

# Deconstructing the Missing Middle: Informality and Growth of Firms in Sub-Saharan Africa<sup>\*</sup>

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**Abstract** – Research shows a large and growing gap in income per capita across countries and a substantial and persistent productivity dispersion within industries, which is relatively higher in developing countries. Studies have resorted to the size distribution of firms, mainly in manufacturing, to better understand and identify plausible explanations of the observed patterns in the income gap and productivity dispersion. In this regard, one of the most important disagreements in the literature on the size distribution of manufacturing firms in developing countries is about the existence of a "missing middle". Using comprehensive censuses of establishments from four sub-Saharan countries, we revisit this key question and establish four stylized facts. First, there is evidence of a missing middle. Medium-sized manufacturing firms account for relatively low employment shares irrespective of any reasonable definition of the middle category. Second, the preponderance of informal firms is the main driver of the missing middle. Hence, observing a missing middle in the data critically depends on whether the sample coverage includes informal firms. Third, despite severe market distortions in sub-Saharan African countries, the size distribution of their formal firms mirrors the distribution in developed economies. Last, the missing middle does not arise from the size distribution of entrants, suggesting that it is an artifact of distortions to firm growth. Overall, our findings underscore that the missing middle is an elusive concept, the controversy around it requires a nuanced approach, and a binary existence statement necessarily rests on identifying assumptions that arguably obscure the relevance of the matter.

**JEL Classification:** L11, O11, O14, O17, O55

**Keywords:** Missing middle, size distribution of firms, informality, market distortion, establishment censuses, manufacturing, sub-Saharan Africa

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# 1 Introduction

Evidence shows a large and growing gap in income per capita across countries and a substantial and persistent productivity dispersion among firms in narrowly defined industries, which is particularly higher in developing countries.<sup>1</sup> In the quest to identify plausible explanations for the gap in total factor productivity between advanced and developing economies, some scholars have focused on cross-country differences in the size distribution of manufacturing firms. A rooted conjecture is that the size distribution of firms in developing countries exhibits a missing middle, reflecting market frictions and policy distortions that discourage production at an intermediate scale.

Studies have used detailed micro datasets looking for evidence of a missing middle in the size distribution of firms. However, the literature evaluating the missing middle hypothesis has not been conclusive. Based on the exact same data, two of the most influential contributions arrive at seemingly opposite conclusions. [Tybout \(2000\)](#) show significant decline in the employment shares of firms with a middle size category (10-49 workers). Recently, in a reply to a critique by [Hsieh and Olken \(2014\)](#), [Tybout \(2014\)](#) argues that better evidence for the presence of a missing middle can be obtained by comparing the share of medium-size firms (not small or large ones) versus what would have been if there had been no distortions in the economy. His test for deviations in the actual size distribution from the undistorted counterfactual lend support for the presence of a missing middle.

On the other hand, [Hsieh and Olken \(2014\)](#) find no evidence of a missing middle using better quality data from manufacturing sectors of developing economies (India, Indonesia and Mexico). They show the preponderance of small firm in these countries and argue that not only medium-sized firms but also large firms are less prevalent in these countries compared with the pattern in developed economies. In their examination of whether regulations generate a missing middle, they have not detected any discernible discontinuities in the size distributions, implying features of formality (which is common among large firms) such as enforcement of regulations and taxes play a minor role as sources of market distortions. Furthermore, they report higher average products of labor and capital in larger firms, which they interpret as evidence of a business environment dragging the growth of larger firms more so than of smaller ones.

One challenge when looking at the "true" distribution of firms and assess whether there is a missing middle in developing countries, is the large prevalence of informality. To this end, we compile detailed and comprehensive censuses of establishments including informal firms in four sub-Saharan Africa countries, namely Burkina Faso, Cameroon, Ghana, and Rwanda. The datasets are comprehensive and cover both formal and informal establishments in the non-agricultural sectors of the economy, which allows to study the size distribution in more detail.<sup>2</sup>

To advance the main results. First, medium-sized manufacturing firms account for relatively low employment shares irrespective of any reasonable definition of the middle size category. Second, defining informality as a lack of registration with government agencies (e.g., business registry,

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<sup>1</sup> [Jones \(2016\)](#) reports a rising inequality in income per capita across countries since the 1960s. In an earlier study, [Hall and Jones \(1999\)](#) show that most of the variation in the level of output per worker is explained by total factor productivity, not by factor accumulation (physical and human capital). Additionally, [Cirera et al. \(2019\)](#) use microdata from sub-Saharan African countries and find productivity dispersion to be significantly higher compared with what [Hsieh and Klenow \(2009\)](#) report for China and India relative to the U.S.

<sup>2</sup> As it pertains to the agricultural sector, these datasets only include establishments owned by the state, the private sector, and in public-private partnership other than household agriculture.

tax authority), the preponderance of informal firms that do not grow drives the missing middle phenomenon. Hence, observing a missing middle in the data critically depends on whether the sample coverage includes informal firms. Third, despite severe market distortions in sub-Saharan African countries, the size distribution of their formal firms mirrors the distribution in developed economies, with large firms accounting for the highest share of manufacturing employment. Last, the size distribution of entrants does not exhibit any missing middle, and the right tail of the size distribution emerges over the life cycle giving rise to the missing middle. Although we do not take this evidence as indisputably in the absence of panel data, it suggests that the missing middle does not arise upon birth, but it is rather a product of the life-cycle and highlights impediments to growth more so than to entry of firms.

Besides providing evidence on the missing middle in sub-Saharan Africa, where theory suggests the phenomenon is the most likely to emerge, our findings stress the significance of informal firms, which should not be conflated with micro firms, in the size distribution pattern. There should be policy effort toward easing transition to formal status as well as reducing attrition into informality for a variety of reasons (e.g., low productivity, tax evasion, corruption).<sup>3</sup> On the other hand, some small informal firms in sub-Saharan Africa are just the outcome of lack of formal employment opportunities and not necessarily the desire of firms to grow. So, while policies should make registration and formality easy and low cost, one should not expect all of these firms to grow significantly. This is also compatible with the view that large firms in sub-Saharan Africa are fewer and grow less than in advanced economies. Therefore, policies should target both reducing formality costs and eliminating distortions that limit the growth of firms in general.

The rest of the paper is organized as follows. Section 2 reviews the debate about the existence of the missing middle. Section 3 describes the data used in the analysis, and section 4 discusses the findings. Section 5 concludes.

## 2 The missing middle debate

Firm growth constitutes a natural focus for development scholars. Given the relative abundance of labor and the comparative difficulty to measure the use of other production factors in developing countries, the number of workers has become the most common metrics for firm size. As a corollary, the distribution of firm size as measured by the number of workers is seen as one of the most straightforward metrics for resource allocation in developing countries. Development economists have long argued on both theoretical and empirical grounds that pervasive market distortions make it hard for firms to grow.

In his widely cited review of manufacturing in developing countries, [Tybout \(2000\)](#) stresses the prevalence of small-scale manufacturing in low-income countries. Presenting the distribution of employment shares by firm size for 19 countries, he notes that the prevalence of small-scale production correlates negatively with per capita income both across countries and within countries

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<sup>3</sup> Using survey data from Côte d'Ivoire, Kenya, Nigeria, and Senegal, [Gajigo and Hallward-Driemeier \(2012\)](#) find that lower productivity and higher incidence of bribe payments push firms to informality even if they were formal at their establishment. On the flip side, higher productivity, better access to credit, larger size at the start-up are associated with higher likelihood of and transition to formality.

through time. In particular, he observes "a large spike in the size distribution for the size class 1–4 workers, [which] drops off quickly in the 10–49 category" (p.15). Thus, middle-sized firms are underrepresented in low-income countries (Tybout, 2000), and the density of the middle part of the size distribution of firms is thought to be lower in developing countries. The author, then goes on in reviewing the potential economic mechanisms that lead to what he describes as a "missing middle".

Two things are worth noting here. First, in a context of limited data availability, Tybout is well aware of the limitation of the highly aggregated information he uses, which he gathers from earlier works, mainly Liedholm et al. (1987). In particular, he acknowledges that his data substantially understate the prevalence of informal, micro enterprises. Second, the metrics he considers is the share of total employment attributable to firms of a given size. His observation is thus an assessment of the aggregate re-partition of the manufacturing labor force across firm size.

In an influential response re-assessing the missing middle hypothesis, Hsieh and Olken (2014) argue that the theories of the missing middle are about firms rather than employment. These theories posit that businesses face size-contingent obstacles (e.g., distortionary regulations, market failures), which prevent them from growing beyond a certain size. The relevant object of observation for assessing the impact of these distortions is therefore the firm itself, not firm employment. They show that the distribution of the *number of firms* by size class looks very different from the distribution of *employment shares* by firm size class. While the former decreases monotonically across size classes, the latter exhibits a missing middle in that medium-sized firms account for a smaller share of manufacturing employment than small or large firms.

Hsieh and Olken (2014) further show that both the size distribution of manufacturing plants and the distribution of average products of factor inputs are unimodal in India, Indonesia and Mexico. There are two essential elements here. The first is that, contrary to (Tybout, 2000), the authors have census data at their disposal, which enables them to present the data divided in bins of equal width and resort to histograms. The second is that their analysis implicitly conflates the existence of a missing middle with an observed bimodality in the distribution of firm size.

Replying to Hsieh and Olken's critique, Tybout (2014) contends that the central thesis of the missing middle literature is that market failures in developing countries discourage production at an intermediate scale. Unimodality, he argues, does not speak to the relevance of the missing middle literature; if anything, the relevant benchmark should instead be the allocative efficient size distribution. Thus, a test of the existence of a missing middle, therefore, consists in comparing the observed share of medium-sized firms to the share that would prevail in an undistorted economy. Assuming that the efficient size distribution is Pareto, as is the case for relatively undistorted economies like the United States, Tybout (2014) shows that developing countries are characterized by a missing middle by this definition, even though their size distribution is unimodal.

Beyond methodological issues, the different views on the existence of the missing middle represent two different views of the impact of distortions that lead to two different policy implications. The first view argues that in an economic environment characterized by major market distortion, small firms face insurmountable obstacles to grow while the largest ones find it profitable to expand, which leaves relatively few firms in the middle range of the size distribution. The implication is that policy interventions should focus on small establishments by providing support in terms of access to credit, favorable market regulations and the like. By contrast, the other view is that the market en-

vironment in these countries does not favor larger establishments by exposing them to unfavorable government regulations, which discourages and constraints the growth of small- and medium-sized establishments. Hence, policy should target addressing constraints facing larger establishments for job creation and productivity growth.

While this debate is not yet fully settled, the missing middle hypothesis is a useful debate to explore with more precision where the problem of firm growth lies. To do so, in the rest of the paper we assemble a unique combination of censuses that include informal and formal firms in four African countries, and explore these issues more formally.

### 3 Data

#### Firm-level data in sub-Saharan Africa

Lack of suitable data constitutes one of the main challenges associated with testing the missing middle conjecture. Even though the information required for this type of exercise is extremely basic—the power of looking at the size distribution to assess broader macroeconomic patterns precisely lies in its simplicity and low data requirement—the availability of such information proves to be an extremely binding constraints in developing countries. Such data availability is particularly challenging for most sub-Saharan African countries. Additionally, in view of the pervasiveness of informal economic activities in these countries, it is necessary that revisiting the question of a missing middle should use census data of both formal and informal firms across the entire spectrum of sizes.

Fortunately, over the recent years, a number of sub-Saharan countries have engaged in establishment censuses as part of wider programs aimed at informing economic policies. Crucially for our purpose, census is by definition taken of all establishments, including unregistered ones, so the ensuing data is representative of the true size distribution. These censuses are typically nothing more than business registers and essentially include contact and location information, legal form, records of business registration, tax and other administrative data, type of economic activity, and number of workers, which is the crucial element for our purpose.

For this paper, we have managed to go directly to the data sources and obtain firsthand establishment censuses from the statistical agencies of select sub-Saharan countries, namely Burkina Faso, Cameroon, Ghana, and Rwanda. The selection of these countries is primarily because their census datasets feature a number of characteristics that arguably ascertain their representativeness of the true size distribution. On the whole, these data are consistent with [Lewis \(1954\)](#) widely held view of developing economies as characterized by the coexistence of a few capital-intensive industries and a mass of inefficient businesses (“tiny islands of capitalist employment surrounded by a vast sea of subsistence workers”). Specifically, small establishments (fewer than ten workers) represent the overwhelming majority of the manufacturing sector in our datasets; for comparison, small businesses account for less than half the manufacturing establishments in the U.S. Moreover, our datasets do not present any obvious censoring or threshold for inclusion in the census. To the best of our knowledge, our contribution is the first that encompasses the entire manufacturing sectors—including informal establishments—of sub-Saharan countries in a comparative fashion.<sup>4</sup>

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<sup>4</sup> Our dataset is more comprehensive by enumerating all establishments. For example, [Hsieh and Olken \(2014\)](#) have a

## Summary of firm-level data from select countries in sub-Saharan Africa<sup>5</sup>

**Burkina Faso.** The data comes from the census conducted in 2016 by Institut National de la Sstatistique et de la Démographie (INSD). It covers establishments mainly in the non-agricultural sector and contains record such as an establishment's industry classification, age, employment, accounting practices, state ownership, and foreign equity. Establishments are classified into formal and informal depending on whether they have registration number (with mobile trade and mobile credit, tax identification number) and use SYSCOA as an accounting standard.<sup>6</sup>

**Cameroon.** The data is obtained from the first Recensement Général des Entreprises (RGE) conducted in 2009 by the Institut National de la Statistique (INS). The RGE covers all businesses of the modern sector (that is, excluding non-commercial agriculture) with a physical location, specifically excluding the street trading industry (hawkers, peddler and others), the (car and bike) taxi industry and the callbox industry. It provides detailed information such as registration with administrative agencies, tax payment, accounting practices, age, employment size, state ownership, and foreign equity. In the census, formal establishments are considered formal if they prepare a Statistical and Fiscal Declaration (DSF) or those that do not prepare DSF but which keep an operating account and a partial account of balance sheets.<sup>7</sup>

**Ghana.** The data comes from the 2014 Integrated Business Establishment Survey (IBES) conducted by the Ghana Statistical Service. The IBES is an economic census of all business establishments (registered and unregistered) in the non-agricultural sectors of the economy. It has detailed information about registration with administrative agencies, tax payment, accounting practices, age, employment size, state ownership, and foreign equity. The data contain records of an establishment's registration status with government agencies, and formality is defined based on registration status with Registrar General's Department (RGD) and keeping formal accounts.<sup>8</sup>

**Rwanda.** The source of the data is the 2014 Establishment Census (EC) conducted by the National Institute of Statistics of Rwanda (NISR). The EC constitutes a virtually exhaustive business registry as surveys every establishment that has a fixed location and operates an economic activity. The ensuing microdata is comprehensive and detailed with respect to key establishment characteristics such as location, registration and legal status, age, ownership and management, and industrial classification, and employment size. The census covers both formal and informal businesses. An establishment is considered to operate in the formal sector if it is registered at Rwanda Revenue Authority (RRA) and maintains regular operational accounts.<sup>9</sup>

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census establishments with 20 or more employees, but they have a sample of those with 20 or less workers in the case of Indonesian manufacturing. Similarly, for Indian manufacturing, their dataset comprises a complete enumeration of formal establishments with 100 or more workers, and sample of formal establishments with fewer than 100 workers and informal ones. The exception is the Mexican manufacturing data, which comprise all establishments with fixed locations.

<sup>5</sup> Note that we interchangeably use the terms firm, establishment, and plant unless otherwise indicated.

<sup>6</sup> National Institute of Statistics and Demography (INSD). [Analysis report of the XVII Industrial and Commercial Census](#). November 2018.

<sup>7</sup> National Institute of Statistics of Cameroon (INS). [General Census of Enterprises In 2009](#). September 2010.

<sup>8</sup> Ghana Statistical Service. [Integrated Business Establishment Survey: Summary Report](#). September 2015.

<sup>9</sup> National Institute of Statistics of Rwanda (NISR). [The Establishment Census, 2014](#). June 2015.



Table 1 summarizes the key features of the census data from these sub-Saharan Africa countries. We now turn to the description of each of the datasets. In Burkina Faso, 99,261 establishments hire about 256,000 workers in 2015. The corresponding figures are 88,144 establishments and 430,000 workers in 2008 (Cameroon); 638,234 establishments and 3.4 million workers in 2013 (Ghana), and 154,236 establishments and 493,000 workers in 2013 (Rwanda). Establishments with foreign equity or state ownership are rare in number and employ a small number of workers. Notable exceptions are the employment shares of foreign-owned establishments in Cameroon (17 percent), and state-owned enterprises in Ghana (15 percent) and Rwanda (14 percent).

Manufacturing production involves a small fraction of the establishments and the workforce in the economy ranging from 7 percent (Ghana) to 17 percent (Burkina Faso) and 8 percent (Rwanda) to 21 percent (Burkina Faso), respectively. It also involves limited number of foreign-owned establishments, but they play a bigger role as sources of manufacturing employment. In Burkina Faso, they constitute about 1 percent of the establishments and 7 percent of the employment in manufacturing. The corresponding figures are 5 and 25 percent in Cameroon, 1 and 7 percent in Ghana, and 1 and 17 percent in Rwanda. Likewise, state-owned establishments are less than 1 percent of the manufacturing establishments. However, they contribute a small fraction to the manufacturing employment; about 1 percent in Burkina Faso, Cameroon, and Ghana, and 4 percent in Rwanda.

## 4 The size distribution in sub-Saharan Africa

Our exploration has generated a few stylized facts about the patterns and drivers of the size distribution of manufacturing plants in Burkina Faso, Cameroon, Ghana, and Rwanda. Whenever possible, we compare them to the well-known size distribution of firms in the U.S. for perspective.

In our sample of countries, the size of an establishment is approximated by the number of persons engaged in the production of its products or services. It comprises both permanent and temporary workers, but there is no distinction between full- and part-time workers. For our purpose, establishments are categorized into six size classes: 1-4, 5-9, 10-19, 20-99, and 100 or more workers.<sup>10</sup>

### The size distribution of manufacturing plants is characterized by a missing middle

**Fact 1.** *Medium-sized manufacturing plants account for a relatively low employment share*

Figure 1 plots the distribution of establishments across the five size classes. It is shown that small establishments dominate the size distribution. Specifically, establishments of size 1-4 workers constitute more than 75 percent of all the establishments in the economy. Although similar pattern is observed in the U.S., the concentration in the small size categories is not to the same extent as observed in our sample countries. Interestingly, the number of establishments monotonically decreases when moving up to larger size classes, which represents a sharp decline compared with the pattern in the U.S. Figure 2 also shows the preponderance of manufacturing establishments in smaller size classes, featuring the same structural characteristics for manufacturing plants in Mexico, Indonesia, and India (Hsieh and Olken, 2014). However, this sharply contrasts the observation in the U.S.

<sup>10</sup>The appendix provides results based on different size cut-offs. The key findings still hold.

where the distribution is more even. The monotonic and sharp decline in the density of establishments with larger size classes highlight a rather low number of establishments in the intermediate and large range of the production scale.

By contrast, figure 3 and 4 reveal a missing middle in the employment distribution. Most of the workers are employed in either small or large establishments, and employment in the middle size categories is well below the share of employment in the other size categories. For the U.S., the monotonic increase in the distribution of employment shares across size classes confirm a major difference in the structure of manufacturing between developing and developed countries.<sup>11</sup>

Furthermore, figure 5 shows that most of the employment is concentrated in the lower and upper most tails. Apart from Cameroon, where most of the workforce is employed in establishments with at least 100 workers, the employment share of the smallest size category (1-4 workers) is the highest for the manufacturing sectors of Burkina Faso, Ghana, and Rwanda. At the same time, the next largest employment share belongs to the upper most tail of the distribution, the size class of 100 or more workers.

An in-depth assessment of the size distribution in manufacturing uncovers that the feature of a missing middle is not attributed to few yet large foreign-owned establishments or state-owned enterprises. This observed pattern hold for private (those that are not state-owned), domestic (in which local citizens are principal owners), or domestic, private manufacturing establishments. Moreover, the missing middle phenomenon does not emerge from a specific way we slice the data, rather it reflects the inherent feature of the size distribution in the sample countries. As a robustness check, we plot the the size distribution based on broader size categories. The key takeaways remain the same (see figures A.3, A.4, and A.5 in the appendix).

