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Firms Far Up!

Productivity, Agglomeration and High-Growth Firms in Ethiopia

Arti Grover

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Abstract

High-growth firms have been widely studied in advanced countries, but little is known about such stellar performers in Africa. Using establishment-level data from Ethiopia, this paper finds that the incidence of high-growth firms stands at an average of 7 percent, a figure comparable to that of advanced countries. High-growth episodes are short-lived, and the likelihood of survival or a subsequent episode is not any higher for high-growth firms. It is difficult for firms to sustain high growth, and the likelihood of a repeated episode is low. There is only a 6.5 percent chance that a manufacturing plant in Ethiopia will repeat a high-growth event in the subsequent three-year period. This likelihood is not greater than that of plants that did not experience high growth in the previous period. The paper explores the drivers of high growth and finds a tight link between exemplary performance and initial plant productivity, which is robust to many controls, including plant location. Plants located in Ethiopia's capital city or agglomerations have a higher probability of high growth. And high growth in plant employment is found to be self-reinforcing, that is, past high-growth experience is positively and significantly associated with subsequent growth in firm productivity.

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I. Introduction

What makes high-growth firms (HGFs) attractive to policy makers? Can research aid public policy by shedding light on the characteristics of firms that become high-growth? While these questions have been explored in the context of advanced countries, Africa has received relatively less attention.[1] For example, studies suggest that in the United Kingdom and Sweden, HGFs comprised 6 percent of the firms and accounted for nearly 50 percent of all jobs during 2002-2008 (NESTA, 2009, Daunfeldt et al., 2015a). HGFs are the powerhouse of employment and output growth which make them an interesting subject for academics and an attractive target for policy makers.[2] This paper fills a critical gap in our understanding of HGFs in Africa by presenting evidence on the incidence and persistence of HGFs in Ethiopia.

It is imperative to understand the fundamental characteristics of firms that experience high-growth spurts, given that policy makers in both developed and developing countries are increasingly attempting to identify and support these firms. Bigsten and Gebreeyesus (2007) is one study that links firm growth to its size, however, their work focuses on the entire growth distribution.[3] Given that a median firm does not grow, there is little merit to exploring the determinants of growth rates for an "average firm" because the little variation in growth rates could largely be explained by the idiosyncratic component.[4] By studying growth of plants at the right tail of the distribution, this paper attempts to identify the correlates of exemplary performance. Given the growing recognition of the importance of productivity in affecting long term growth, a key contribution of this study is to establish a tight link of high-growth experience with initial plant productivity.[5]

Ethiopian manufacturing makes an interesting laboratory for studying HGFs because of the phenomenal services-driven double-digit growth that the country experienced in the last decade or so. While Ethiopia's real GDP grew at 10.9 percent per annum over 2004-14, the share of manufacturing stagnated at 4 percent of GDP (Moller, 2014).[6] Studying HGFs in Ethiopian manufacturing is thus likely to be informative on the possible challenges in boosting the growth of this sector in an environment that has rather been centrally planned, thereby undermining the performance of private firms. Evaluating the correlates of HGFs that relate not only to firm capabilities but also to external factors relating to spatial location and industry concentration offers interesting insights for improving the potential of private sector driven growth.

This paper makes the following key contributions: *First*, it presents evidence on the incidence and persistence of HGFs in the context of a low-income country in Africa. About 7 percent of total establishments during 1999-2009 experienced high-growth, per the OECD definition, peaking at 15 percent

[1] Diao et al. (2016) is perhaps one of the few studies that isolate the performance of informal high performing firms in an African country. Using Tanzania's nationally representative survey of micro, small and medium sized enterprises the authors find that most of the labor productivity growth in the country is attributed to a relatively small subset of firms. Page and Söderbom (2015) use these detailed longitudinal data from Ethiopia to analyze firm entry and exit and patterns of net employment growth across firms of differing size. They find that exit rates were significantly higher for small, young firms. Half of the firms starting with 10 employees (or fewer) were gone after 3 years; and after 8 years two thirds of the firms starting small had disappeared. However smaller firms that survived often grew.

