that young small firms have very high exit rates. Conditional on surviving, the exit rates are becoming gradually less dependent on start-up size. Thus, there is a class of young, small firms—and some of these are highly productive—that are at high risk of exit.

Productivity dynamics

In general, aggregate productivity changes because of productivity improvements within surviving firms and as a result of a reallocation of inputs and outputs between surviving, entering, and exiting firms. In order to distinguish between the contributions of these processes, we now conduct a decomposition of productivity (growth) distinguishing among surviving, entering, and exiting firms. We adopt the approach proposed by Melitz and Polanec (2015), which is a generalisation of the method proposed by Olley and Pakes (1996) that accounts for the contributions of surviving, entering, and exiting firms to aggregate productivity levels and changes. Aggregate productivity at time *t* is denoted Φ_t and defined as a share-weighted average of firm productivity φ_{it}:

$$\Phi_t = \sum_i s_{it}\, \varphi_{it}$$

where the market shares $s_{it} \geq 0$ sum to 1. The underlying productivity measure φ_{it} is in logs, which implies that aggregate productivity growth between periods 1 and 2, denoted $\Delta\Phi_t = \Phi_2 - \Phi_1$, represents a percentage change. Next, decompose aggregate productivity growth into three sets of surviving (*S*), entering (*E*) and exiting (*X*) firms:

$$\Delta\Phi = \sum_{i \in S} (s_{i2}\varphi_{i2} - s_{i1}\varphi_{i1}) + \sum_{i \in E} s_{i2}\varphi_{i2} - \sum_{i \in X} s_{i1}\varphi_{i1}$$

The first term on the right-hand side, i.e., the contribution of surviving firms, can be further decomposed into one part representing productivity growth *within* firms with shares kept constant, and one part representing changes in market shares *between* firms with productivity levels kept constant:

$$\sum_{i \in S} (s_{i2}\varphi_{i2} - s_{i1}\varphi_{i1}) = \sum_{i \in S} s_{i1}(\varphi_{i2} - \varphi_{i1}) + \sum_{i \in S} (s_{i2} - s_{i1})\, \varphi_{i2}$$

Abstracting from entering and exiting firms, Olley and Pakes (1996) rewrite aggregate productivity Φ_t as

$$\Phi_t = \overline{\varphi_t} + \sum_i (s_{it} - \overline{s_t})\, (\varphi_{it} - \overline{\varphi_t}) = \overline{\varphi_t} + \mathrm{cov}(s_{it}, \varphi_{it})$$

where $\overline{\varphi_t} = n^{-1} \sum_i \varphi_{it}$ is the unweighted firm productivity mean. Aggregate productivity growth over two periods is thus equal to the change in the unweighted mean $\overline{\Delta\varphi_t}$ and change in the covariance between market shares and firm-level productivity. This decomposition highlights the fact that a positive correlation between market shares and productivity is a driver of aggregate productivity. It follows that changes in the correlation between market shares and productivity affect aggregate productivity growth. That is, if the most productive firms tend to increase their market shares, aggregate productivity grows, all else equal.

The main contribution of Melitz and Polanec (2015) was to extend the Olley-Pakes approach to account for entering and exiting firms. Melitz and Polanec thus write aggregate productivity growth as:

$$\Delta\Phi = \Delta\overline{\varphi_S} + \Delta\mathrm{cov}_S + S_{E2}(\Phi_{E2} - \Phi_{S2}) + S_{X1}(\Phi_{X1} - \Phi_{S1}),$$

where

$\Delta\overline{\varphi_S}$:	Unweighted mean change in the productivity of surviving firms
$\Delta \mathrm{cov}_S$:	Contribution of market share reallocations between surviving firms
$S_{E2}(\Phi_{E2}-\Phi_{S2})$:	Productivity contribution of entrants, with surviving firms as benchmark
$S_{X1}(\Phi_{X1}-\Phi_{S1})$:	Productivity contribution of exiting firms, with surviving firms as benchmark