Also when we compare the distribution to that of a Pareto distribution, often taken as the firm size distribution in an undistorted economy (see e.g., Luttmer 2007), we see that there is an underrepresentation of medium-sized firms in aggregate employment. This is the metric used by Tybout's (2014). Assuming that the efficient cumulative size distribution is described by  $F(\ell) = 1 - \ell^{-\zeta}$  where  $\ell$  is firm size as measured by the number of worker and  $\zeta$  is the country-specific shape parameter that accounts for cross-country variation the scale of production, it is straightforward to show that the efficient share of manufacturing labor force employed in firms of size range  $\ell_i \leq \ell < \ell_j$  is given by  $\hat{s}(\ell_i, \ell_j | \zeta) = \ell_i^{1-\zeta} - \ell_j^{1-\zeta}$ . For each of the binnings laid out above, we calibrate  $\zeta$  by country based on the minimization of the Euclidean distance between observed shares and theoretical shares given by the equation above (Axtell 2001; Di Giovanni, Levchenko, and Ranciere 2011; Tybout 2014). We then compute the theoretical shares  $\hat{s}$  based on the estimated shape coefficients  $\hat{\zeta}$ , and compare them to the actual shares. Table 3 reports the estimation results and shows that that the middle category is underrepresented, irrespective of the binning.

## The preponderance of informal firms is the main driver of the missing middle

**Fact 2.** *The preponderance of informal firms is the main driver of the missing middle*

<sup>11</sup> Since the focus is on manufacturing production and the pattern of the establishment distribution is clearly known, the forthcoming discussion on the size distribution exclusively considers the employment distribution. Henceforth, results on the establishment distribution and other sectors of the economy are relegated to the appendix and are only referred to whenever necessary.



Roughly speaking, a formal establishment is a business entity with a registration record at an administrative agency such as a business registry or tax authority. For the baseline analysis, registration status at the tax authority is used as an indicator of formality. We choose this indicator because of its availability and comparability across the sample countries. The only exception is Burkina Faso, for which we use information on whether an establishment applies the SYSCOA accounting standard to define formality.

Not surprisingly, we find that formal establishments constitute a very small percentage of the manufacturing plants in sub-Saharan Africa (table 2). In Burkina Faso, they constitute about 4 percent of the establishments and hire about 27 percent of the workforce in manufacturing. The respective figures for Cameroon, Ghana, and Rwanda are 5 and 59 percent; 28 and 50 percent, and 21 and 59 percent, respectively. These results indicate that significant number of the manufacturing establishments and their workforce operate in the informal sector.<sup>12</sup>

As shown in figure 6, informal establishments are behind the observation of the missing middle in the employment distribution. Informal establishments are primary sources of employment in the lower ranges of the production scale, but their relevance sharply diminishes as the scale of production goes up. In view of the practical difficulty of defining informality, we plot the employment distribution using alternative criteria for classifying establishments into formal and informal. We see that driver of the missing middle is robust to alternative definitions of informality.

It is necessary to emphasize that the pervasiveness of informality in these countries is not a trivial matter. To begin with, there exist sizable growth and productivity differences between formal and informal establishments, having a serious implication for job creation and standard of living. Another concern is the issue of narrow tax bases that government would undermine a country's capacity to finance the provision of public services. Further, informality adversely affects welfare simply because of low wages, poor working conditions, and limited benefit to workers. On the other hand, informality reflects bad business environment such as unreliable, low-quality public services as well as weak enforcement of rules and regulations that make informality attractive.

### **The size distribution of formal firms mirrors the distribution in developed economies**

**Fact 3.** *The size distribution of formal firms mirrors the distribution in developed economies*

Figure 7 reveals that formal manufacturing has a strikingly different pattern compared with the rest of manufacturing; it features a high concentration of employment in the upper tail of the size distribution. Most importantly, this is very comparable to the size distribution of developed countries. It appears that the population of formal firms in sub-Saharan African countries seems to obey the same distribution law as in developed economies even if the business environment in sub-Saharan Africa is characterized by a multitude of market distortions and policy uncertainties. Again, this phenomenon holds no matter the choice of criteria used to define formality.

### **The missing middle does not arise from entry**

**Fact 4.** *The missing middle does not arise from entry*

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<sup>12</sup> See tables A.1–A.4 in the appendix for summary using alternative definitions of formality.

The last finding from our exploration is the fact that the missing middle pattern does not seem to arise from the size distribution of entrants. As a corollary, this suggests that the missing middle has to emerge as the outcome of the life cycle of manufacturing firms. Figure 8 plots the the size distribution of new cohort of entrants. We see that employment in the new cohort of establishments is concentrated in smallest class and distributed more evenly across the remaining size classes.

Another factor possibly explaining the missing middle is the pattern growth along the life cycle of establishments. That is, variations in the growth along with selection can drive the employment distribution. For this purpose, establishments are divided into six age cohorts: entrant, 1-5, 6-10, 11-15, 1-20, and above 20 years. Figure 9 shows that entrants are the smallest compared with other age cohorts. There also exist a few larger establishments, as evidenced by the mean size to be exceedingly higher than the median size for each age cohort, and the difference is even more magnified among older age cohorts. Two things are worth noting. The first one is the small difference between the mean and median size for Burkina Faso. Second, the median establishment does not see a significant increase in its size over its life cycle.

Figures 10–13 illustrate growth differentials between formal and informal establishments by plotting the employment distribution at different age cohorts. Among formal establishments, the employment shares of larger class sizes continuously increases when looking at older age cohorts. These establishments tend to increase in size with additional years of market operation even if they face challenges in the business environment that stifle their growth. As for the informal establishments, the smallest size class has the highest employment shares and display only a slight decline with older age cohorts. We also note the presence of a few informal establishments that are large or have been in operations for a number of years.

Similarly, figure 14 depicts the size of incumbents relative to new informal establishments. Here, we also see that incumbents experiencing size growth with age, but this tendency is most common among formal establishments rather than informal ones. Note that this pattern holds to a lesser extent in Burkina Faso.

## 5 Conclusion

This paper investigates the size distribution of manufacturing plants in sub-Saharan Africa, where the distortions are arguably all the more ubiquitous. It uses firsthand establishment censuses from Burkina Faso, Cameroon, Ghana, and Rwanda to identify four stylized facts: (i) there exists a drop in the employment share accounted for by the middle range of the size distribution, providing some support to the missing middle hypothesis; (ii) informal firms are necessary for the missing middle to appear; (iii) the size distribution of formal firms looks somehow more like the size distribution in developed economies; and (iv) the missing middle does not arise from entry, but instead reflects firm growth patterns. To the best of our knowledge, our contribution is the first that embraces detailed and comprehensive censuses of establishments in the non-agricultural sectors of sub-Saharan countries in a comparative fashion.

The controversy about the existence of a missing middle appears to be definitional. A binary existence statement necessarily rests on identifying assumptions that arguably obscure the relevance of the matter. In that sense, we argue that the missing middle is an elusive concept. In this paper,

we stepped back from the controversy and established a number of stylized facts with respect to patterns in the size distribution.

Our analysis underlines the important consequences of informality and questions the common perception that the missing middle arises from the size distribution of entrants. Beyond our exercise, we believe that methodically studying the size distribution in order to identify empirical regularities is useful and policy relevant. The possibilities are currently rather limited, as one comes up against the issue of data availability. We can only hope that more establishment censuses will be conducted in the future – panels, in particular, would be greatly informative.

The policy-relevant question here is whether a missing middle is a cause for concern. In some ways it is: a firm size distribution exhibiting a missing middle means that there is a scope for shifting workers from small enterprises into medium-sized and larger ones. Given that larger firms tend to be more productive thanks to economies of scale, this shift would imply a productivity gain. A missing middle is therefore a symptom of an unrealized potential for reallocation of labor across firms. It is therefore a useful metric to assess a scope for labor reallocation, which can be applied in relatively data scarce settings.

Nevertheless, the missing middle as a term and concept can be a bit more misleading. It is not just about a lack of medium-sized firms, but also about small firms not growing as well as larger firms failing to absorb the workforce employed in inefficiently small firms. A multitude of factors can contribute to this: lacking capabilities of entrepreneurs limiting growth of micro-enterprises as well as distortions around formalization and labor market that medium-sized or large firms face to grow.

In terms of policy implications, a critical problem for African economies productivity and formal employment is a lack of a large number of formal firms, and also a very large share of small informal firms that do not grow. Thus, policies that reduce the costs of registration by making it simple to become formal, and especially strengthening enforcement ([Ulyssea, 2020](#)) are important to reduce informality. However, most informal firms do not grow much, which can be the result of the need to stay small to avoid enforcement, but also lacking firm capabilities and necessity entrepreneurship due to the lack of formal employment opportunities. Thus, policies that are size dependent, if effective, do not necessarily increase the number of medium and large firms. Finally, despite the fact that formal firms in Africa resemble more the size distribution of formal firms in advanced economies, their growth is much less over the life-cycle due to existing distortions ([Cirera et al., 2019](#)), which imply that measures to reduce informality, need to go hand-in-hand with measures to reduce existing distortions to firm growth more generally.

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Table 1: Description of the establishment census data

Indicator	Coverage	Burkina Faso (2015)			Cameroon (2008)			Ghana (2013)			Rwanda (2013)										
		Total	Foreign-owned	State-owned	Total	Foreign-owned	State-owned	Total	Foreign-owned	State-owned	Total	Foreign-owned	State-owned								
		#	%	#	%	#	%	#	%	#	%	#	%								
Establishment	All	99,261	1.19	27	0.03	88,144	6.385	7.24	185	0.21	638,234	8.827	1.38	25,536	4.00	154,236	10,510	0.98	1,577	1.02	
	Manufacturing	16,705	1.02	4	0.02	10,922	519	4.75	1	0.01	99,437	711	0.72	164	0.16	10,742	152	1.42	8	0.07	
Employment	All	255,908	20,774	8.12	6,171	2.41	429,758	73,464	17.09	9,590	2.23	3,383,206	136,265	4.03	497,078	14.69	493,302	28,920	5.86	67,546	13.69
	Manufacturing	53,116	3,981	7.49	400	0.75	82,502	20,742	25.14	352	0.43	437,316	31,272	7.15	5,657	1.29	39,708	6,883	17.33	1,667	4.20

Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. Note: Establishments with missing employment are excluded.

Table 2: Summary statistics on establishment census data

Country	All sectors						Manufacturing					
	Establishment		Employment		Employment size (# of workers)		Establishment		Employment		Employment size (# of workers)	
	Formal	%	Formal	%	Mean	p50	Formal	%	Formal	%	Mean	p50
Burkina Faso (2015)	9.56	31.81	2	1	15	3	3.89	27.48	2	2	36	6
Cameroon (2008)	7.78	46.11	3	2	29	6	5.26	58.65	3	2	84	14
Ghana (2013)	32.62	50.63	4	2	8	2	28.12	50.07	3	2	8	3
Rwanda (2013)	23.69	64.18	2	1	9	2	21.47	59.11	2	1	10	2

Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. Note: Establishments with missing employment are excluded.

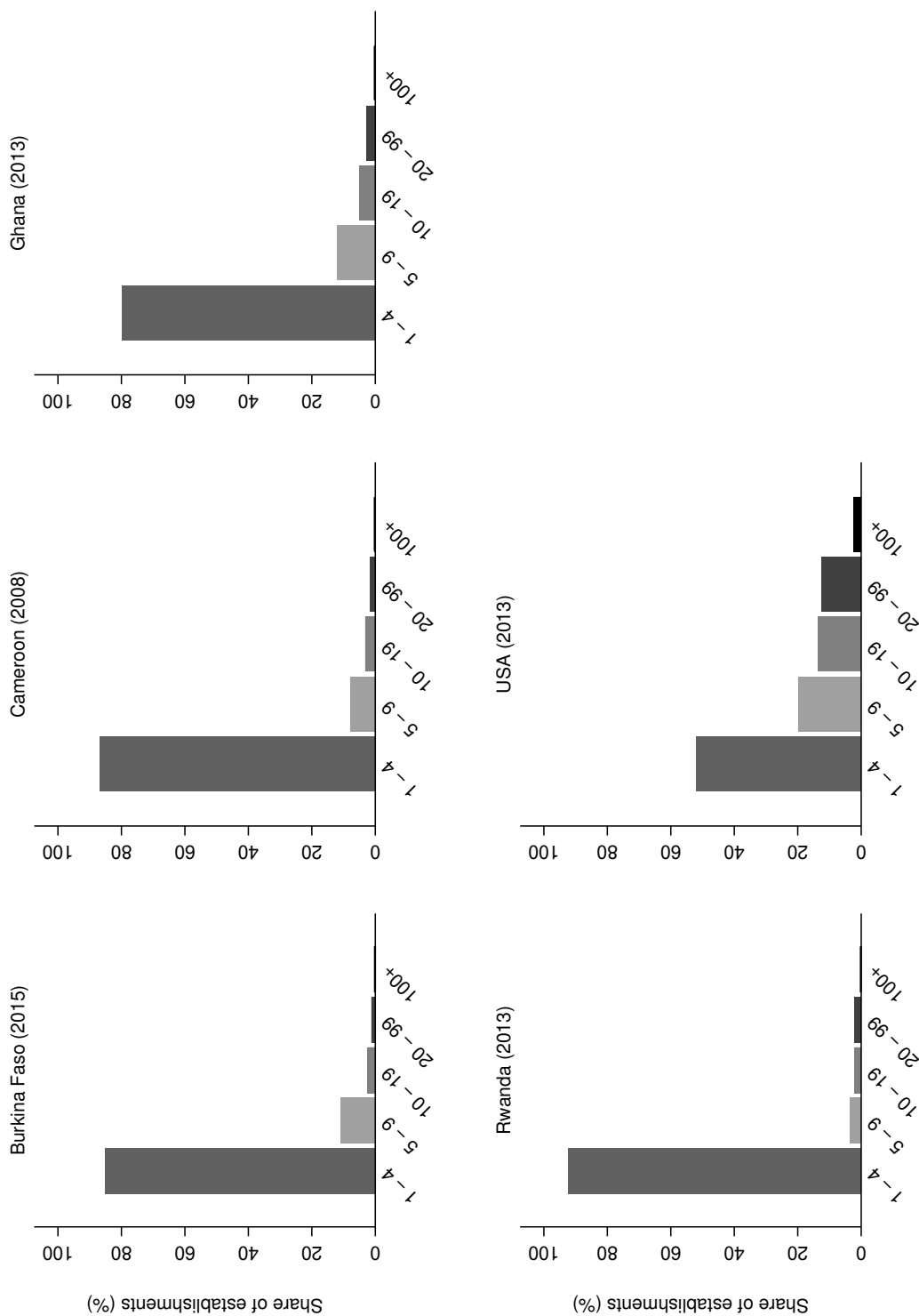
Table 3: Difference Between Actual vs Predicted Employment Shares (based on Pareto distribution)

	$\kappa$	Size class – Number of workers				
		1 – 4	5 – 9	10 – 19	20 – 99	100+
Panel a - Narrow size classes						
Burkina Faso (2015)	1.383	-0.013	0.150	-0.013	-0.066	0.014
Cameroon (2008)	1.149	0.021	0.012	0.015	-0.015	0.011
Ghana (2013)	1.336	0.007	0.098	-0.006	-0.053	0.023
Rwanda (2013)	1.299	0.047	0.012	-0.015	-0.017	0.039
Panel b - Broad size classes						
		1 – 9		10 – 49		50+
Burkina Faso (2015)	1.454	0.027		-0.052		0.044
Cameroon (2008)	1.143	0.015		-0.011		0.008
Ghana (2013)	1.366	0.028		-0.042		0.032
Rwanda (2013)	1.294	0.022		-0.024		0.019

*Source:* Establishment censuses obtained from the statistical agencies of the select countries; see section 3. *Note:* The Pareto shape parameter  $\kappa$  is estimated based on minimizing Euclidean distance between observed and theoretical shares.

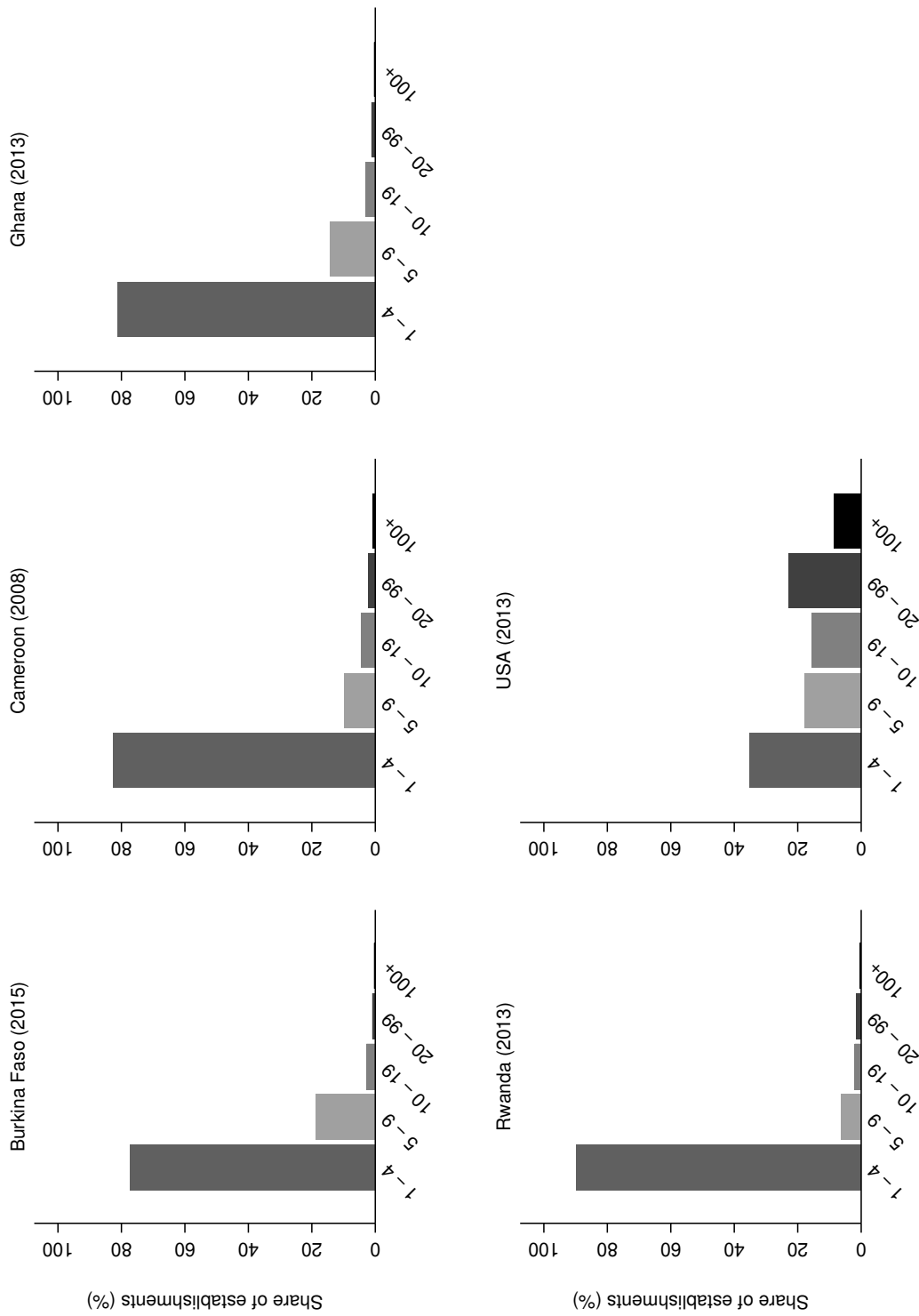


Figure 1: Establishment distribution: Economy-wide



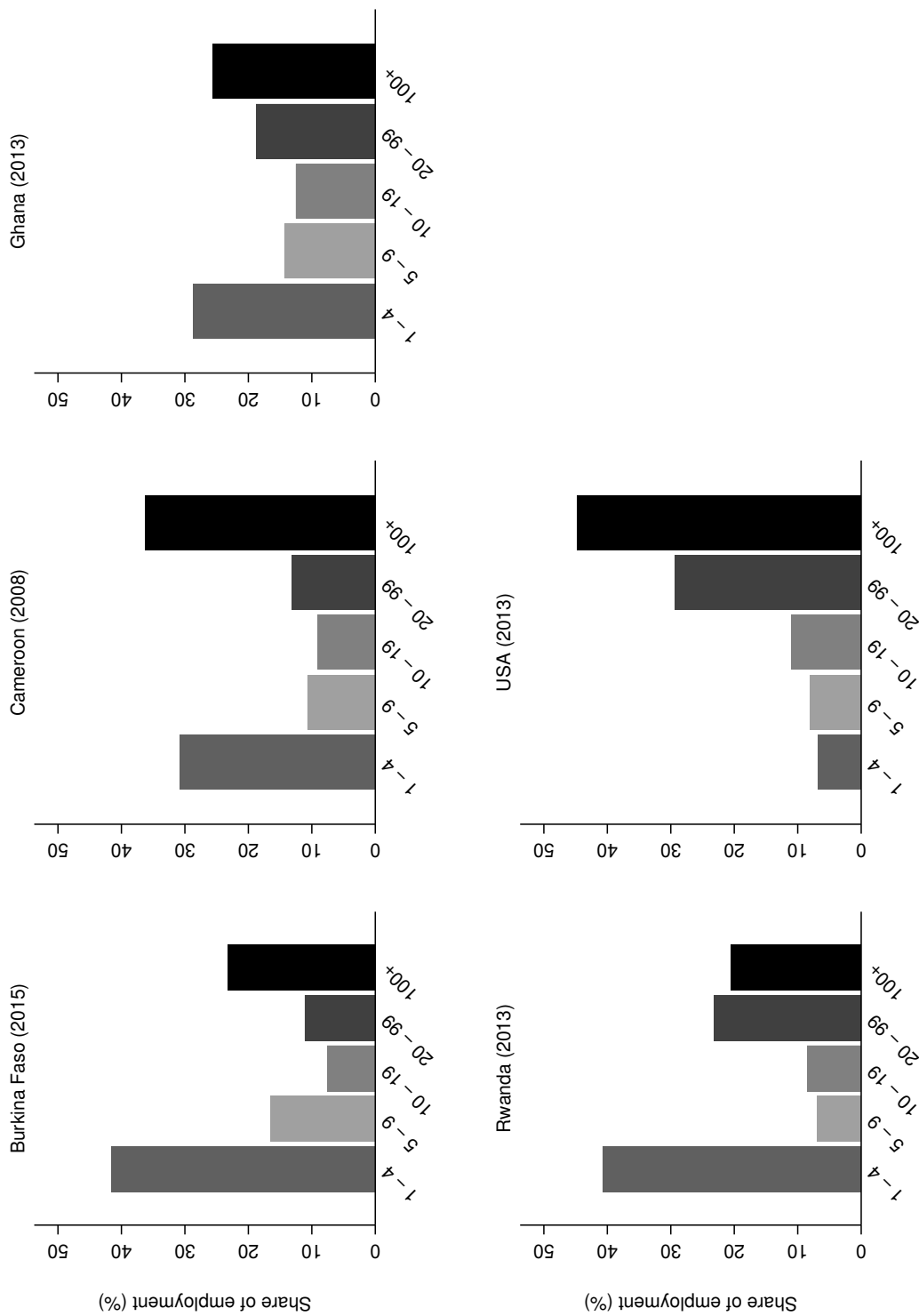
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. For the U.S., the data comes from the 2019 Business Dynamics Statistics (BDS) dataset. Note: The figure is constructed based on data for establishments in all sectors irrespective of their state or foreign ownership status. Establishments with missing employment data are excluded.