[2] Some studies go a step further to provide guidance on the forms of targeting and policy support for such firms (e.g. Shane, 2009; Mason and Brown, 2013).

[3] Their system GMM estimates suggest that small firms grow faster than larger firms, while young firms grow faster than older firms. Labor productivity is positively related to growth, that is, more productive forms grow faster and location within Addis and surrounding areas is also found to be a growth advantage.

[4] See Stanley et al.,(1996), Bottazzi and Secchi, (2003)

[5] Although research on enterprise dynamics in Ethiopia covers a range of issues relating to productivity, resource misallocation, learning by exporting and so on, little is known on the correlates of firm growth. See Bigsten et al (2009); Gebresilasse (2016); Bigsten and Gebreeyesus (2009)

[6] Total value added in the manufacturing sector grew by 4.4 times during the study period 1996-2009, total employment grew by 3.4 times (Gebresilasse, 2016).

in 2005-2006 but declining to 5 percent in 2009. Although high-growth experience marginally improves survival probability, it does not improve the likelihood of a repeat episode.[7]

Second, it provides a sharp contrast to the popular perception that HGFs are high-tech start-ups which have been or can be used as filters for policy action. The evidence presented in this research shows that HGFs are neither young nor do they emerge from high-tech sectors. The share of young HGFs is close to 6 percent of all HGFs, while they disproportionally originate in the food and beverages industry, a relatively low-tech sector. The fact that the probability of high growth is negatively associated with firm size does not lend support for policies supporting SMEs but points to the broader constraints on the growth of larger firms.

Third, this paper explores the association of high growth experience with productivity, a topic that remains nascent even in the context of advanced countries.[8] Productivity seems to be weakly associated with growth for a variety of reasons, with growth driven not only by high efficiency but sometimes also demand shocks, uncompetitive markets, or political connections.[9] Studying the link between productivity and high growth helps understand the implications for productivity-limiting distortions which can potentially misallocate resources in a way that allows less efficient firms to achieve high growth. The results presented on Ethiopia are reassuring in that initial plant productivity has a positive and significant association with the probability of achieving high-growth.

Fourth, it contributes to understanding the importance of economic geography for firm dynamics. Internal core-competency is known to be accentuated by external geographical factors, for example, when cities offer an opportunity for entrepreneurship due to agglomeration economies. The question, however, is if this could also be true for Africa where cities are known to have a fragmented urban form (Lall, Henderson and Venables, 2017). Exploring this link in the context of Ethiopia suggests that plants located in the top agglomeration centers and those within a 50-kilometer band have a greater probability of achieving high-growth vis-à-vis those located farther away. Although industry-level concentration has a positive association with the probability of experiencing high-growth, nonetheless, plants in more concentrated industries located in top cities are at a relative disadvantage vis-à-vis those in the same location but in less-concentrated industries. Thus, it appears that plants agglomerate and benefit from the connectivity associated with location rather than externalities and knowledge spillovers from clustering (*localization economies*) such that industrial concentration, in fact, lowers the probability of high growth in agglomerations. It appears that plants within the same industry are competing with each other for scarce resources, which could possibly be limiting their growth potential.

Finally, given that Ethiopia went through major industrial reforms in 2002-03, this paper explores if industrial policy can be associated with changes in the value of locational fundamentals important for business growth. The results suggest that policy reforms that intended to affect certain industries also elevated the growth probabilities among plants in certain geographical locations. These results are suggestive of the fact that while the geographical characteristics are time invariant, their values can change over time due to changes in policies. Trade policy reforms in Ethiopia appeared to have enhanced the values of locational fundamentals important for high-growth.

The paper beyond this point is organized as follows: Section II reviews related literature on HGFs, in general, and on studies focusing on enterprise dynamics in Ethiopia. Section III describes the data used in

[7] Several studies suggest that HGFs are unlikely to repeat their initial high growth rates in subsequent periods (Hölzl, 2013; Daunfeldt and Halvarsson, 2015; Grover, Medvedev and Olafsen, 2019).
[8] A related work is done by Du and Temouri (2015) who explore this link in the United Kingdom.
[9] See Cusolito and Maloney (2019), for latest advances in productivity research.

this paper, while Section IV presents the descriptive findings on the incidence and persistence of HGFs. Section V introduces the empirical methodology, and Section VI follows up with the results. Finally, Section VII concludes with recommendations on policies and follow-up research.