Table 33.7 shows aggregate (average) labour productivity, defined as log value added per worker, and share data for the three types of firms—survivors, entrants, and exiting firms—across all timespans. The average labour productivity for all firms in the first period observed in the data (1999) is 7.80, which corresponds to 2,334 US$ per worker. The firms that survived between 1999 and 2000 accounted for 92 per cent of total employment, while the firms that exited during this period accounted for 8 per cent of total employment. The average of the labour productivity measure among the firms that survived at least until 2000 was 7.87, which corresponds to 2,620 US$ per worker, while the average of the labour productivity measure among the firms that exited after 1999 was 6.98 (1,078 US$ per worker). Hence, the firms that exited had considerably lower initial labour productivity than the surviving firms, implying that the group of exiting firms lowered aggregate labour productivity in 1999. This pattern is qualitatively the same for all timespans. Average labour productivity during 1999 for the group of firms that survived at least until 2007 was 8.14 (3,412 US$ per worker), and 7.23 (1,380 US$) for the group of firms that exited during the 1999–2007 period.

The lower panel of Table 33.7 shows data on the productivity contributions of new entrants. The average labour productivity for all firms in the second period observed in the data (2000) is 7.68, which corresponds to 2,174 US$ per worker. The firms that had survived until 2000 accounted for 71 per cent of total employment in 2000, while new entrants accounted for 29 per cent of total employment in that year. The average of the labour productivity measure in 2000 among the surviving firms was 7.90 (2,706 US$ per worker), while the average of the labour productivity measure among entering firms was 7.15 (1,279 US$). Hence, the entering firms had considerably lower average labour productivity than the surviving firms, implying that the group of new entrants contributed negatively to aggregate labour productivity in 2000. This pattern holds qualitatively for all time spans. Average labour productivity during 2007 for the group of firms that had existed at least since 1999 was 8.18 (3,565 US$), and 7.63 (2,054 US$) for the group of firms that had entered after 1999.

One reason for the higher labour productivity among surviving firms, compared to firms that (are about to) exit and new entrants, is selection and 'survival of the fittest'. That is, productive firms may simply last longer. The link between productivity and enterprise longevity has been studied quite extensively in the literature on firms in Africa (e.g., Frazer 2005; Söderbom, Teal, and Harding 2006; Shiferaw 2007, 2009; Bigsten and Gebreeyesus 2007). Several of these have analysed the Ethiopian data. Shiferaw (2007), for example, tracks Ethiopian firms over seven years (1996–2002) and shows that relatively efficient firms are more likely to survive and stay at the top of the productivity distribution while the exit hazard is substantially higher among inefficient firms. Hence, this literature indeed suggests a positive relationship between underlying total factor productivity and firm survival. Ethiopian firms, just like firms in other parts of the world, are subject to market selection.

An additional possible explanation for the higher labour productivity among surviving firms is that firms learn to grow their underlying total factor productivity over time. To shed some light on whether such learning is taking place, we now study TFP growth within and between firms. For this analysis we calculate TFP as a residual from a production function:

$$\ln TFP_{it} = \ln VAD_{it} - \hat{\beta}_0 - \hat{\beta}_K \ln K_{it} - \hat{\beta}_L \ln L_{it}$$

where VAD_{it}, K_{it}, and L_{it} denote real value added, real capital, and employment, respectively, of firm *i* in year *t*, and $\hat{\beta}_0, \hat{\beta}_K, \hat{\beta}_L$ are OLS estimates. We estimate the production function separately for each industrial subsector, hence $\hat{\beta}_0, \hat{\beta}_K, \hat{\beta}_L$ vary across subsectors. For the decomposition of TFP growth, we use value-added shares as weights. Table 33.8 shows the contributions to TFP growth of surviving, entering, and exiting firms, with 1999 as the base year. Column 6 shows total TFP growth, and the decomposition is shown in columns 1–5.

Over the entire sampling period, 1999–2007, average ln TFP grew by 0.61, which corresponds to 83 per cent growth or about 8 per cent growth per year. The surviving firms contributed 0.34 in total. The contribution of changes in the covariance between market shares and productivity was very small, implying that the contribution of surviving firms was driven almost entirely by within-firm growth—which may be due to learning. New entrants contribute 0.37, i.e., approximately as much as surviving firms, to aggregate productivity growth. The contribution of exiting firms is qualitatively as expected (i.e., negative) but quantitatively modest (-0.10). Hence, long-run growth in manufacturing is primarily sourced from intra-firm productivity growth and from the process by which new entrants replace failing firms, thus making better use of fixed resources. Shiferaw (2007) makes a similar point based on his analysis of data from an earlier period.