Figure 2: Establishment distribution: Manufacturing



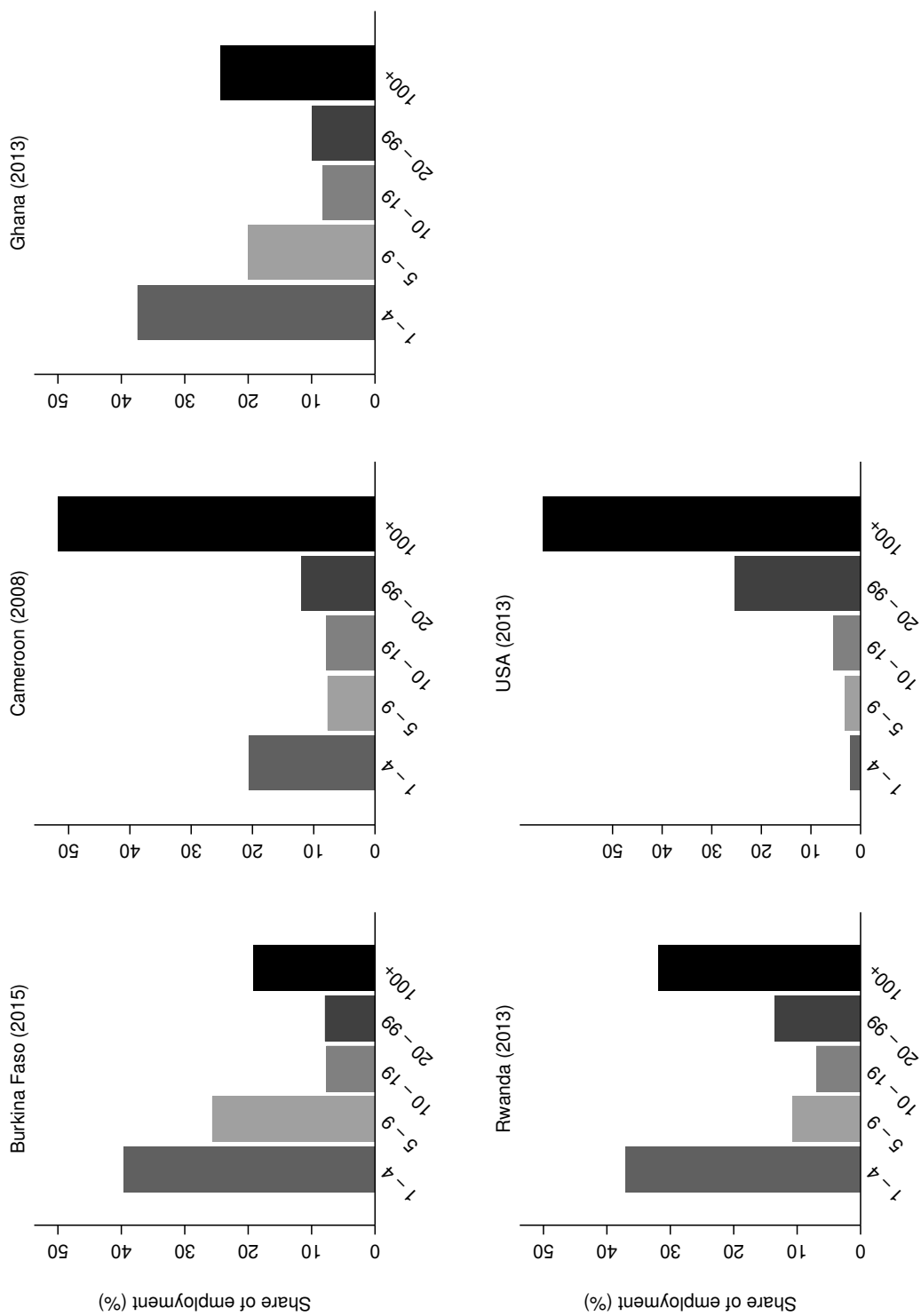
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. For the U.S., the data comes from the 2019 Business Dynamics Statistics (BDS) dataset. Note: The figure is constructed based on data for establishments in the manufacturing sector irrespective of their state or foreign ownership status. Establishments with missing employment data are excluded.

Figure 3: Employment distribution: Economy-wide



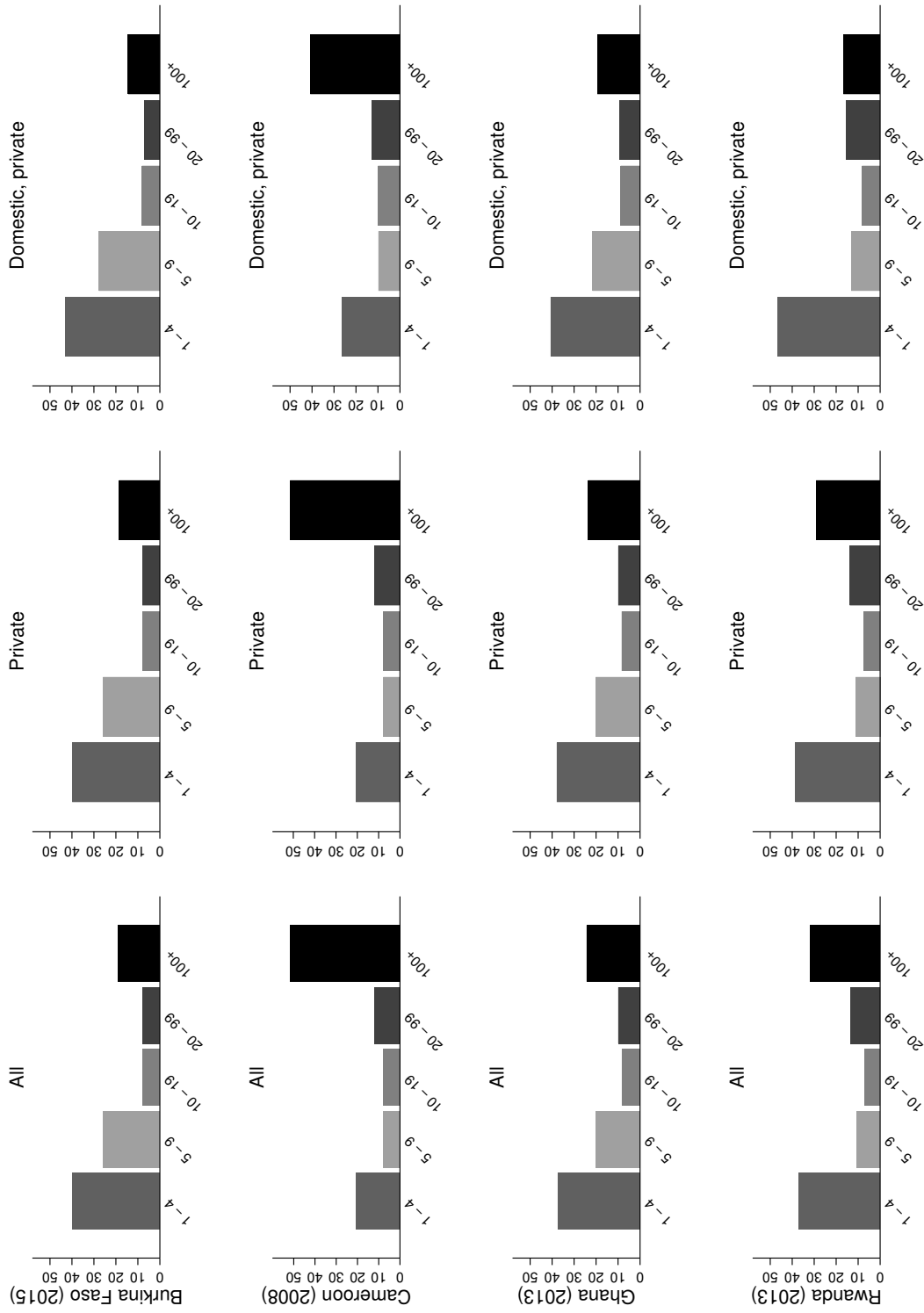
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. For the U.S., the data comes from the 2019 Business Dynamics Statistics (BDS) dataset. Note: The figure is constructed based on data for establishments in all sectors irrespective of their state or foreign ownership status. Establishments with missing employment data are excluded.

Figure 4: Employment distribution: Manufacturing



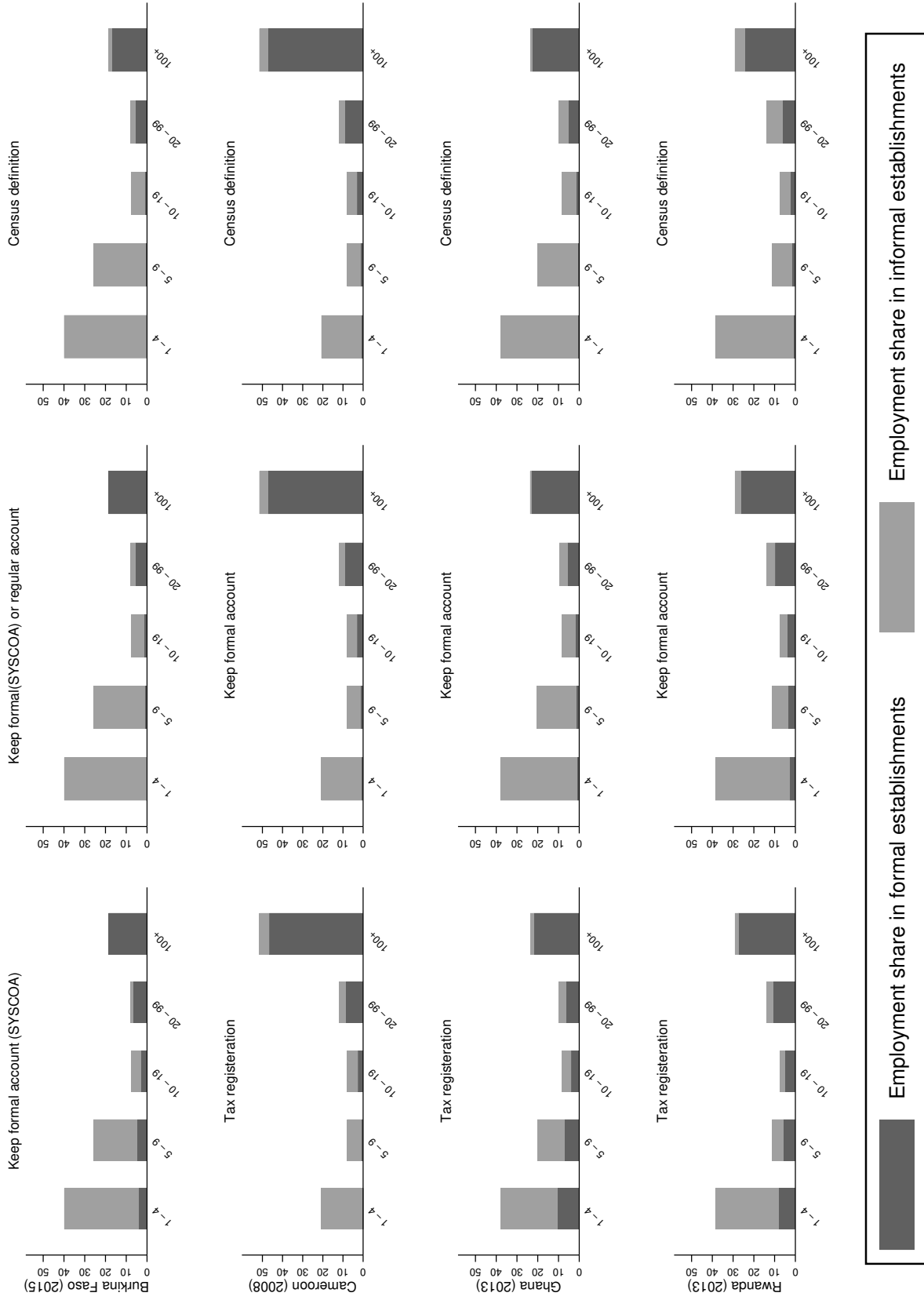
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. For the U.S., the data comes from the 2019 Business Dynamics Statistics (BDS) dataset. Note: The figure is constructed based on data for establishments in the manufacturing sector irrespective of their state or foreign ownership status. Establishments with missing employment data are excluded.

Figure 5: Employment distribution by state and foreign ownership: Manufacturing



Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. Note: The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment data are excluded.

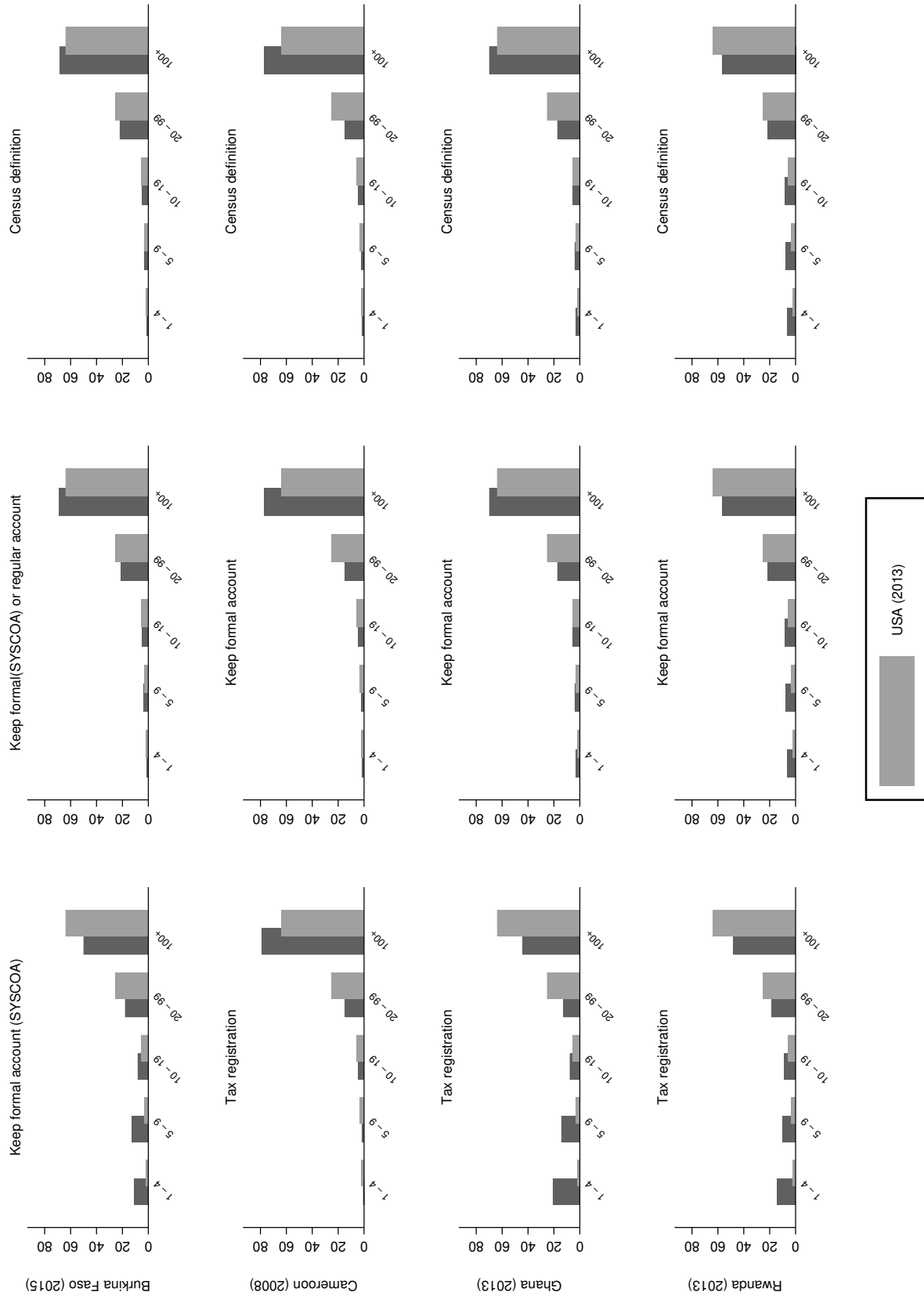
Figure 6: Formal and informal employment distribution: Manufacturing



*Source:* Establishment censuses obtained from the statistical agencies of the select countries; see section 3. *Note:* The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment data and state-owned are excluded. Census definition of formality slightly differs across the statistical offices of the sample countries. In Burkina Faso, an establishment is considered formal if it has registration number (with mobile trade and mobile credit, tax identification number) and uses SYSCOA as an accounting standard. In Cameroon, formal establishments are the ones that prepare a Statistical and Fiscal Declaration (DSF) or those that do not prepare DSF but which keep an operating account and a partial account of balance sheets. In Ghana, formal establishments are defined as those that are registered with the Registrar General's Department (RGD) and keep formal accounts. In Rwanda, an establishment is considered to operate in the formal sector if it is registered at Rwanda Revenue Authority (RRA) and maintains regular operational accounts.