II. Related Literature

High-growth firms (HGFs) are the dynamic core of an economy, set apart by their disproportionate ability to generate output and create jobs. Grover, Medvedev and Olafsen (2019) identify several empirical regularities on HGFs that are robust across many countries and studies.[10] For the 11 developing countries studied in this research, the incidence of HGFs does not appear to be systematically related to per capita income, rates of sectoral growth, or market concentration. Another important stylized fact is that HGFs are young but not necessarily small. Age and size are among the most investigated characteristics of HGFs, however, they appear to be less robust to methods and definitions. Even among OECD countries, there is consensus that HGFs tend to be young, but are not necessarily small (Coad et al., 2014). When measured in relative growth, an average HGF is smaller than other firms, but any systematic relationship disappears when controlling for firm age (Haltiwanger et al., 2013). When measured based on an employment growth quantifier such as the Birch index, HGFs in fact appear to be large and relatively old firms (Acs et al., 2008).[11] On sectoral origin, HGFs are found in all types of sectors. It is now well known that a typical HGF is not a high-technology firm, even though growth is often understood as the outcome of superior innovative capabilities. If anything, HGF prevalence is higher in knowledge-intensive service industries (e.g. Daunfeldt et al., 2016).

Firm Productivity and Growth Entrepreneurship

For lack of evidence, the relationship between firm productivity and HGFs is not well established. This relationship could be positive, negative or stagnant depending on firm capabilities. A positive relationship between productivity and HGFs could be expected if firm level TFP embeds a host of factors measuring firm competencies, such as, the quality of managerial capacity and workers' ability, use of information technology, extent of R&D and product innovation.[12] These are also the factors that are associated with high-growth. For instance, innovation is associated with exemplary performance among firms in countries such as the United Kingdom, Scotland and the United States (Mason et al., 2009; Mason and Brown, 2010; Jorgenson et al. 2005; Oliner et al. 2008). In Scotland, HGFs are associated with high-quality output and employees' knowledge of the market (Mason and Brown 2010). Using unconditional labor productivity averages, Acs et al. (2008) find that relative to the rest of the firms, high-impact firms contribute more to aggregate productivity in the United States, while Bravo-Biosca (2011) argue that HGFs and fast-shrinking firms are associated with higher aggregate productivity growth in the United Kingdom. More recently, Decker et al. (2016) link the decrease in the skewness of the growth rate distribution with the secular decline in U.S. productivity.

The relationship between firm productivity and high-growth could also be stagnant or negative. For example, periods of rapid expansion in firm productivity are characterized by organizational changes and if a firm does not have the managerial abilities to cope with this change, then it may have to contract its

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[10] Finally, the shift of paradigm from focusing on overall firm-level growth to HGF is a consequence of the fact that most firms do not grow. Although this realization has spurred systematic studies on high-growth firms, predicting high-growth spells is difficult (Coad et al., 2014). This casts doubt on the value of HGF as a vehicle for public policy, all the more for high growth typically shows very little persistence (e.g. Hölzl, 2013).

[11] The fact that different growth indicators select different sets of HGFs confounds policy formulation (e.g. Daunfeldt et al., 2014).

[12] That human capital is crucial to productivity is observed in many studies (e.g. Fox and Smeets, 2011). In addition, innovation differences also explain the gap between the European and US productivity experience over the last few decades (Van Ark et al., 2008).

size. This is precisely the challenge described as the "Penrose effect" which refers to managerial capabilities and the absorption of technology as the key binding constraint limiting firm growth (Penrose, 1959). Such a short-term trade-off between high growth in employment and productivity has been observed in Sweden over the period 1997-2005 (Daunfeldt et al., 2010). A report by the UK Department for Business, Enterprise and Regulatory Reform (BERR) (2008) also confirms that high-growth may not necessarily imply high productivity.