While we do not address in detail the drivers of intra-firm productivity growth in this chapter, there are a number of plausible contenders. Mekonnen and Shiferaw (Chapter 9 in the present Handbook) show very high import intensity of intermediate inputs in Ethiopian manufacturing. Given the critical shortage of foreign exchange in Ethiopia in recent years, this is very likely to undermine capacity utilization and productivity growth. Some authors argue that the labor cost advantages of African countries relative to East Asian countries may actually be offset by high input costs (Abegaz, 2018). Shiferaw (2016) also shows lackluster investment in Ethiopian manufacturing particularly among firm that do not have relationships with banks. Given the strong link between investment in modern machinery and technology transfer in low-income countries, weak investment may contribute to slow productivity growth in addition to constraining capacity expansion. On the up side, continued public investment in infrastructure, education and skill development are expected to help manufacturers improve their productivity.

Conclusions

It is often argued that a poor investment climate is an important reason why growth in most of Africa's industrial sector has been weak. Firms producing tradeables, particularly manufacturers, are extensive users of investment climate services, and a poor investment climate thus hampers such firms disproportionally (Collier 2000). In recent years, while recognising that the investment climate has an important role to play, some commentators have argued for the need to go beyond a focus on regulation in order to understand more fully the constraints on growth. It has been argued that a policy agenda aimed at facilitating for manufacturing development should acknowledge the important roles of infrastructure, post-primary education, and regional integration, for example

(Page 2010). Ethiopia provides a very good case study for researchers who wish to document the importance of factors that are not strongly associated with the investment climate. We began this study by showing that Ethiopia's manufacturing sector is underdeveloped compared with the sub-Saharan benchmark, both in terms of its relative size and its international competitiveness (gauged by its weak presence in export markets), despite the fact that the business environment is reasonable. It has been beyond the scope of this chapter to identify what other factors could be constraining manufacturing in Ethiopia. We have, however, documented some striking differences in firm performance, especially across firms of differing size, and we have identified some areas that deserve closer attention by researchers and policy makers. Our analysis of firm survival suggests that small firms are particularly vulnerable to shocks in the first four years of operation. During this phase, we observe high exit rates among small firms, some of which have a high underlying productivity. A better understanding of the reasons for these patterns could help in the formulation of policies that help young, small, and productive firms to survive. Our analysis of productivity growth shows that aggregate TFP growth is driven, in roughly equal measures, by growth among existing firms and by new entrants. This suggests that potential entrants constitute an untapped potential for further growth. It would appear that a better understanding of the barriers to entry into the sector could be helpful in order to design policies that facilitate entry for more firms and thus the creation of more jobs. Manufacturers are expected to play a central role in the Growth and Transformation Plan of the Ethiopian government that aims, among other things, to make Ethiopia a lower middle-income country by 2025. There is considerable potential for growth and development of the sector, and it is hoped that this chapter has identified some areas in which obstacles need to be better understood and subsequently removed in order for the sector to take off.