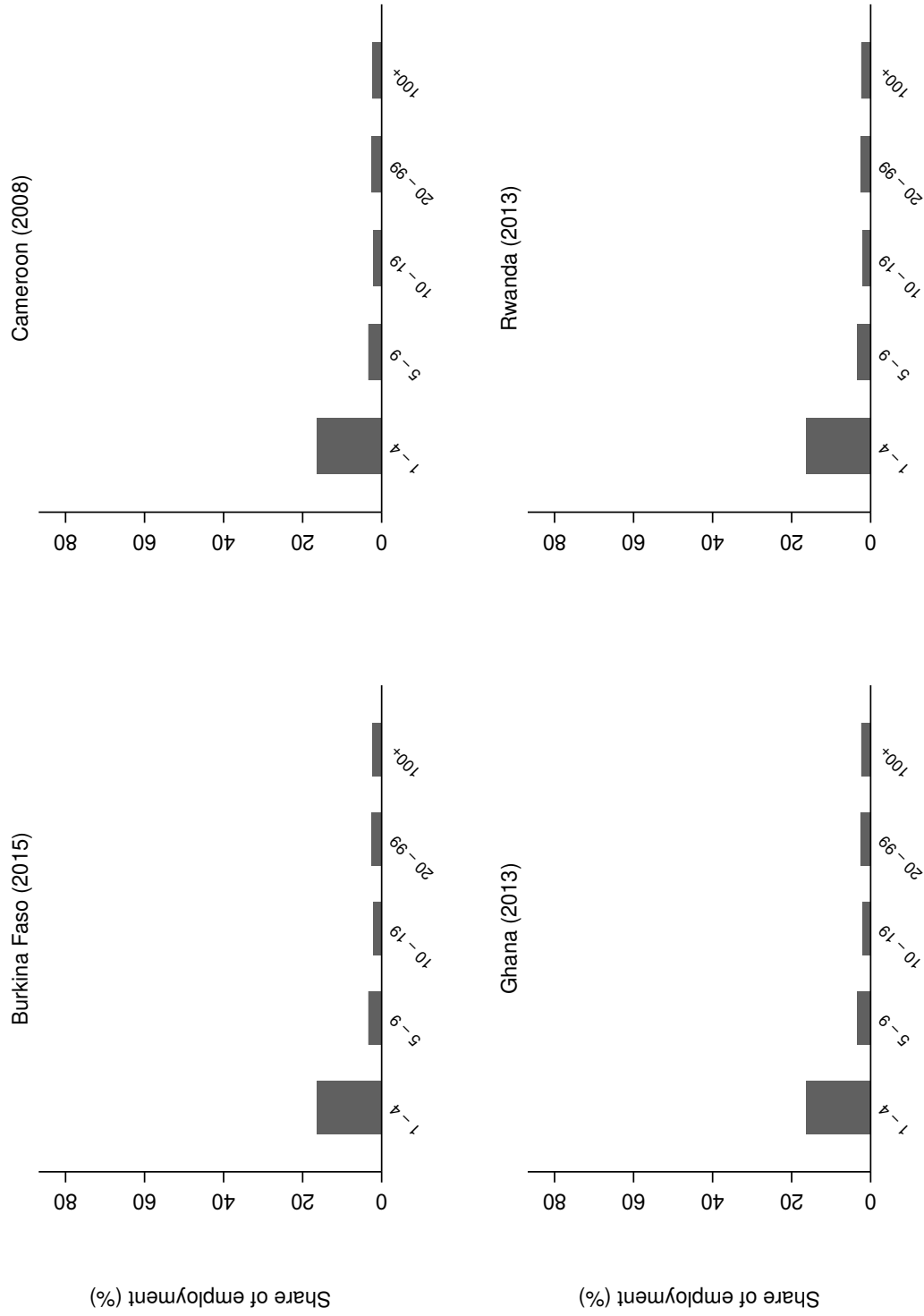


Figure 7: Formal employment distribution compared with the U.S.: Manufacturing



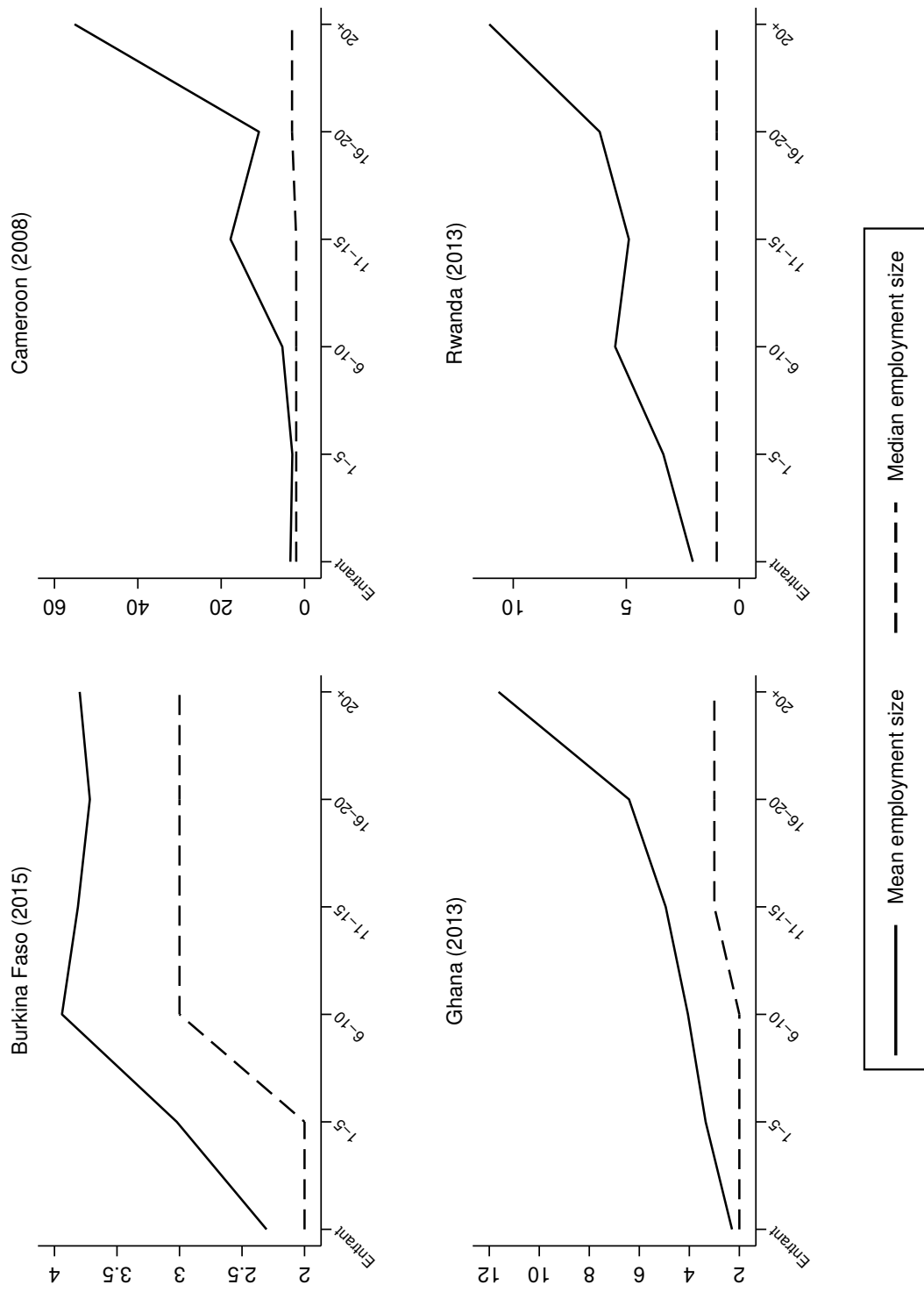
*Source:* Establishment censuses obtained from the statistical agencies of the select countries; see section 3. *Note:* The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment data and state-owned are excluded. Census definition of formality slightly differs across the statistical offices of the sample countries. In Burkina Faso, an establishment is considered formal if it has registration number (with mobile trade and mobile credit, tax identification number) and uses SYSCOA as an accounting standard. In Cameroon, formal establishments are the ones that prepare a Statistical and Fiscal Declaration (DSF) or those that do not prepare DSF but which keep an operating account and a partial account of balance sheets. In Ghana, formal establishments are defined as those that are registered with the Registrar General's Department (RGD) and keep formal accounts. In Rwanda, an establishment is considered to operate in the formal sector if it is registered at Rwanda Revenue Authority (RRA) and maintains regular operational accounts.

Figure 8: Employment distribution among entrants: Manufacturing



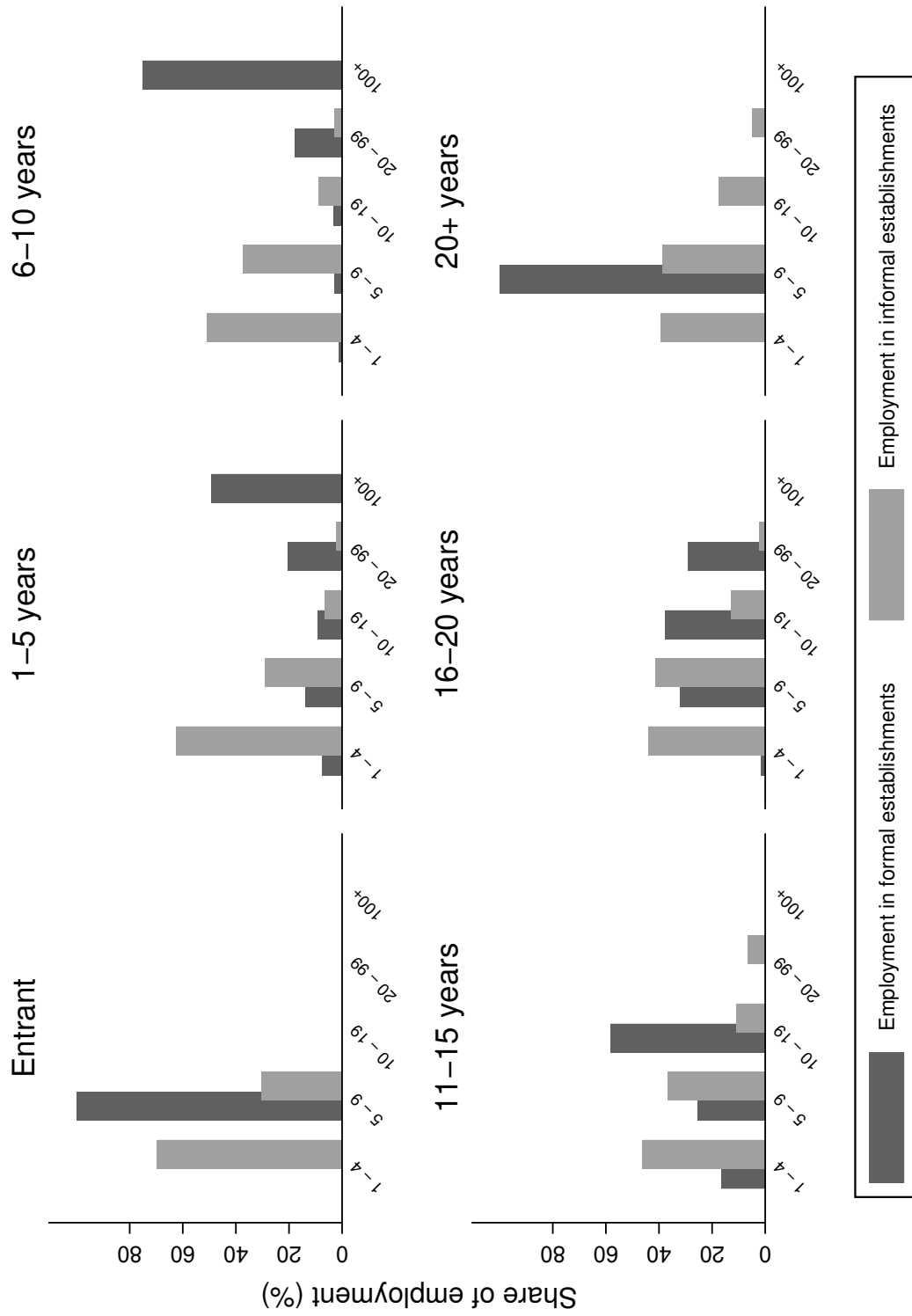
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. Note: The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

Figure 9: Size of establishments by age cohort: Manufacturing



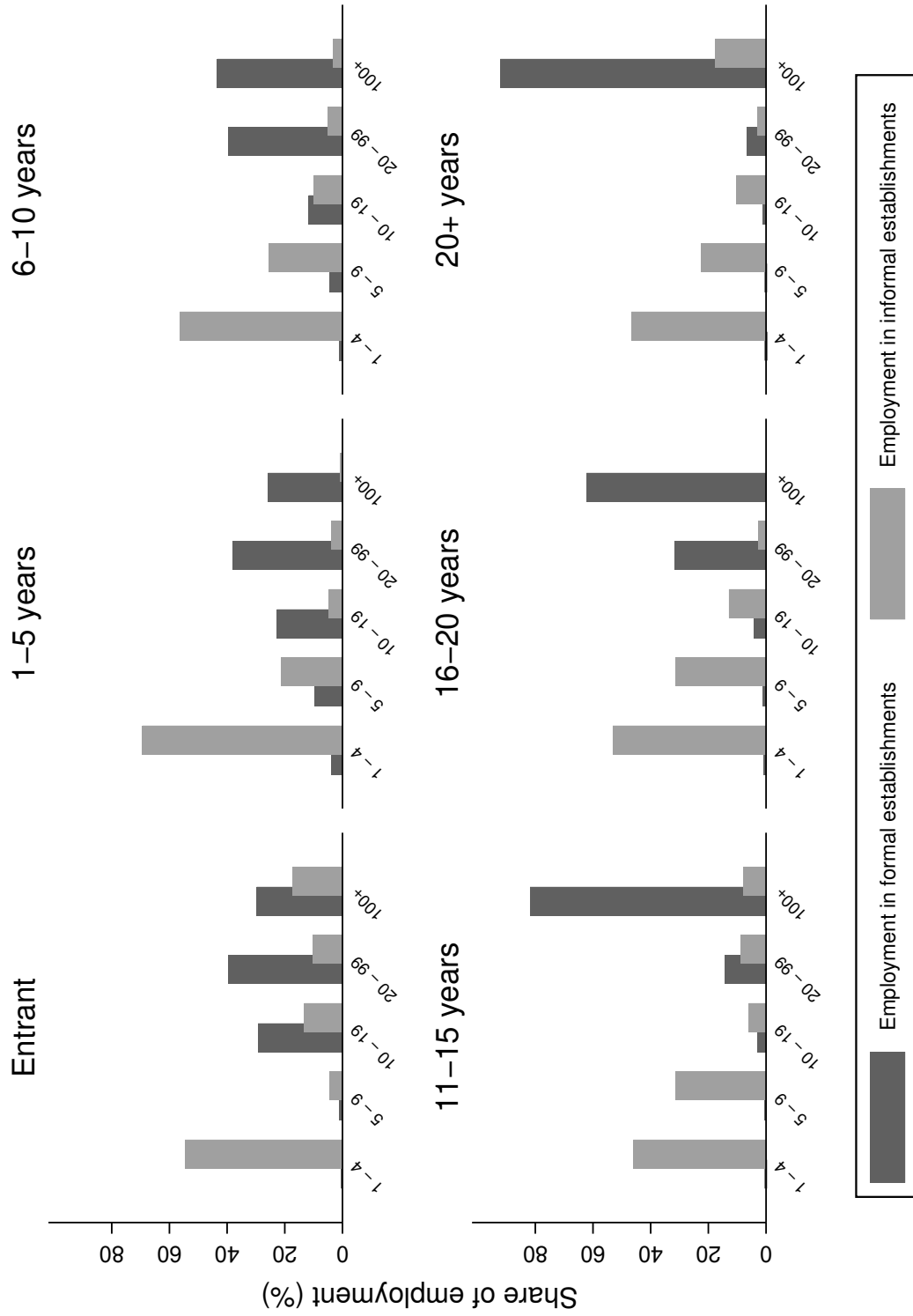
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. Note: The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

Figure 10: Formal and informal employment distribution by age cohort in manufacturing: Burkina Faso (2015)



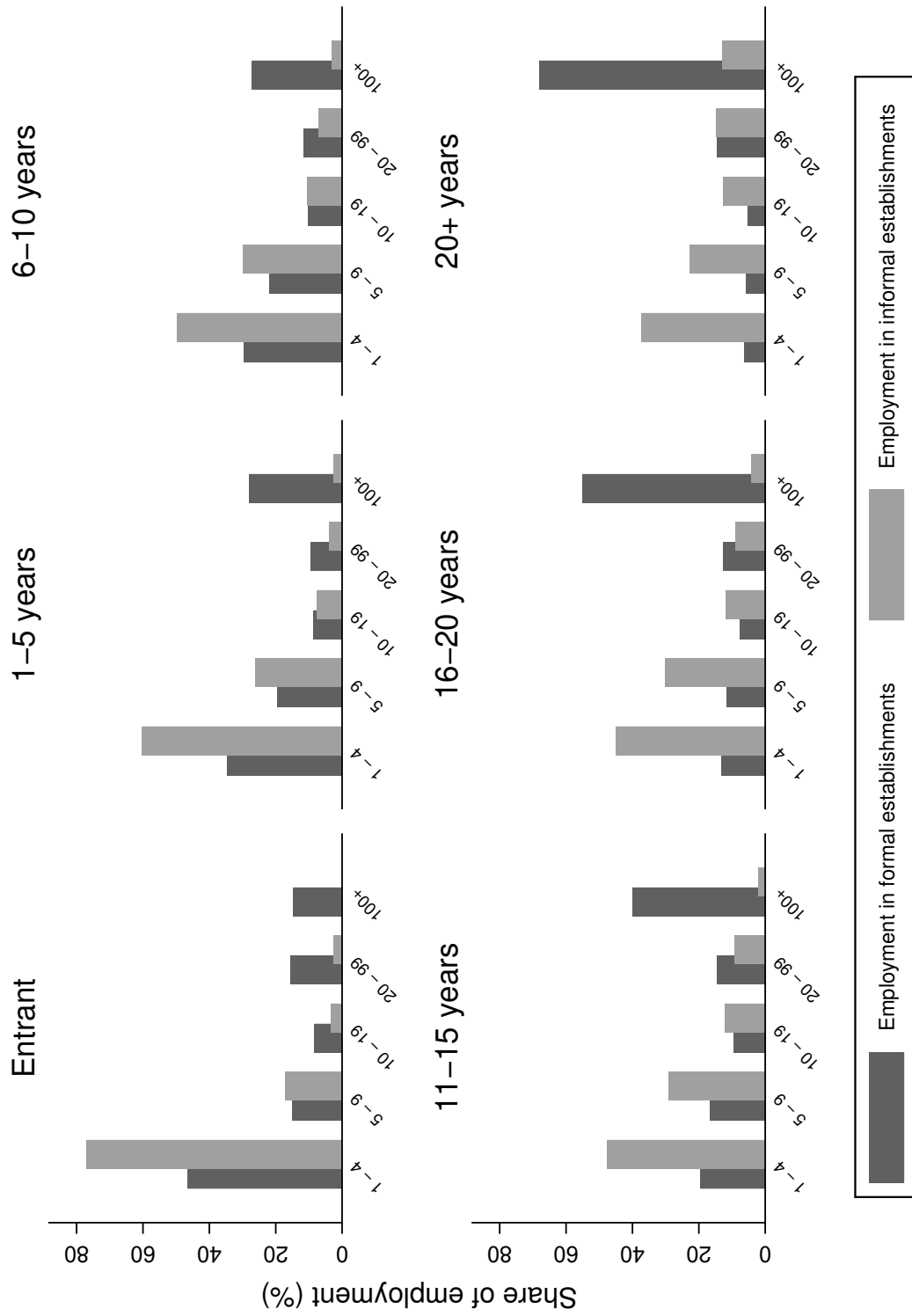
Source: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3. Note: The reference is the total employment for each age cohort and formality status. The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

Figure 11: Formal and informal employment distribution by age cohort in manufacturing: Cameroon (2008)



Source: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3. Note: The reference is the total employment for each age cohort and formality status. The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

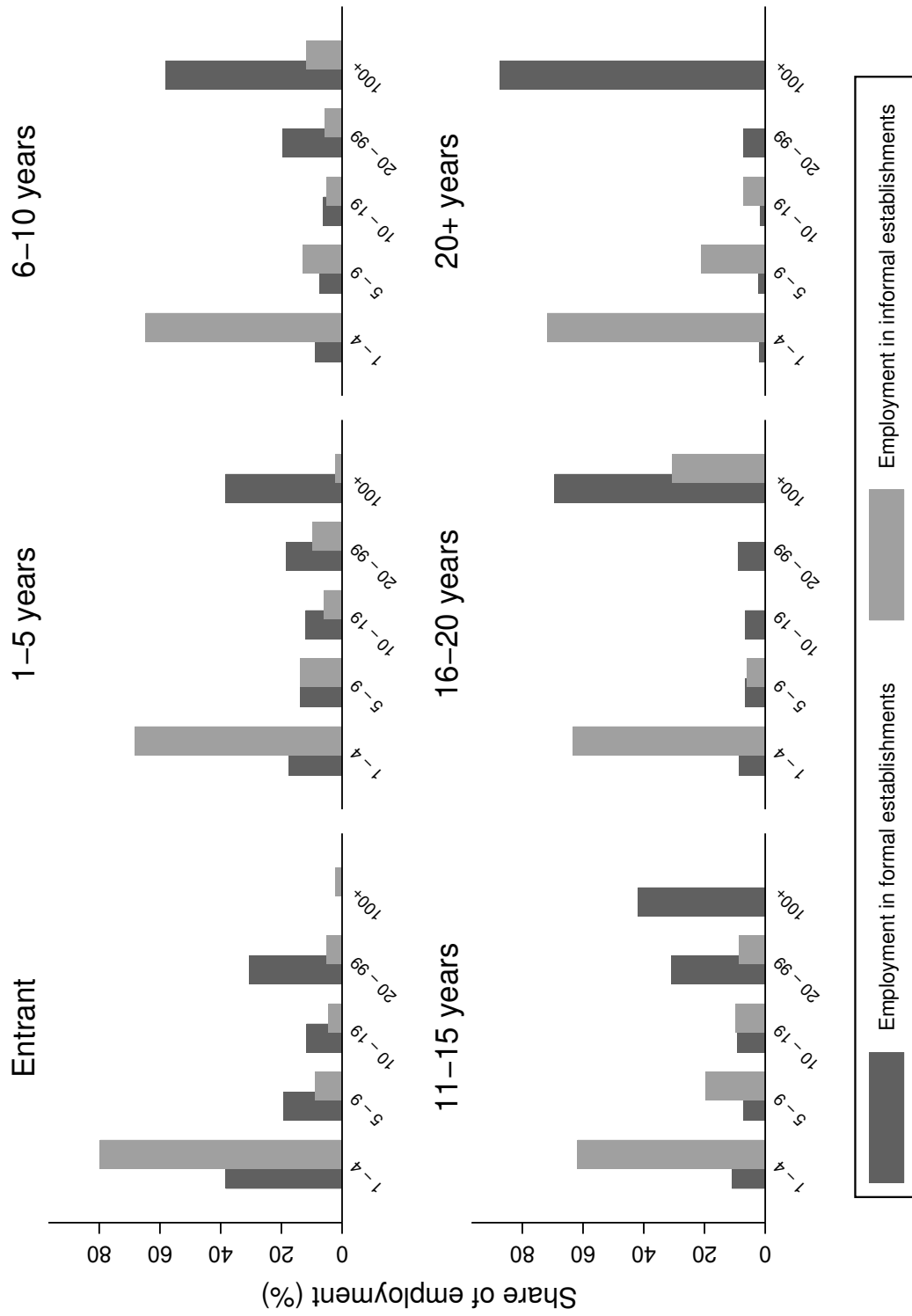
Figure 12: Formal and informal employment distribution by age cohort in manufacturing: Ghana (2013)