This relationship between productivity and high growth could be further nuanced based on whether productivity is measured in growth or in levels. Using data from 2001-2010, Du et al. (2013) find that firms in the United Kingdom are more likely to achieve high-growth when they exhibit higher TFP growth. By comparison, when productivity is measured in levels, the relationship with HGF incidence is negative. The rationale for this difference is that it is usually the larger firms that have higher productivity levels (Van Ark and Monnikhof, 1996) and hence their growth is limited by the large base. It could also be the case that a threshold level of productivity is needed before firms begin to strategize their expansion capacity, which may imply lower growth in the short term.[13]

Additionally, the metrics used for assessing high-growth could also be crucial. One could argue that growth in employment is less sensitive to firm productivity but depends more on industry characteristics. Thus, revenue may be a more natural metric for computing the HGF status (Du and Temouri, 2015). However, if it is the more productive firm that expands into international markets (Melitz, 2003) or engages in foreign investments (Helpman et al., 2003), then productivity is likely correlated with higher employment growth. From the perspective of this paper, both employment and revenue metrics are critical, although, given that the focus of developing country policy makers on jobs, HGFs computed using employment metrics is more relevant.

Agglomeration and Growth Entrepreneurship

There is a paucity of research linking clustering to high growth even in the context of advanced economies. Clustering matters because firms located in cities may benefit from thicker markets for capital, labor and material inputs (Fujita et al., 1999), knowledge spillovers and reduced transaction costs (Audretsch and Feldman, 1996). Clustering of economic activity can also yield dynamic benefits, such as increased innovation (Matsuyama, 1991) and competition, which may also reduce the scope for opportunistic behavior (Collier and Venables, 2008). Studies suggest that firms located in geographic regions with industry clustering exhibit higher rates of growth due to enhanced demand for their products and a higher ability to harness reputational advantage (Gilbert et al., 2006, 2008). Clustering can generate high firm growth by providing greater access to both customers and prospective suppliers (Lechner and Dowling, 2003).[14]

Manufacturing and Industrial Policy Reforms in Ethiopia

Ethiopian manufacturing has been the focal point of several studies that document the performance, productivity as well as the challenges for the sector. Ethiopian manufacturing grew at an average rate of 10.5 percent over 1996–2009, which coincided with employment growth of 4.1 percent. During this period, manufacturing was dominated by smaller firms, with a highly-skewed size distribution. Overall, less than 5 percent of manufacturing firms exported, with the total value of their exports being less than 8 percent of

[13] This would be true for young firms relative to incumbents (Du et al., 2013).

[14] On specific works pertaining to geography and HGFs, Anyadike-Danes, Bonner, and Hart (2013) focus on the type of location, but not specifically on clustering. Likewise, the finding of a positive correlation of high-growth with human capital, industrial specialization and services agglomeration in Bogas and Barbosa (2015) speaks to locational traits rather than the importance of firm clustering.

total sales. The share of manufacturing in GDP was 5.5 percent in 1996. To address the low-level of export diversification in Ethiopia, a comprehensive industrial policy emphasizing active support for the export-oriented and labor-intensive sectors was formulated in 2002-03.[15] Certain sectors in Ethiopia were protected by the import-substitution policy instituted in 1996. These sectors include, agriculture, agro-industry, manufacturing activities in textiles, chemicals, metal and electrical electricity generation, education and health (Gebresilasse, 2016). Following the implementation of these policies, Ethiopia experienced double digit economic growth. While per capita income grew rapidly in Ethiopia between 1995 and 2008, the share of manufacturing in total value-added remained constant (about 5 percent), implying that manufacturing kept pace with the overall economic activity.

The second industrial policy, which supplanted the pre-existing policy in 2003, was an activist trade policy that targeted certain sectors for export promotion.[16] Policies that "picked winners" for targeting support have had significant negative effects on physical and revenue productivity among Ethiopian manufacturing plants (Gebresilasse, 2016). This is because priority sector support policies exacerbated the extent of the "within-industry" misallocation. By comparison, the amendment of the priority sector policy, that is, the transition from focus on import substitution to export promotion, contributed to the observed improvements in allocative efficiency. Liberalization of tariff regimes, that allowed competition in certain industries, had large positive effects on total factor productivity (TFP) suggesting that excessive tariff levels were particularly distortionary in Ethiopia. These productivity gains were primarily driven by reductions in tariffs on imported intermediate goods rather than tariffs on final goods (Bigsten et. al., 2016).