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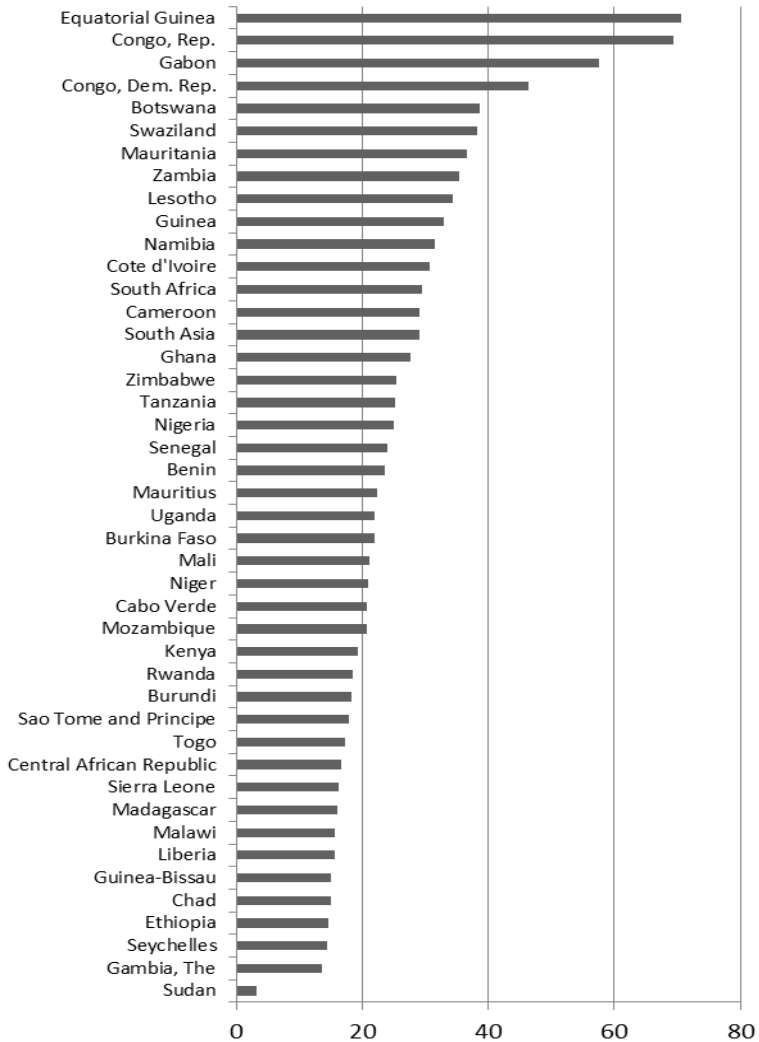
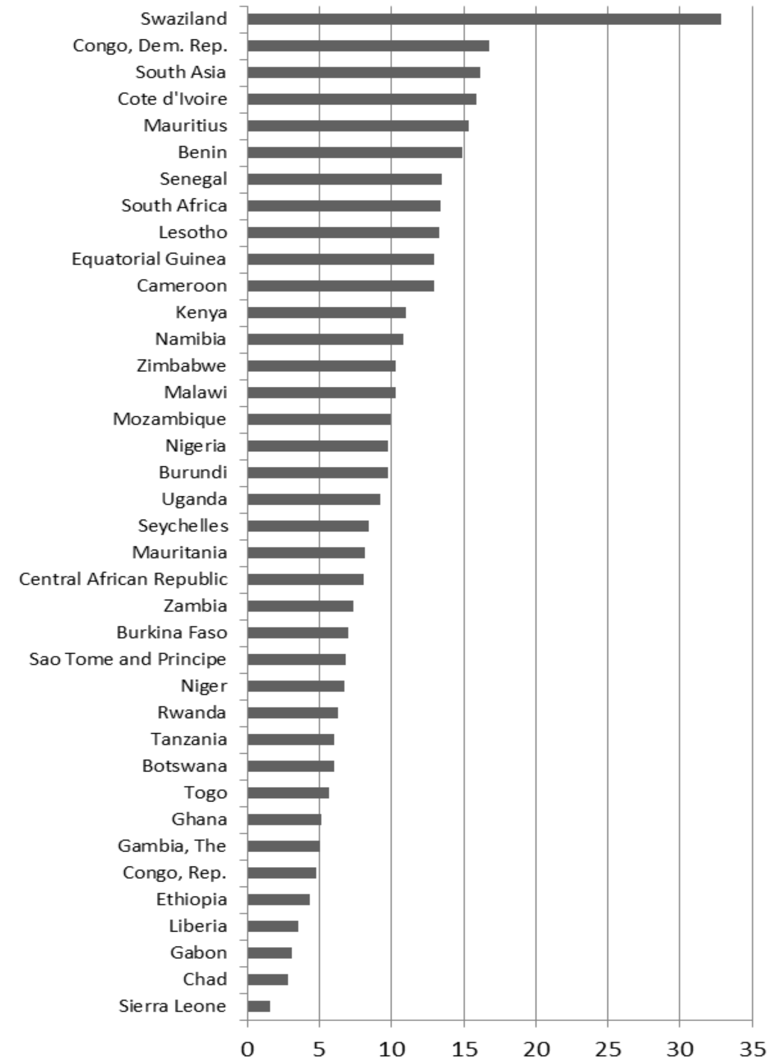
Figure 33.1 Industry and manufacturing in sub-Saharan Africa, 2014