Source: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3. Note: The reference is the total employment for each age cohort and formality status. The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

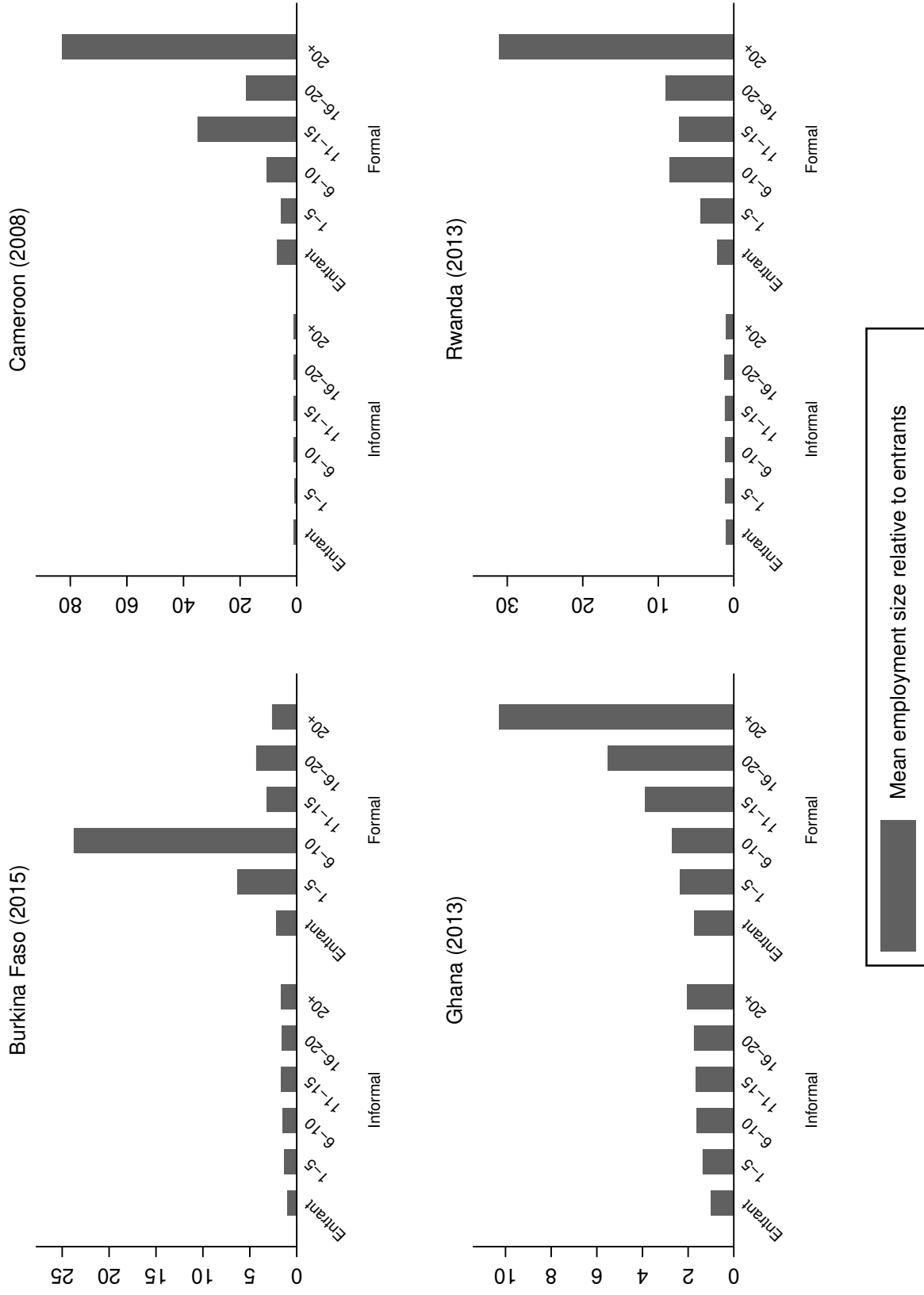


Figure 13: Formal and informal employment distribution by age cohort in manufacturing: Rwanda (2013)



Source: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3. Note: The reference is the total employment for each age cohort and formality status. The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

Figure 14: Size of formal and informal establishments by age cohort: Manufacturing



Source: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3. Note: The reference is the total employment for each age cohort and formality status. The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

# Appendix

Table A.1: Burkina Faso (2015)

Indicator	Sector coverage	Total	Establishment formality indicator							
			Keep regular account		Use SYSCOA accounting standard		Keep regular account or use SYSCOA accounting standard		Census (local) definition	
			#	%	#	%	#	%	#	%
Establishment	All	99,261	12.655	12.75	9,492	9.56	22,147	22.31	9,028	9.10
	Manufacturing	16,705	1,509	9.03	650	3.89	2,159	12.92	620	3.71
Employment	All	255,908	30,927	12.09	81,412	31.81	112,339	43.90	74,067	28.94
	Manufacturing	53,116	5,338	10.05	14,594	27.48	19,932	37.53	13,420	25.27

*Source:* Establishment censuses obtained from the statistical agencies of the select countries; see section 3. According to the census data from Burkina Faso, an establishment is considered formal if it has registration number (with mobile trade and mobile credit, tax identification number) and uses SYSCOHADA as a type of accounting.

Table A.2: Cameroon (2008)

Indicator	Sector coverage	Total	Establishment formality indicator							
			Registration at tax authority		Keep formal account		Registration at tax authority and keeps formal account		Census (local) definition	
			#	%	#	%	#	%	#	%
Establishment	All	88,144	6,859	7.78	11,673	13.24	6,584	7.47	11,948	13.56
	Manufacturing	10,922	575	5.26	876	8.02	564	5.16	887	8.12
Employment	All	429,758	198,151	46.11	231,512	53.87	196,477	45.72	233,186	54.26
	Manufacturing	82,502	48,384	58.65	50,647	61.39	48,298	58.54	50,733	61.49

*Source:* Establishment censuses obtained from the statistical agencies of the select countries; see section 3. According to the census data from Cameroon, formal establishments are the ones that prepare a Statistical and Fiscal Declaration (DSF) or those that do not prepare DSF but which keep an operating account and a partial account of balance sheets.

Table A.3: Ghana (2013)

Indicator	Sector coverage	Total	Establishment formality indicator											
			Registration at business register		Registration at tax authority		Registration at business register or tax authority		Keep formal account		Registration at business register/tax authority or keep formal account		Census (local) definition	
			#	%	#	%	#	%	#	%	#	%	#	%
Establishment	All	638,234	114,285	17.91	208,191	32.62	247,771	38.82	88,141	13.81	269,083	42.16	60,314	9.45
	Manufacturing	99,437	8,220	8.27	27,964	28.12	31,082	31.26	4,267	4.29	31,947	32.13	2,936	2.95
Employment	All	3,383,206	1,683,640	49.76	1,709,699	50.53	2,083,013	61.57	1,700,999	50.28	2,360,573	69.77	1,355,326	40.06
	Manufacturing	437,316	166,783	38.14	218,970	50.07	241,252	55.17	145,925	33.37	246,580	56.38	137,246	31.38

Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. According to the census data from Ghana, formal establishments are defined as those that are registered with the Registrar General's Department (RGD) and keep formal accounts. In Rwanda, an enterprise is considered to operate in the formal sector if it is registered at Rwanda Revenue Authority (RRA) and maintains regular operational accounts.

Table A.4: Rwanda (2013)

Indicator	Sector coverage	Total	Establishment formality indicator											
			Registration at business register		Registration at tax authority		Registration at business register or tax authority		Keep formal account		Registration at business register/tax authority or keep formal account		Census (local) definition	
			#	%	#	%	#	%	#	%	#	%	#	%
Establishment	All	154,236	124,423	80.67	36,538	23.69	125,443	81.33	11,889	126,041	81.72	14,487	10,051	6.52
	Manufacturing	10,742	8,758	81.53	2,306	21.47	8,844	82.33	971	8,881	82.68	707	405	3.77
Employment	All	493,302	452,631	91.76	316,605	64.18	455,233	92.28	270,976	456,078	92.45	264,649	204,679	41.49
	Manufacturing	39,708	36,441	91.77	23,473	59.11	36,724	92.49	19,142	36,785	92.64	18,691	15,064	37.94

Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. According to the census data from Rwanda, an enterprise is considered to operate in the formal sector if it is registered at Rwanda Revenue Authority (RRA) and maintains regular operational accounts.

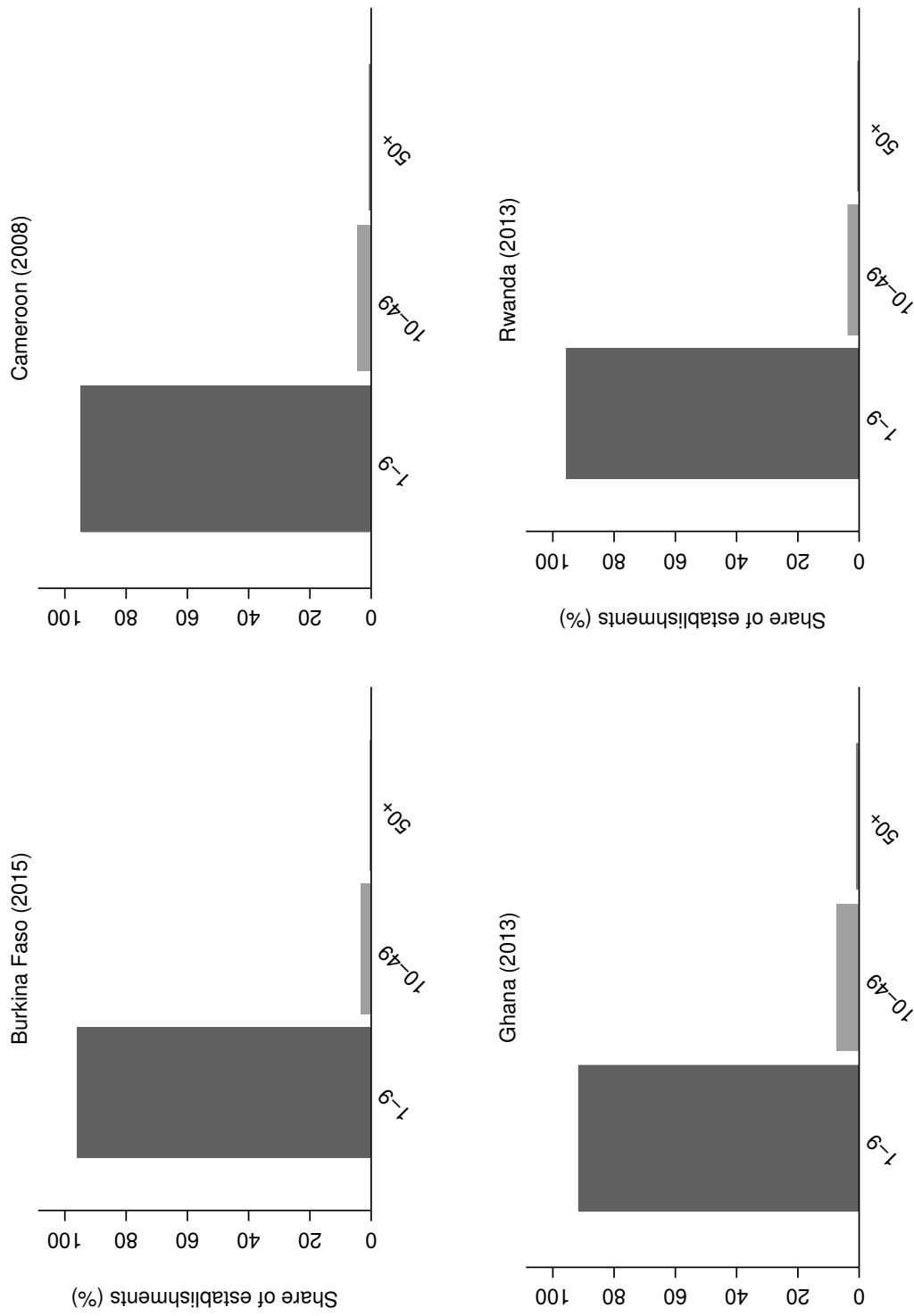
Table A.5: Difference Between Actual vs Predicted Employment Employment Shares in the Formal Manufacturing (based on Pareto distribution)

		Size class – Number of workers				
		1 – 4	5 – 9	10 – 19	20 – 99	100+
	$\kappa$					
Panel a - Narrow size classes						
Burkina Faso (2015)	1.079	-0.092	-0.002	0.009	0.117	-0.005
Cameroon (2008)	1.051	-0.064	-0.014	0.015	0.080	0.001
Ghana (2013)	1.178	-0.010	0.068	0.006	-0.018	0.002
Rwanda (2013)	1.155	-0.050	0.035	0.020	0.049	-0.010
Panel b - Broad size classes						
		1 – 9		10 – 49		50+
Burkina Faso (2015)	1.061	-0.076		0.097		-0.014
Cameroon (2008)	1.030	-0.045		0.056		-0.006
Ghana (2013)	1.186	0.017		-0.012		0.010
Rwanda (2013)	1.150	-0.035		0.058		-0.011

*Source:* Establishment censuses obtained from the statistical agencies of the select countries; see section 3. *Note:* The Pareto shape parameter  $\kappa$  is estimated based on minimizing Euclidean distance between observed and theoretical shares.

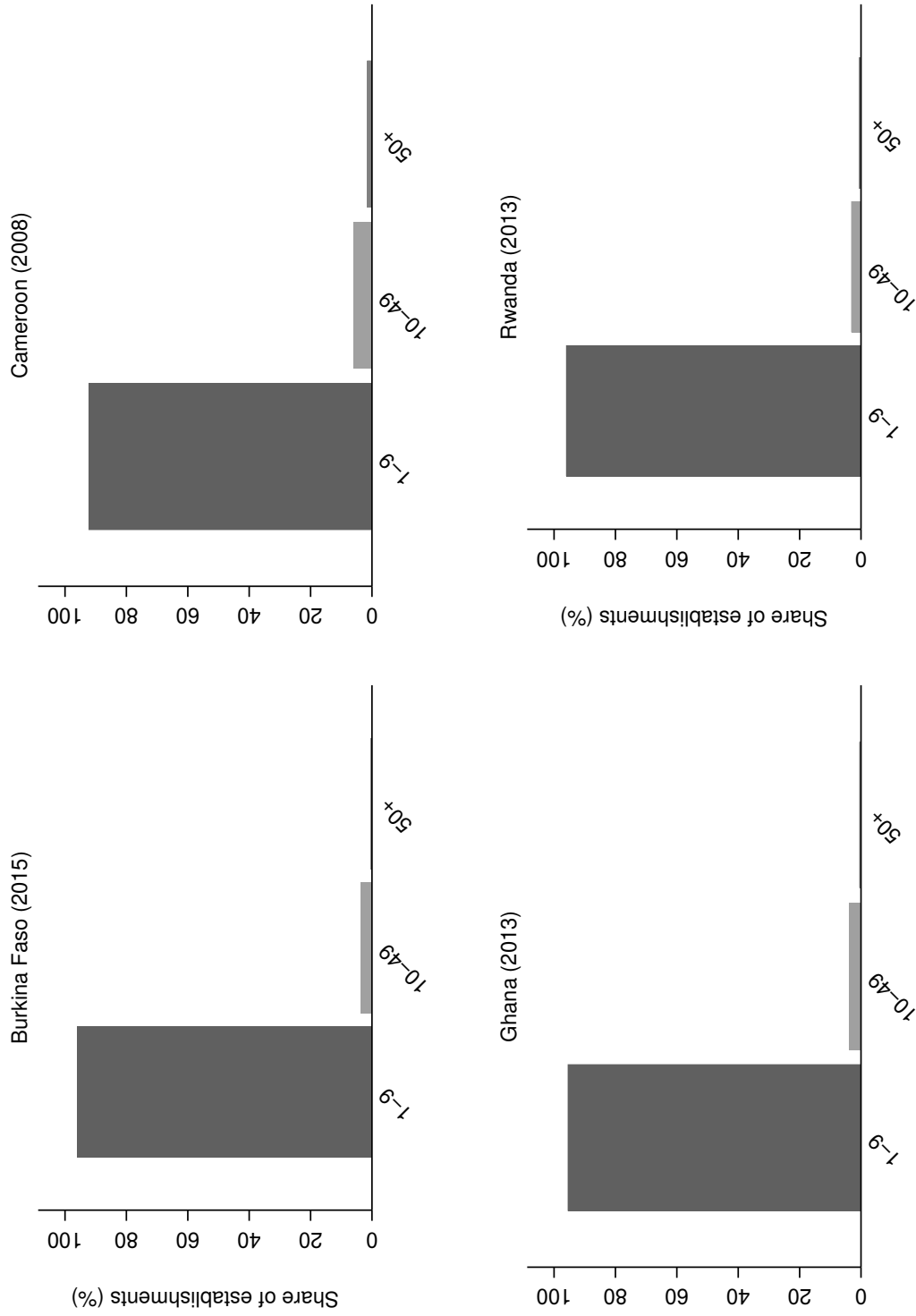


Figure A.1: Establishment distribution (broad size classification): Economy-wide



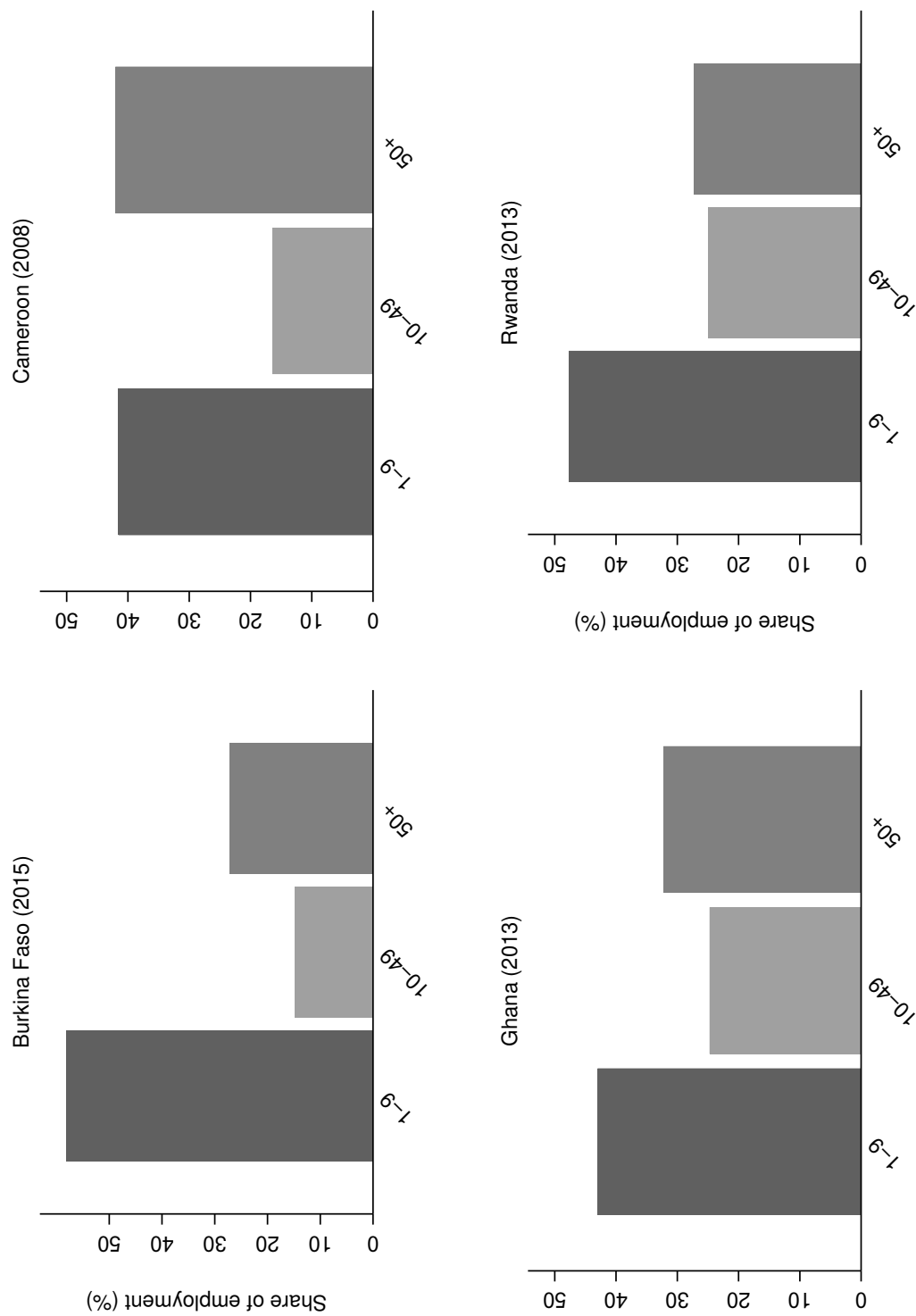
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. For the U.S., the data comes from the 2019 Business Dynamics Statistics (BDS) dataset. Note: The figure is constructed based on data for establishments in all sectors irrespective of their state or foreign ownership status. Establishments with missing employment data are excluded.