A. Share of industry in GDP

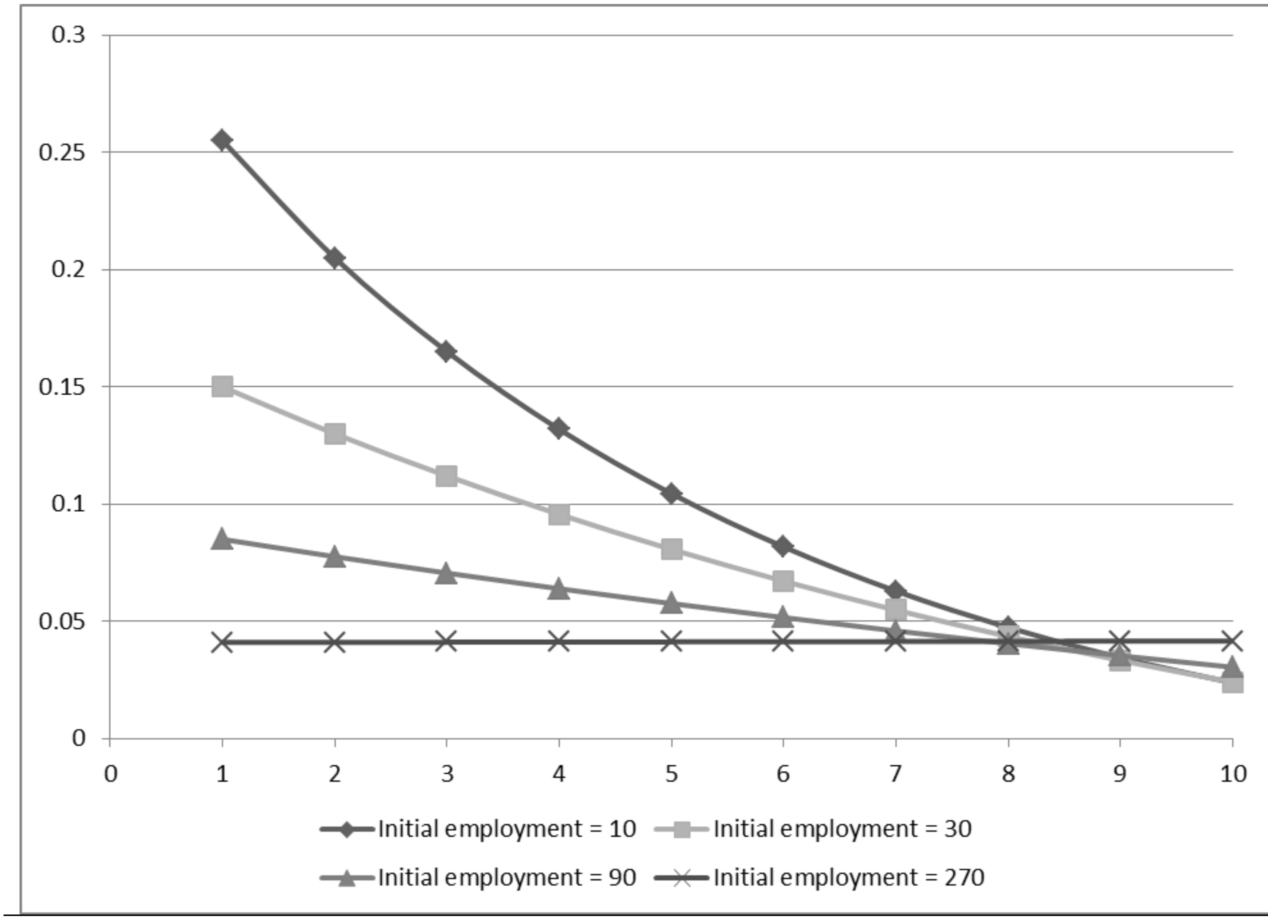


B. Share of manufacturing in GDP



Source: World Development Indicators

Figure 33.2 Firm size, age, and the probability of exit in Ethiopian manufacturing



Source: Adapted from Page and Söderbom (2012).

Table 33.1 Industrial performance in Ethiopia and sub-Saharan Africa

	(1) GDP per capita		(2) Share of manufacturing value added in GDP		(3) Share of industry value added in GDP		(4) Manufactured exports per capita	
Year	ETH	SSA	ETH	SSA	ETH	SSA	ETH	SSA
1993	179	1134	0.04	0.12	0.08	0.38	0.0	
1994	178	1125	0.04	0.11	0.09	0.37		
1995	183	1130	0.05	0.12	0.09	0.37	0.8	
1996	199	1158	0.04	0.11	0.08	0.36		34.9
1997	199	1169	0.04	0.11	0.08	0.36	0.9	37.4
1998	187	1167	0.04	0.11	0.09	0.35	0.6	29.4
1999	191	1162	0.04	0.11	0.09	0.34	0.5	31.4
2000	197	1172	0.04	0.11	0.09	0.35	0.7	37.0
2001	207	1187	0.04	0.11	0.09	0.35	0.9	34.4
2002	204	1190	0.04	0.11	0.09	0.35	1.0	43.4
2003	194	1216	0.04	0.10	0.10	0.36	0.8	47.1
2004	214	1322	0.04	0.10	0.10	0.34	0.3	
2005	233	1358	0.04	0.10	0.10	0.33	0.5	
2006	251	1415	0.04	0.10	0.10	0.31	0.7	78.4
2007	272	1474	0.04	0.10	0.10	0.31	2.2	78.5
2008	294	1512	0.04	0.10	0.10	0.29	1.7	115.6
2009	311	1513	0.04	0.09	0.10	0.28	1.6	66.8
2010	341	1552	0.04	0.09	0.09	0.28	2.4	93.8
2011	370	1576	0.04	0.09	0.10	0.28	3.3	103.5
2012	391	1591	0.04	0.10	0.11	0.28	2.7	103.4
2013	421	1622	0.04	0.10	0.12	0.28	3.7	99.8
2014	453	1652	0.04	0.10	0.13	0.28	3.9	101.2
2015	487	1656	0.05	0.10	0.14	0.27	3.7	
2016	511	1632	0.05	0.09	0.16	0.26		
Growth[1]								
95-02	1.6%	0.7%	-0.7%	-1.0%	0.7%	-0.7%	2.4%	
02-09	6.0%	3.4%	-0.7%	-2.4%	0.3%	-3.0%	7.4%	6.2%
09-16	7.1%	1.1%	3.7%	0.5%	6.9%	-1.0%	13.5%	

Source: World Development Indicators.
(1) Average annual growth rates

Table 33.2 Ease of doing business in Ethiopia

	All countries	Sub-Saharan Africa
Rank: Overall ease of doing business	97	9
Rank: Per-capita GDP	162	37
Rank: Per-capita GDP (PPP adjusted)	155	31
Rank: Doing business topics		
Starting a business	85	9
Dealing with construction permits	56	7
Employing workers	87	15
Registering property	99	13
Getting credit	118	17
Protecting investors	115	18
Paying taxes	37	8
Trading across borders	146	30
Enforcing contracts	56	7
Closing a business	68	9

Source: Data obtained from www.doingbusiness.org.

Table33. 3 Value added per worker, capital intensity, and average wage by firm size, 2007/08

Size range (number of workers)	Less than 10	10–19	20–49	50+
Survey	Small-scale mfg	Formal mfg		
Value added per worker in birr (US$)	8,200 (854)	17,400 (1,813)	27,200 (2,833)	79,400 (8,271)
Capital installed per worker in birr (US$)	7,269 (757)	22,872 (2,382)	47,611 (4,960)	70,039 (7,296)
Average wage in birr (US$)	3,144 (328)	3,590 (374)	5,750 (599)	11,700 (1,219)

Note: The official exchange rate birr / US$ was 9.6 for 2008 (source: World Development Indicators).
Source: CSA (2009, 2010) and own calculations.