Figure A.2: Establishment distribution (broad size classification): Manufacturing



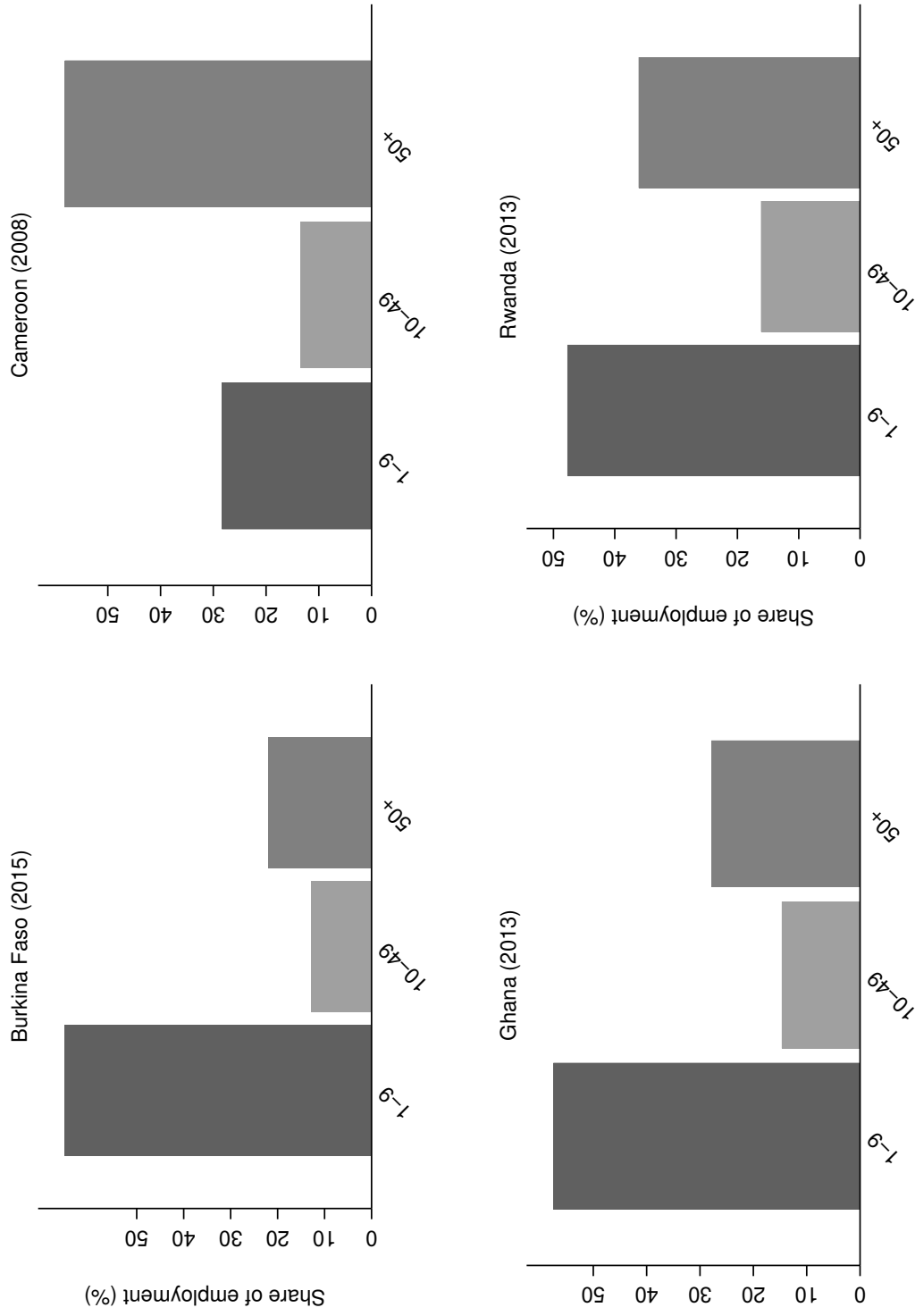
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. For the U.S., the data comes from the 2019 Business Dynamics Statistics (BDS) dataset. Note: The figure is constructed based on data for establishments in the manufacturing sector irrespective of their state or foreign ownership status. Establishments with missing employment data are excluded.

Figure A.3: Employment distribution (broad size classification): Economy-wide



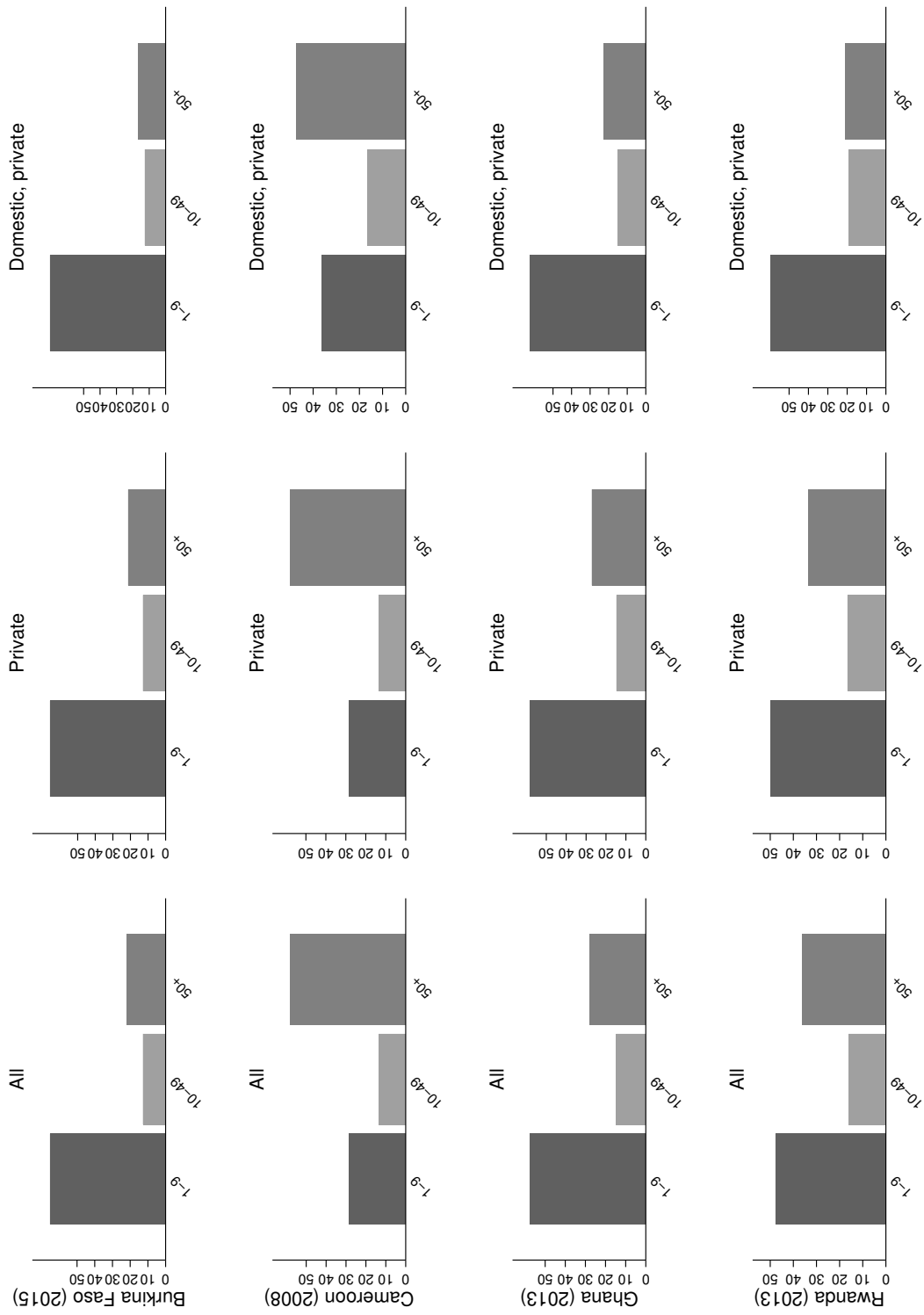
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. For the U.S., the data comes from the 2019 Business Dynamics Statistics (BDS) dataset. Note: The figure is constructed based on data for establishments in all sectors irrespective of their state or foreign ownership status. Establishments with missing employment data are excluded.

Figure A.4: Employment distribution (broad size classification): Manufacturing



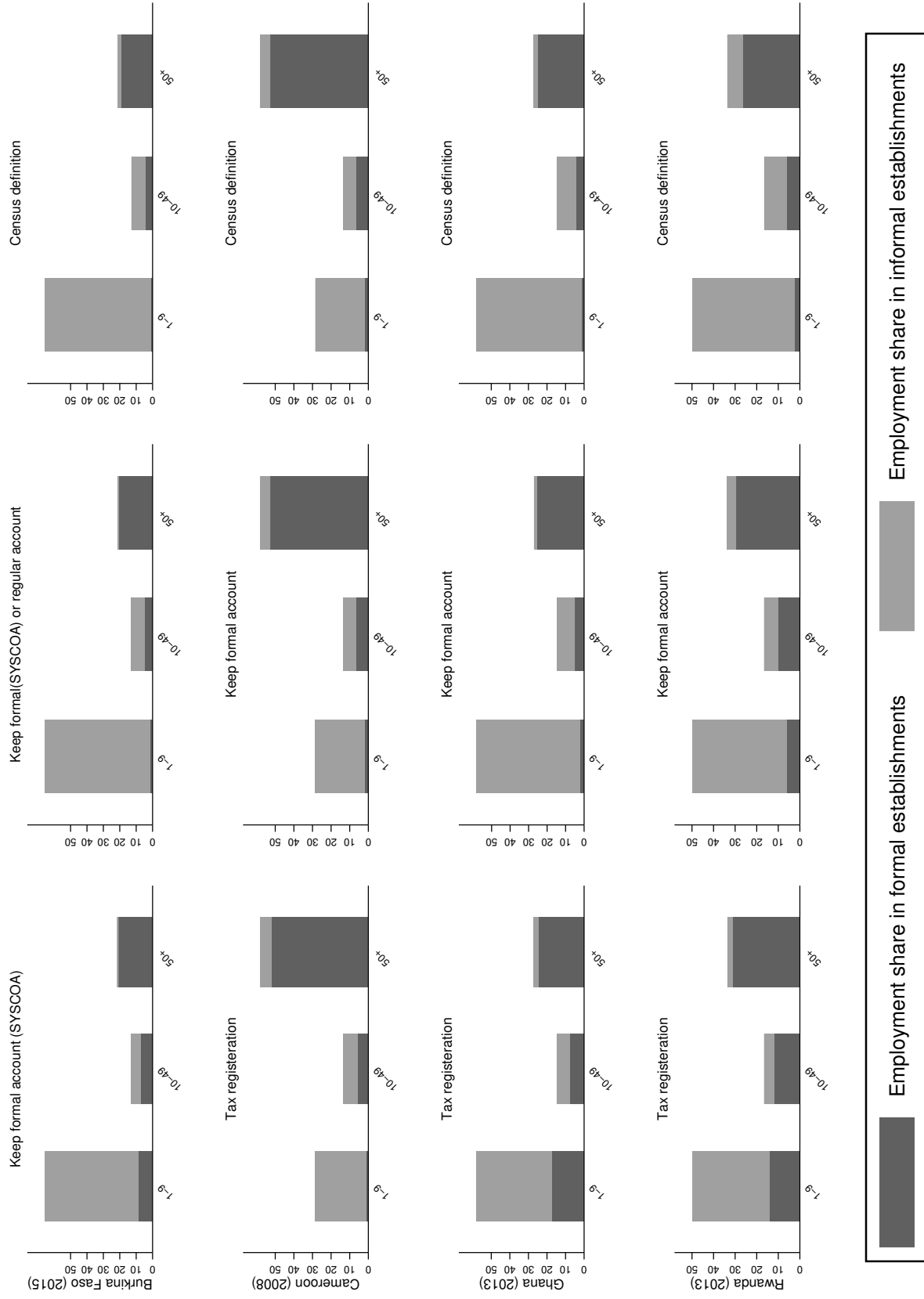
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. For the U.S., the data comes from the 2019 Business Dynamics Statistics (BDS) dataset. Note: The figure is constructed based on data for establishments in the manufacturing sector irrespective of their state or foreign ownership status. Establishments with missing employment data are excluded.

Figure A.5: Employment distribution by state and foreign ownership (broad size classification): Manufacturing



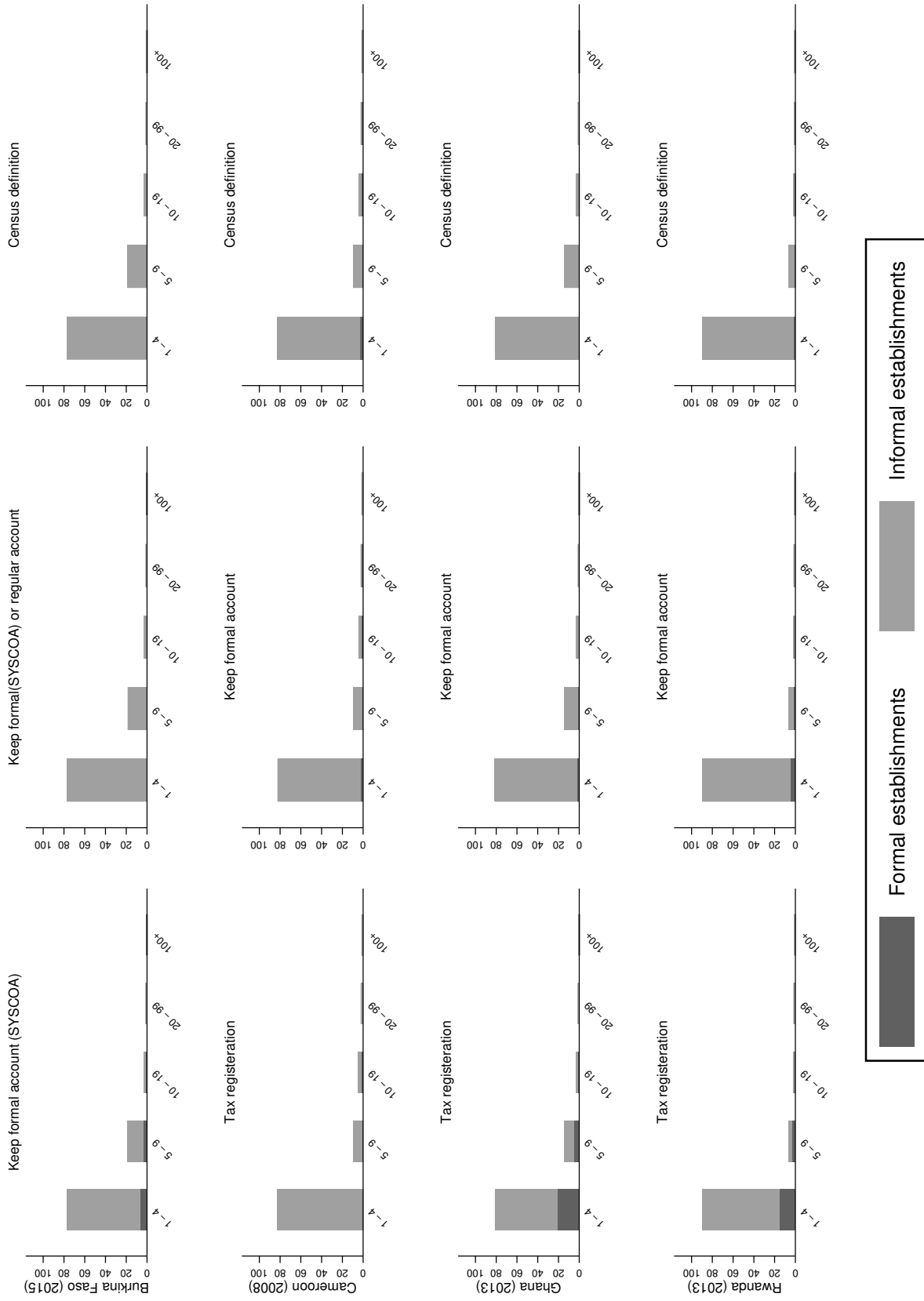
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. Note: The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment data are excluded.

Figure A.6: Formal and informal employment distribution (broad size classification): Manufacturing



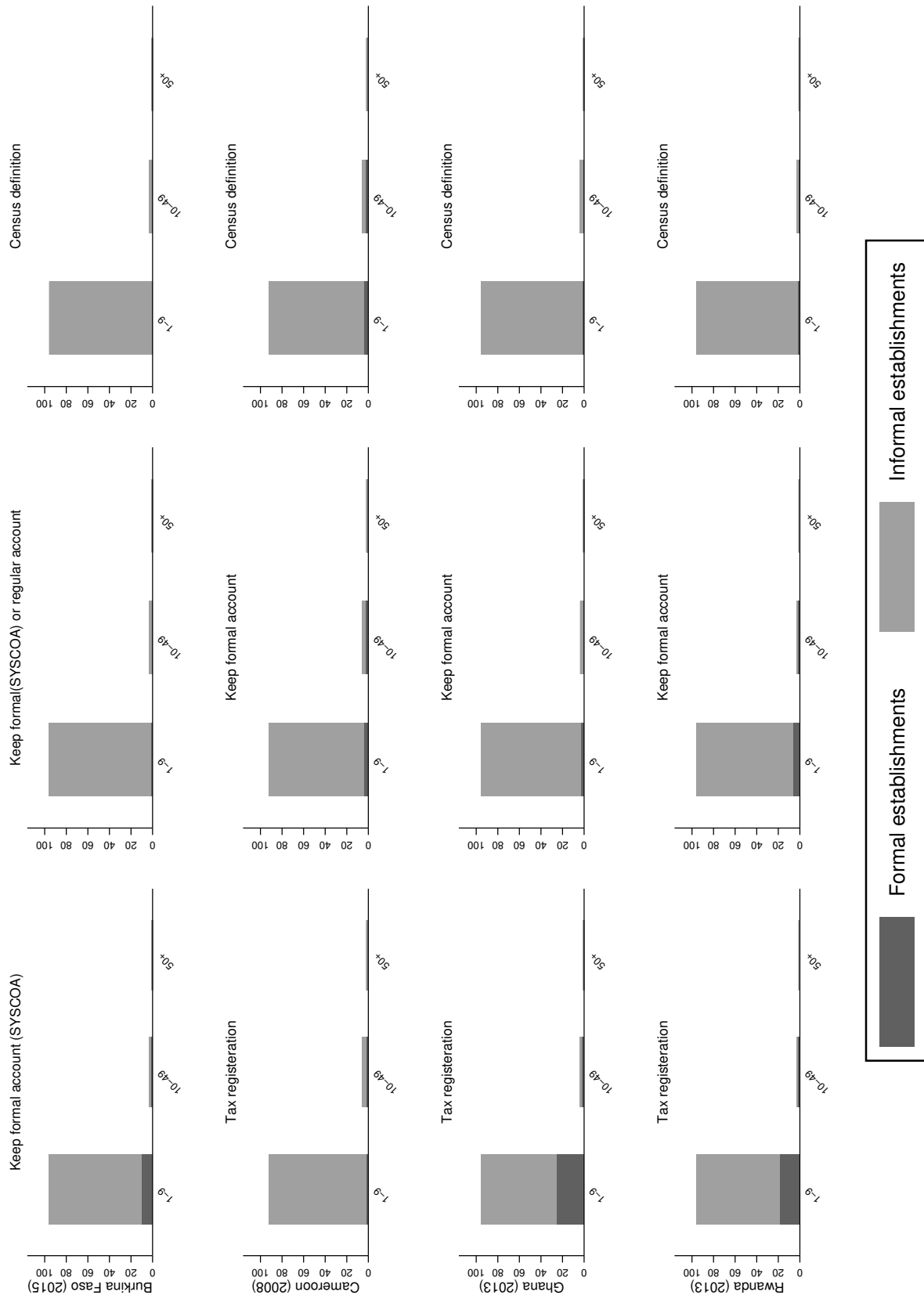
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. Note: The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment data and state-owned are excluded. The statistical offices of the sample countries have slightly different yet comparable definitions of formality. In Burkina Faso, an establishment is considered formal if it has registration number (with mobile trade and mobile credit, tax identification number) and uses SYSCOA as an accounting standard. In Cameroon, formal establishments are the ones that prepare a Statistical and Fiscal Declaration (DSF) or those that do not prepare DSF but which keep an operating account and a partial account of balance sheets. In Ghana, formal establishments are defined as those that are registered with the Registrar General's Department (RGD) and keep formal accounts. In Rwanda, an establishment is considered to operate in the formal sector if it is registered at Rwanda Revenue Authority (RRA) and maintains regular operational accounts.