Table 33.4 Number of firms in 1999 and 2007

	Year	
	1999	2007
All firms	587	1141
Surviving firms	251	251
Entering firms		890
Exiting firms	336	

Table 33.5 Descriptive statistics for Ethiopian manufacturing firms in 1999 and 2007

	ln value added per employee	Number of employees	
	Mean	Mean	Median
All firms, both periods	7.178	58.7	20
Surviving firms, 1999	7.422	72.6	27
Surviving firms, 2007	7.743	94.2	39
Entering firms	7.049	55.8	18
Exiting firms	6.878	29.3	13.7

Table 33.6 Predicted probability of exit before year *t* for a firm in the 1999 cross-section

Year *t*	Employment at baseline year (1999) $EMP_{1999} = 10$	$EMP_{1999} = 100$
2000	0.35	0.03
2001	0.44	0.12
2002	0.48	0.16
2003	0.53	0.19
2004	0.57	0.21
2005	0.62	0.23
2006	0.65	0.26
2007	0.72	0.33

Note: The table shows predicted exit probabilities based on probit specifications of the form $\Pr(exit_{it} = 1) = \Phi(\beta_0 + \beta_1 \ln(EMP_i) + \beta_2 ln(AGE_i + 1) + \beta_3 TFP_i)$ where *exit* is a dummy variable for firm exit; EMP_i, AGE_i, and TFP_i denote number of employees, firm age and total factor productivity for firm *i* in the base year 1999; Φ denotes the cumulative density function; and the β_j are parameters. The predicted probabilities are evaluated at probit estimates and sample means of the age and tfp variables.

Table 33.7 Aggregate labour productivity and employment shares

Year		In $t = 1$				
		Surviving firms		Exiting firms		All firms
$t = 1$	$t = 2$	Φ_{S1}	S_{S1}	Φ_{X1}	S_{X1}	Φ_1
1999	2000	7.871	0.917	6.984	0.083	7.797
1999	2001	7.979	0.821	6.967	0.179	7.797
1999	2002	8.027	0.786	6.957	0.214	7.797
1999	2003	8.062	0.754	6.987	0.246	7.797
1999	2004	8.066	0.731	7.068	0.269	7.797
1999	2005	8.078	0.714	7.095	0.286	7.797
1999	2006	8.094	0.690	7.136	0.310	7.797
1999	2007	8.135	0.627	7.230	0.373	7.797
		In $t = 2$				
Year		Surviving firms		Entering firms		All firms
$t = 1$	$t = 2$	Φ_{S2}	S_{S2}	Φ_{E2}	S_{E2}	Φ_2
1999	2000	7.903	0.708	7.154	0.292	7.684
1999	2001	7.937	0.673	7.703	0.327	7.860
1999	2002	8.072	0.569	7.495	0.431	7.823
1999	2003	8.112	0.570	7.451	0.430	7.828
1999	2004	8.065	0.530	7.717	0.470	7.901
1999	2005	8.040	0.484	7.697	0.516	7.863
1999	2006	8.051	0.411	7.767	0.589	7.884
1999	2007	8.179	0.316	7.627	0.684	7.802

Source: CSA data and own calculations.

Table 33.8 Melitz-Polanec decomposition of total factor productivity (TFP) growth

	Surviving firms			Entering firms	Exiting firms	All firms
	(1) Total	(2) Unweighted mean change	(3) Contribution of market share reallocations	(4) Total	(5) Total	(6) Total
Year		$\Delta\overline{\varphi_S}$	$\Delta \mathrm{cov}_S$	$S_{E2}(\Phi_{E2}-\Phi_{S2})$	$S_{X1}(\Phi_{X1}-\Phi_{S1})$	$\Phi_2-\Phi_1$
2000	0.010	0.021	-0.010	0.016	0.005	0.031
2001	0.194	0.036	0.158	0.021	-0.086	0.129
2002	0.069	0.184	-0.116	0.019	-0.077	0.010
2003	-0.034	0.108	-0.143	0.223	-0.076	0.113
2004	0.088	0.171	-0.083	0.150	-0.076	0.162
2005	0.042	0.251	-0.209	0.247	-0.082	0.208
2006	0.223	0.231	-0.008	0.305	-0.081	0.446
2007	0.342	0.339	0.004	0.367	-0.103	0.606

Source: CSA data and own calculations.