Figure A.7: Formal and informal establishment distribution: Manufacturing



*Source:* Establishment censuses obtained from the statistical agencies of the select countries; see section 3. *Note:* The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment data and state-owned are excluded. The statistical offices of the sample countries have slightly different yet comparable definitions of formality. In Burkina Faso, an establishment is considered formal if it has registration number (with mobile trade and mobile credit, tax identification number) and uses SYSCOA as an accounting standard. In Cameroon, formal establishments are the ones that prepare a Statistical and Fiscal Declaration (DSF) or those that do not prepare DSF but which keep an operating account and a partial account of balance sheets. In Ghana, formal establishments are defined as those that are registered with the Registrar General's Department (RGD) and keep formal accounts. In Rwanda, an establishment is considered to operate in the formal sector if it is registered at Rwanda Revenue Authority (RRA) and maintains regular operational accounts.

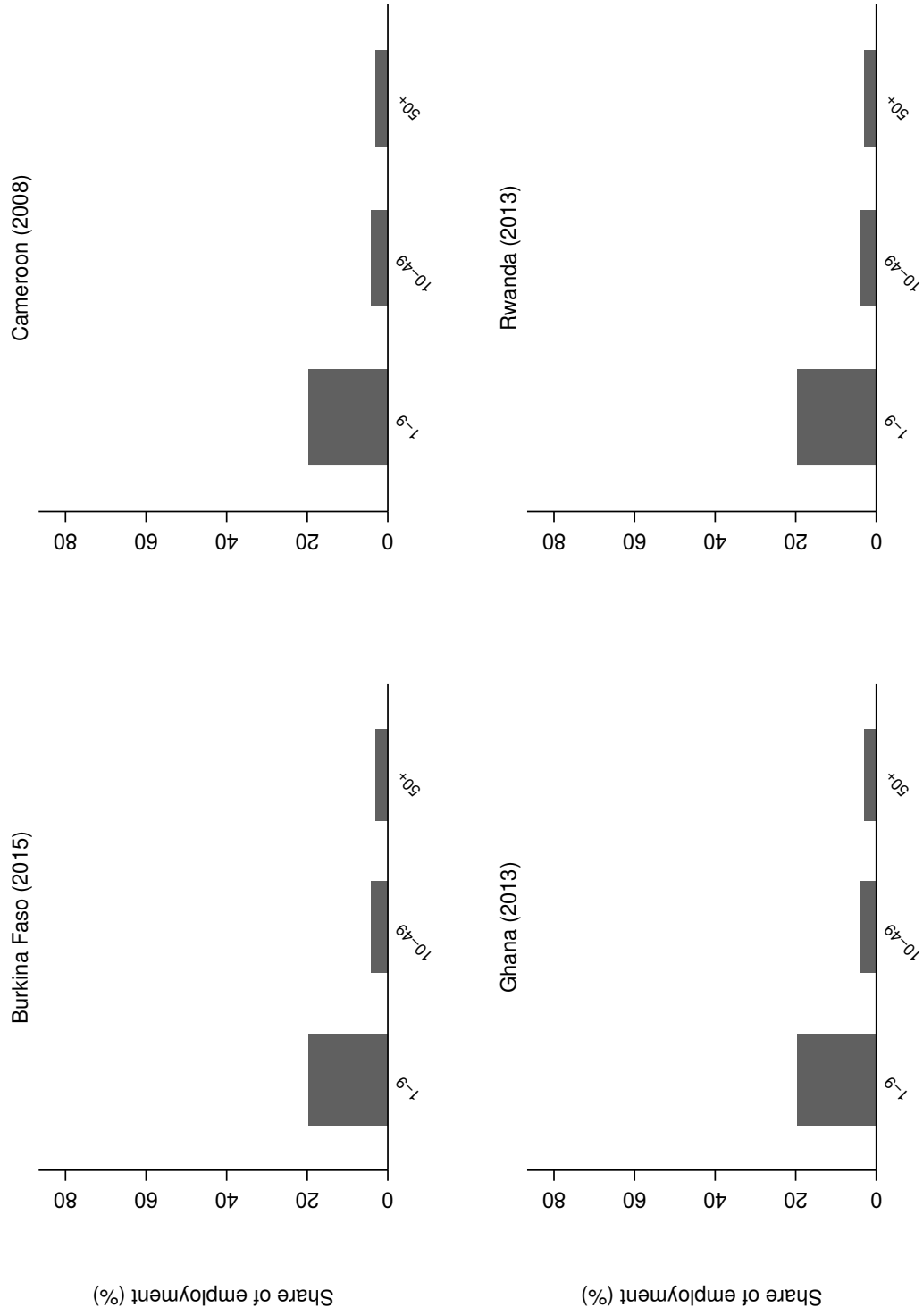
Figure A.8: Formal and informal establishment distribution (broad size classification): Manufacturing



*Source:* Establishment censuses obtained from the statistical agencies of the select countries; see section 3. *Note:* The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment data and state-owned are excluded. The statistical offices of the sample countries have slightly different yet comparable definitions of formality. In Burkina Faso, an establishment is considered formal if it has registration number (with mobile trade and mobile credit, tax identification number) and uses SYSCOA as an accounting standard. In Cameroon, formal establishments are the ones that prepare a Statistical and Fiscal Declaration (DSF) or those that do not prepare DSF but which keep an operating account and a partial account of balance sheets. In Ghana, formal establishments are defined as those that are registered with the Registrar General's Department (RGD) and keep formal accounts. In Rwanda, an establishment is considered to operate in the formal sector if it is registered at Rwanda Revenue Authority (RRA) and maintains regular operational accounts.

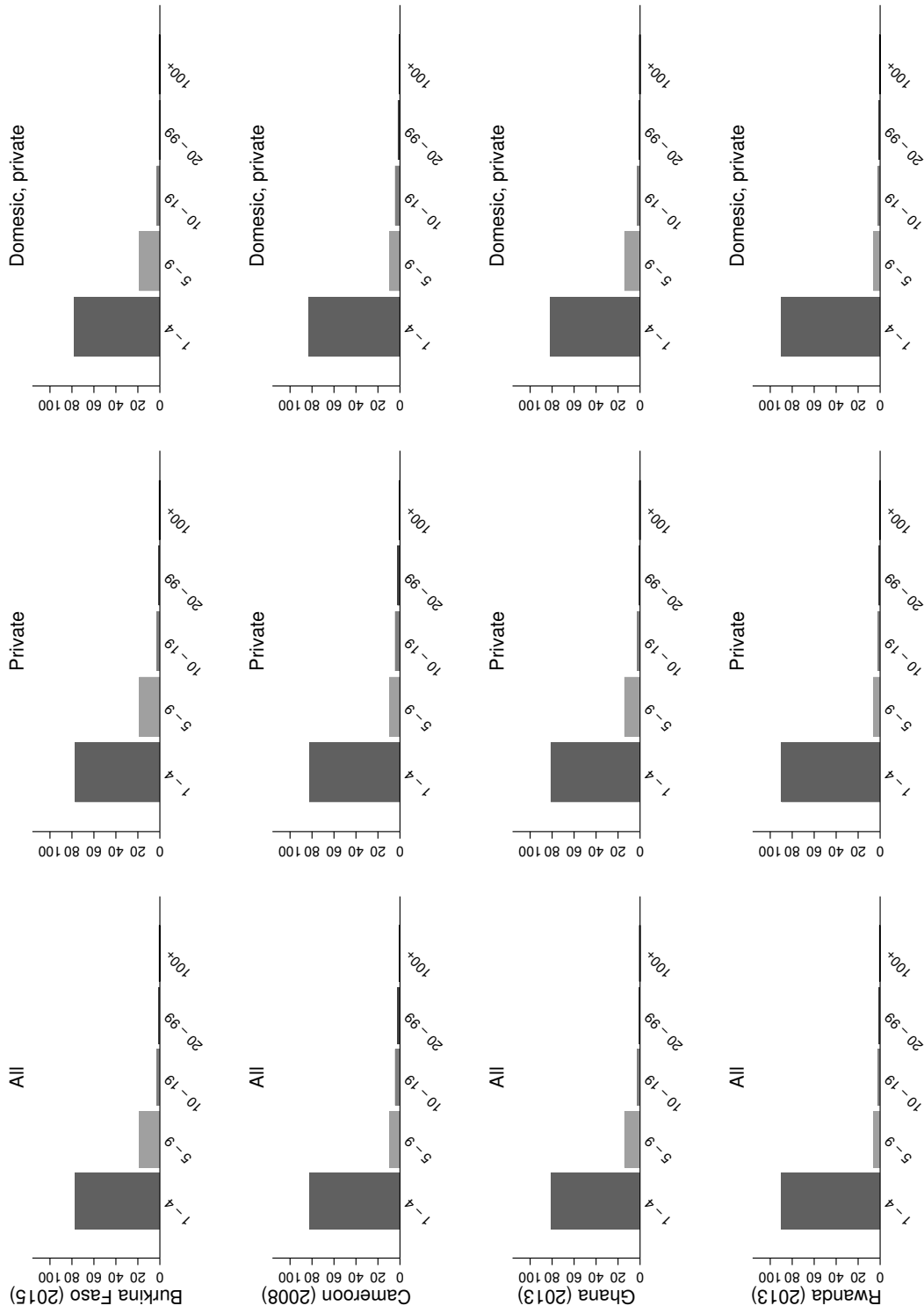


Figure A.9: Employment distribution among entrants (broad size classification): Manufacturing



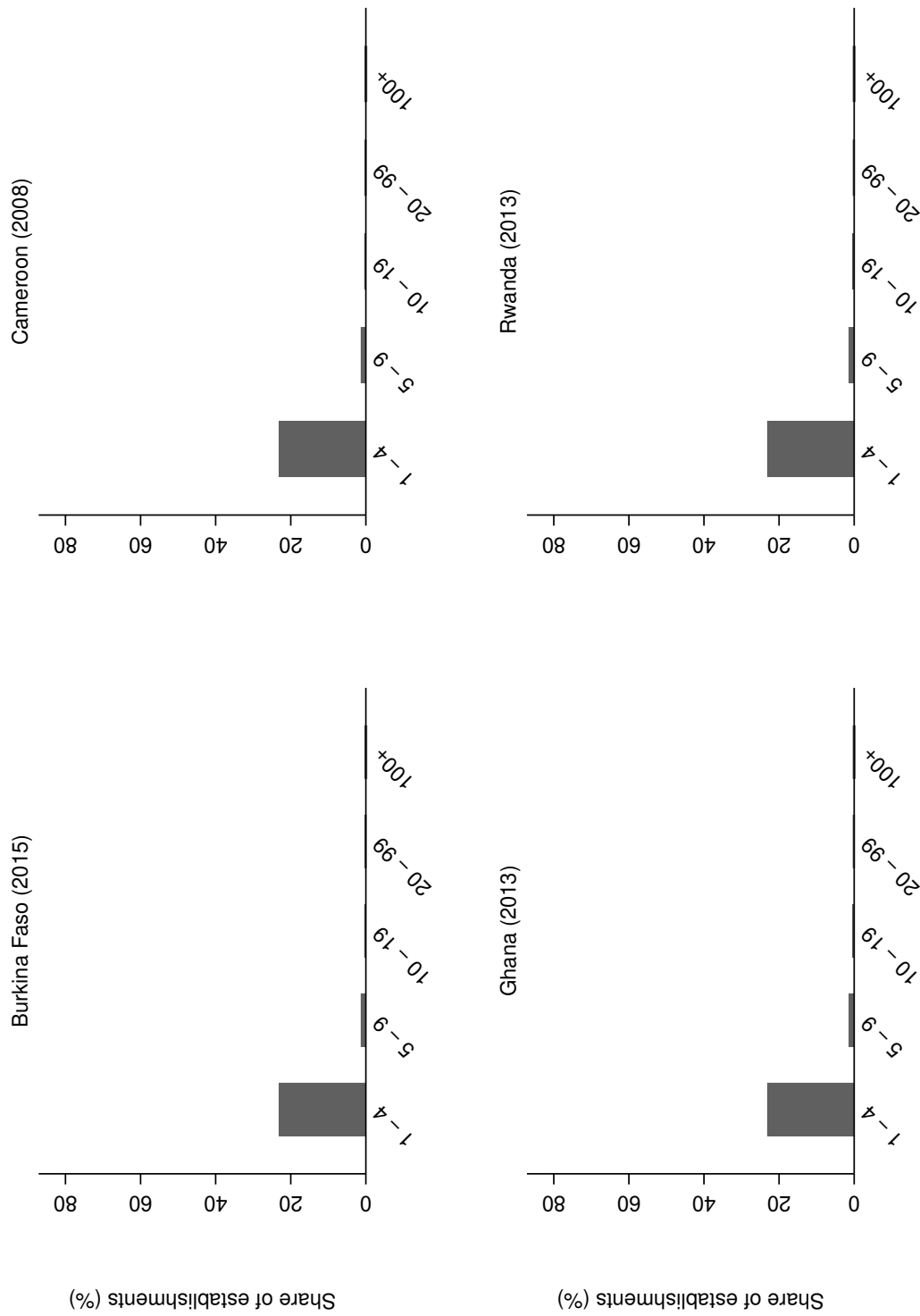
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. Note: The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

Figure A.10: Establishment distribution by state and foreign ownership: Manufacturing



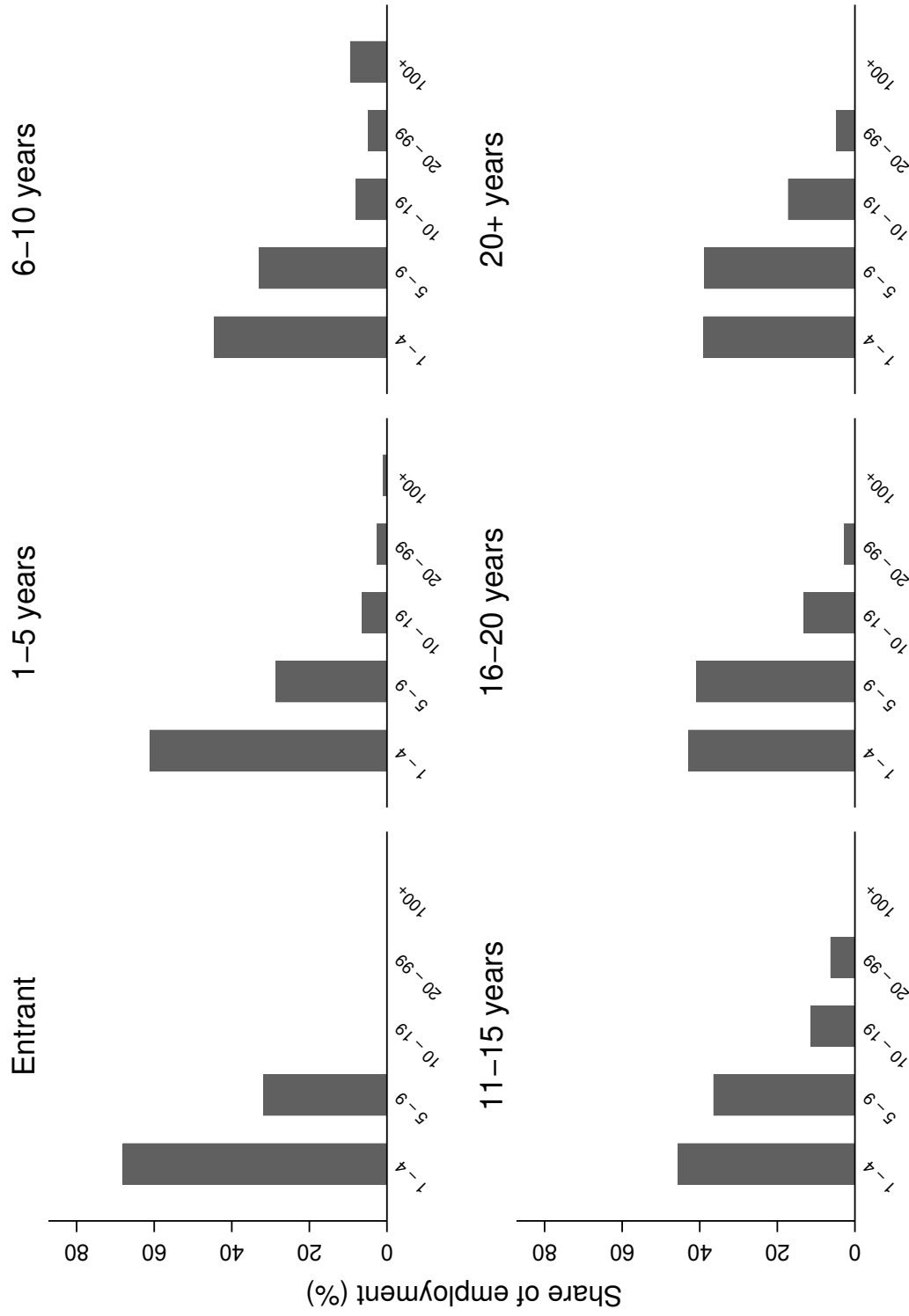
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. Note: The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment data are excluded.

Figure A.11: size difference by age group manufacturing



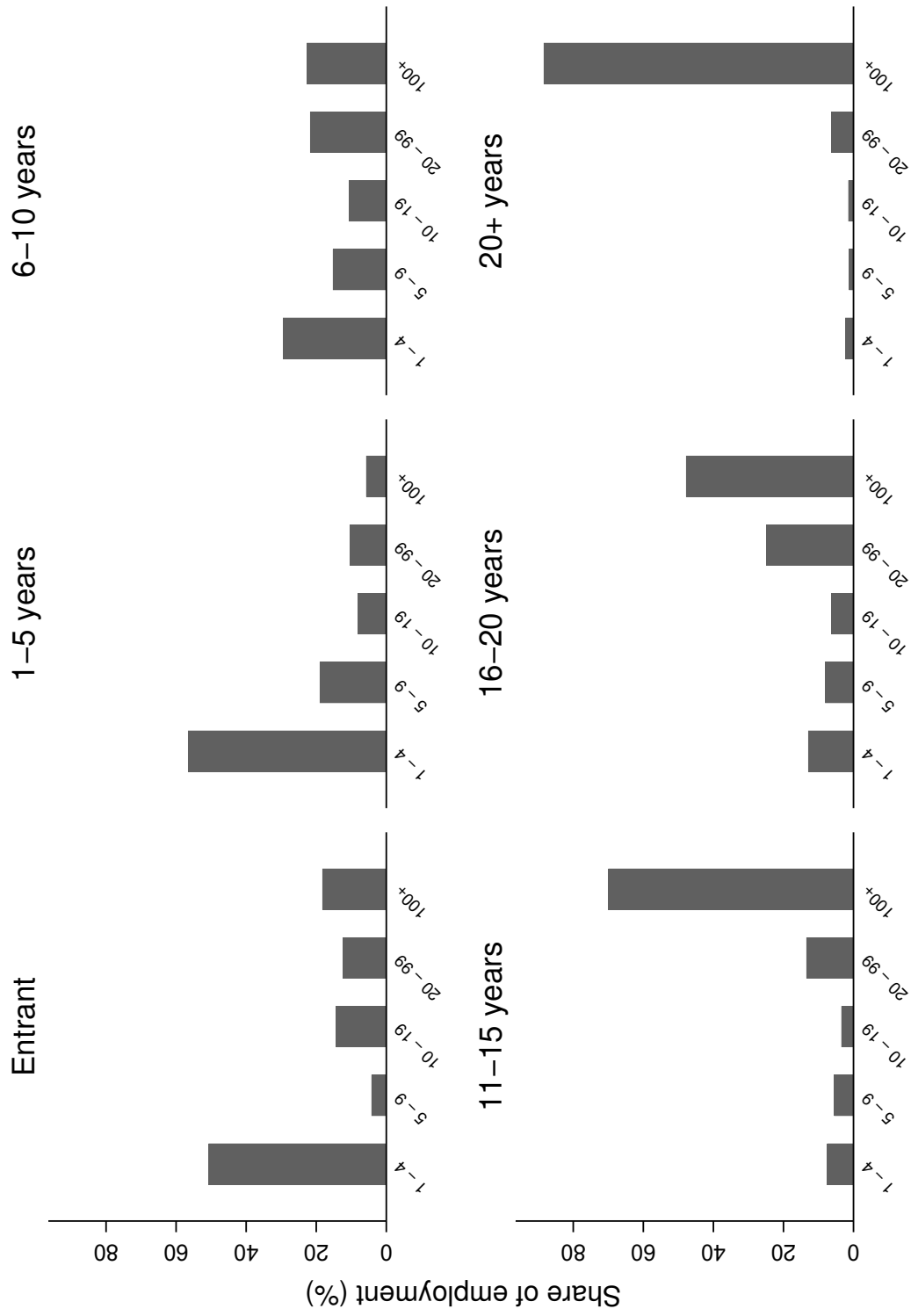
Source: Establishment censuses obtained from the statistical agencies of the select countries; see section 3. Note: The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

Figure A.12: Formal and informal establishment distribution by age cohort in manufacturing: Burkina Faso (2015)



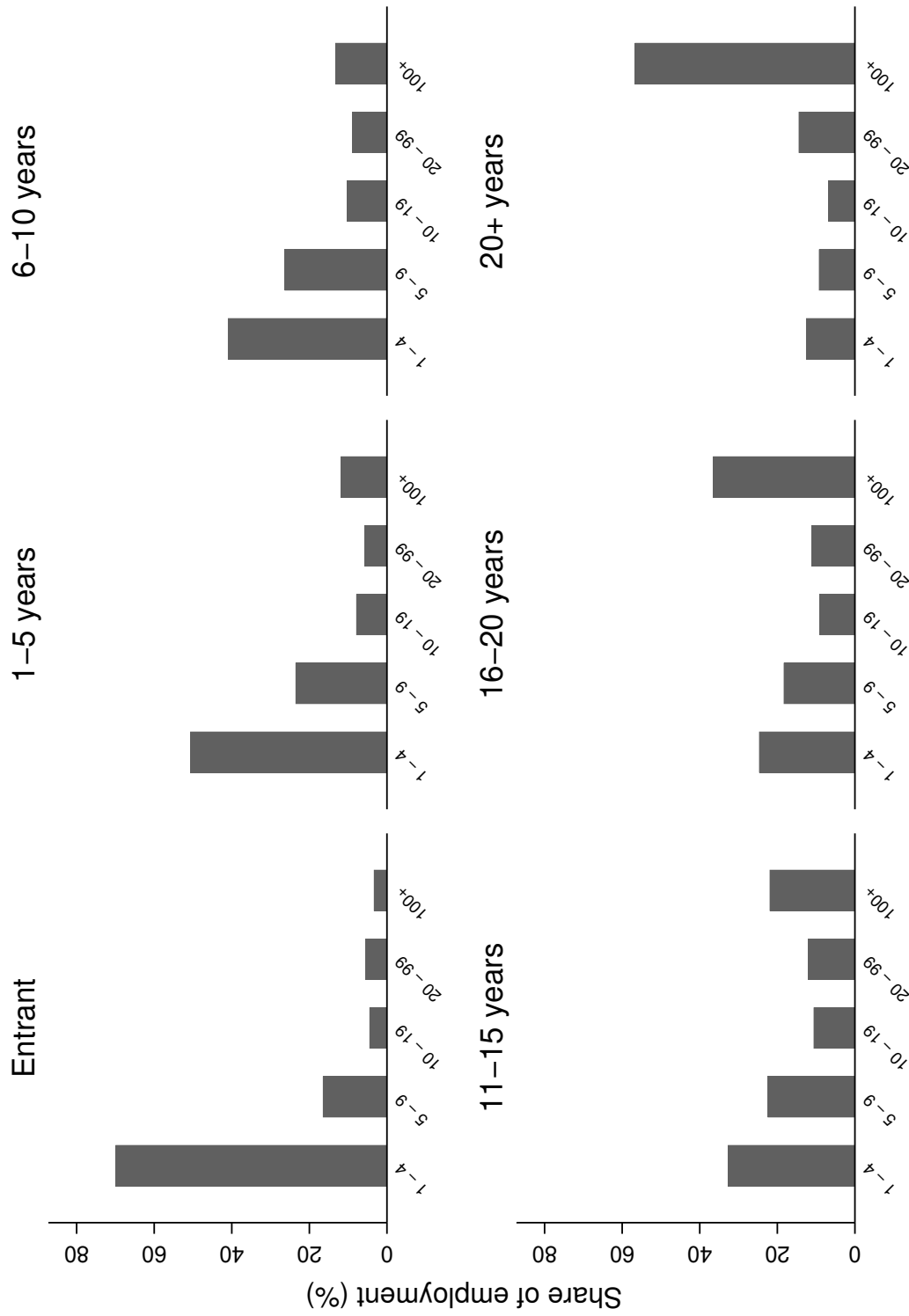
Source: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3. Note: The reference is the total employment for each age cohort and formality status. The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

Figure A.13: Formal and informal establishment distribution by age cohort in manufacturing: Cameroon (2008)



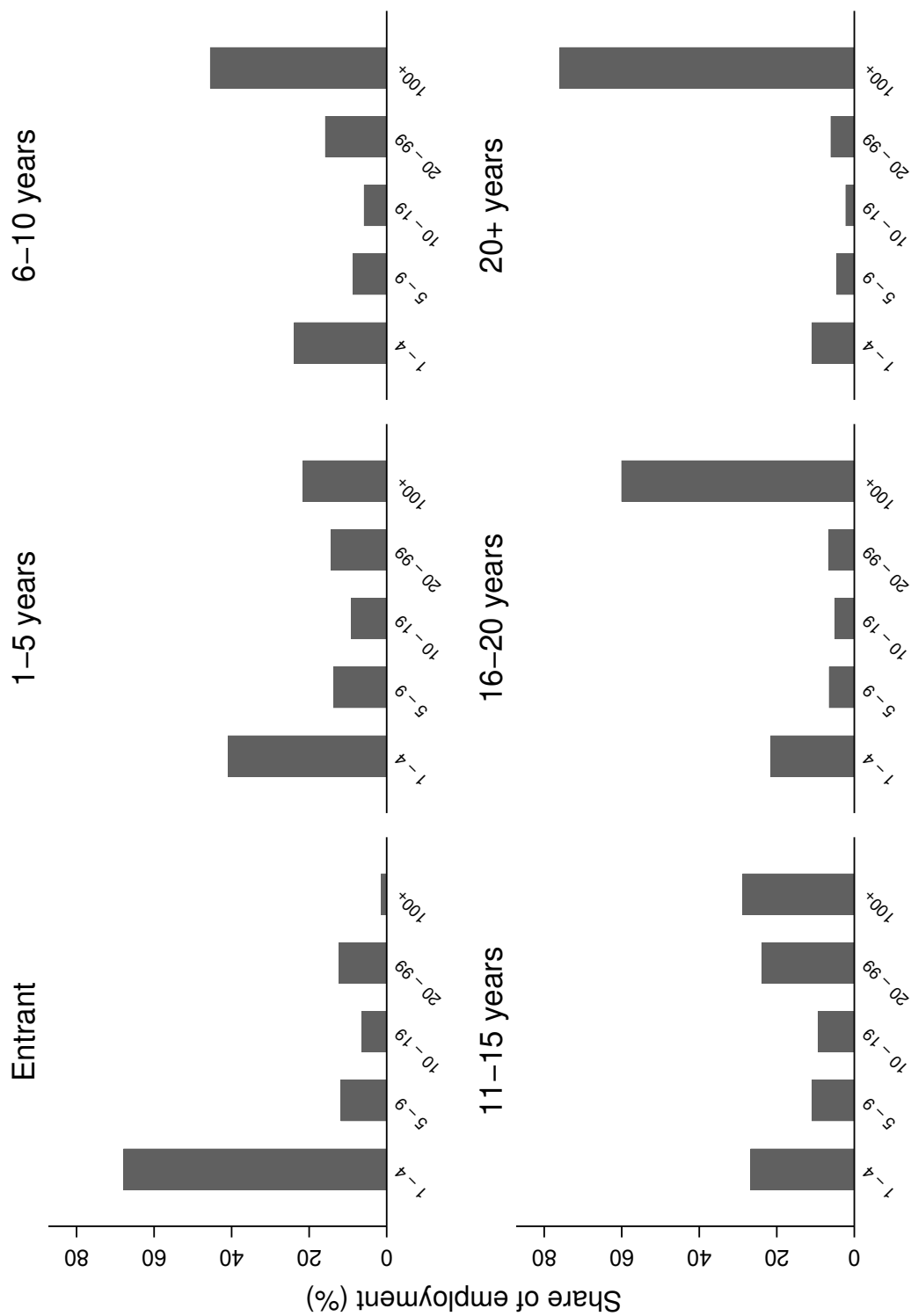
Source: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3. Note: The reference is the total employment for each age cohort and formality status. The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

Figure A.14: Formal and informal establishment distribution by age cohort in manufacturing: Ghana (2013)



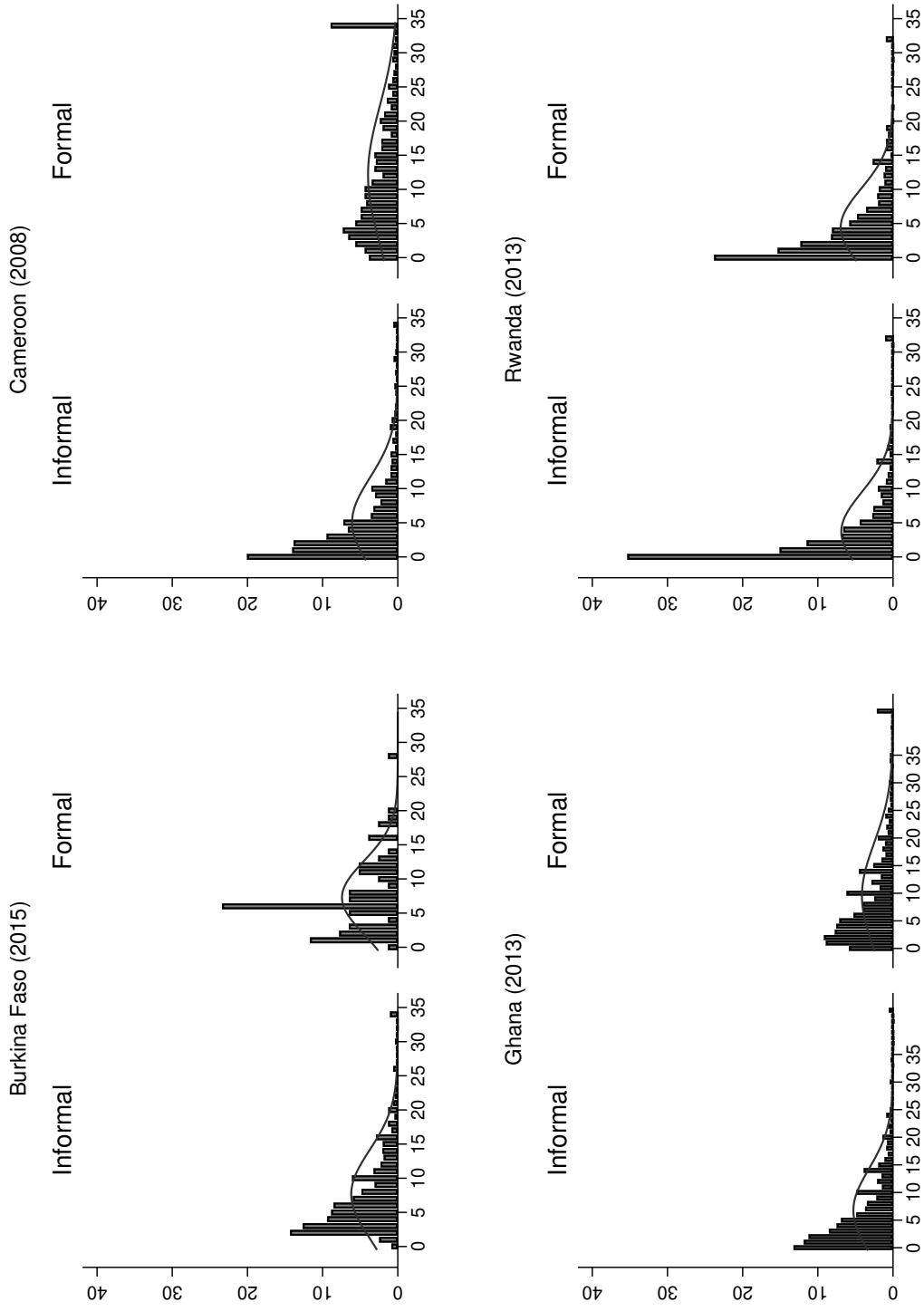
Source: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3. Note: The reference is the total employment for each age cohort and formality status. The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

Figure A.15: Formal and informal establishment distribution by age cohort in manufacturing: Rwanda (2013)



Source: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3. Note: The reference is the total employment for each age cohort and formality status. The figure is constructed based on data for establishments in the manufacturing sector. Establishments with missing employment or age data and state-owned are excluded.

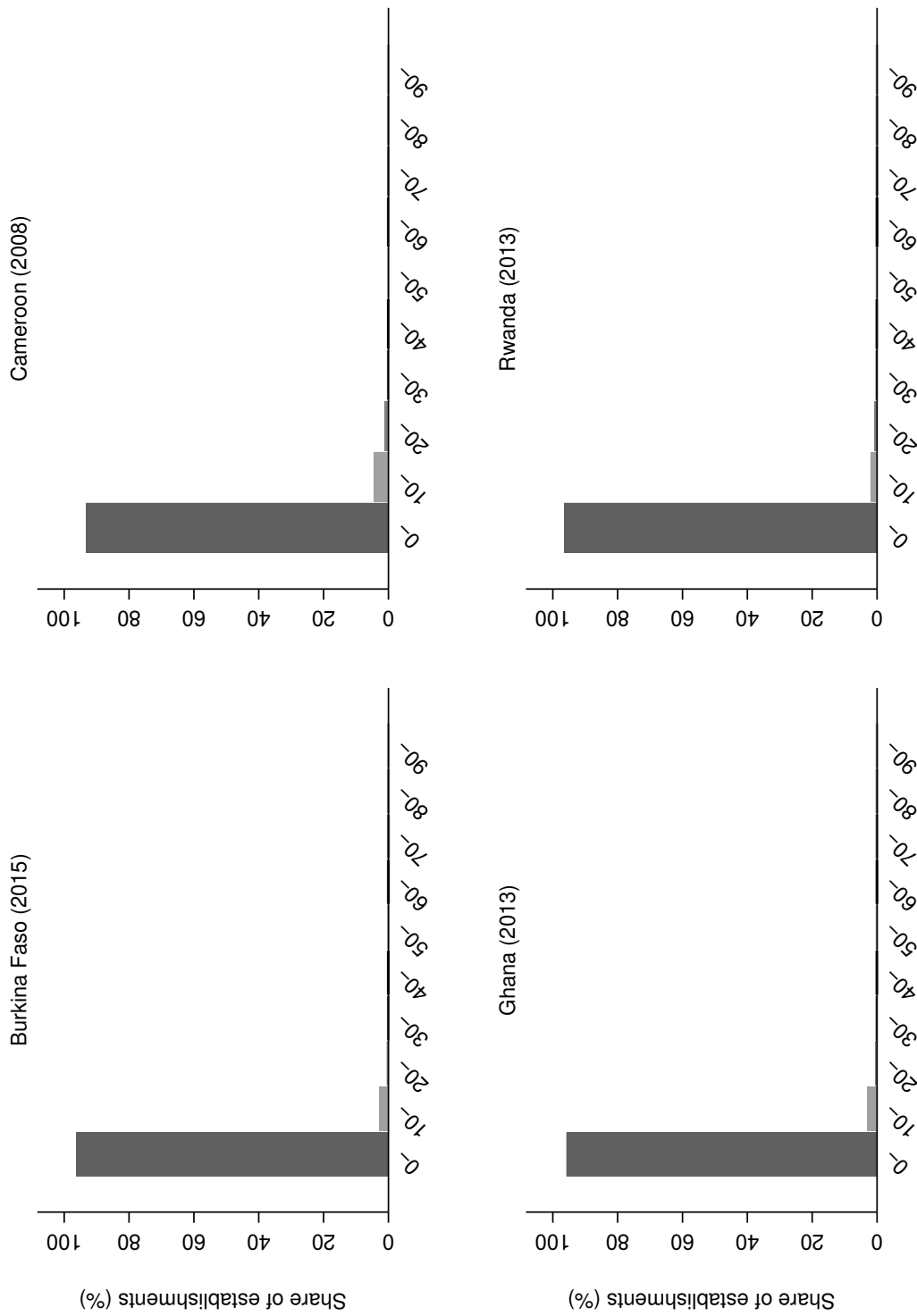
Figure A.16: Formality, age and establishment distribution in manufacturing



Sources: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3.

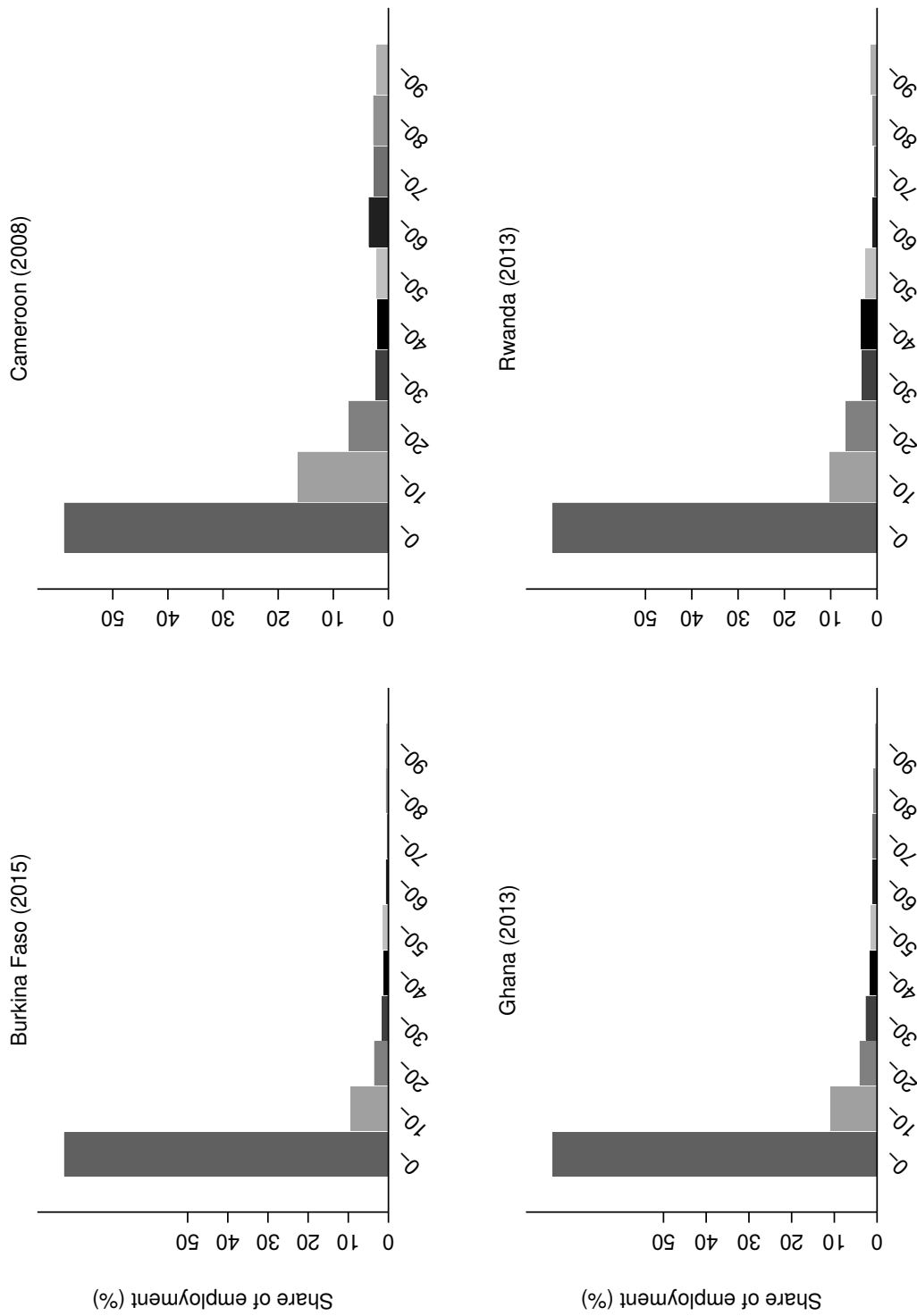


Figure A.17: Establishment distribution in manufacturing (bins of equal width)



Sources: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3.

Figure A.18: Employment distribution in manufacturing (bins of equal width)



Sources: Establishment censuses obtained from the statistical agencies of the selected countries; see section 3.