Correlates of Firm Growth in Ethiopia

Research on Ethiopia has focused on both internal and external firm-level drivers of growth. Among these, firm size is critical. Evidence from Ethiopia does not support the view that growth is a stochastic process as implied by Gibrat's law. Studies using formal manufacturing data, in fact suggest a negative association between firm size and growth (Bigsten and Soderbom, 2006).[17] By comparison, using the World Banks's Enterprise Survey data on nine African countries (including Ethiopia) Van Biesebroeck (2005) finds that conditional on other covariates, large firms grow the fastest.[18] Using data from the Ethiopian Rural Investment Climate Survey (RICS) and the Ethiopian Enterprise Survey (EES) in 2007, Rijkers et. al. (2010) support the view that size is positively correlated with success. Larger firms have higher (i) likelihood of survival (ii) productivity (iii) wages for workers, and (iv) probability of breaking into export markets. The latter findings contradict the theory of a negative relationship between firm size and subsequent growth, as well as the view that small firms have suboptimal initial size and therefore, grow quickly to reach efficient size. Nonetheless, large firms could possibly grow more because of their ability

[15] The industrial policy was more concretized into action by various sub-sector strategies and by the successive development plans such as Sustainable Development and Poverty Reduction Program (SDPRP) 2002/03-2004/05, the Plan of Action for Sustainable Development and Eradication of Poverty (PASDEP) 2005/06-2009/10, and the Growth and Transformation Plan (GTP) 2010/11-2014/15. The export promotion strategy was targeted at high value agricultural exports (e.g. horticulture products and meat) and labor-intensive manufacturing products such as clothing, textile, leather and leather products.

[16] Gebreeyesus (2013) provides an extensive review of the Ethiopian reform process in the 1990s as well as industrial policy experiments in the 2000s.

[17] Bigsten & Gebreeyesus (2007) find similar results using the same data source, while Tarfasa et. al. (2016), find a negative correlation between start-up size and growth of the MSEs.

[18] These countries include: Kenya, Ghana, Zambia, Zimbabwe, Côte d'Ivoire, Ethiopia, Burundi, Tanzania, and Cameroon.

to engage in innovation (Gebreeyesus, 2009) and exports (Rijkers et. al., 2010). [19] They may also benefit from stronger bank ties and hence have better access to finance (Shiferaw, 2016).[20]

Firm age is also critical for growth, with young formal Ethiopian firms growing faster than their older counterparts (Bigsten and Soderbom, 2007). Innovation also matters. A cross-country study using the World Bank's Enterprise Survey data shows that product innovation matters for growth once factors such as firm's ownership of transport and internet connectivity through their own website are controlled for (Goedhuys and Sleuwaegen, 2010).

External industry environment and geographical factors also affects firm growth. Among industry characteristics, Ethiopian firms operating in industries with high competition from imports observed stunted job growth (Shiferaw, 2016). Studies focusing on spatial characteristics in Ethiopia suggest that enterprise clustering, when measured by the total count of firms producing the same product, has a positive effect on physical productivity (Bigsten et al., 2012). However, this relationship is not significant when agglomeration is among firms producing different products or sectors. In the case of Ethiopia, it seems that concentration of activity is a result of lack of accessibility to markets in places beyond a few cities. For example, although towns with initially large number of firms continue to attract more firms, nonetheless, accessibility to better roads contributes to a convergence in the overall distribution of manufacturing firms and a decline in the degree of geographic concentration (Shiferaw et al., 2015). This result suggests that firms do not foresee remarkable benefits from agglomeration if they have access to markets.[21,22]

The quality of infrastructure and transport costs are important factors explaining the elevated performance of urban manufacturing enterprises in Ethiopia vis-à-vis their rural counterparts (Rijkers et. al., 2010).[23] Exploiting geographical variations in greenfield foreign direct investment (FDI) in Ethiopian woredas (districts), Abebe et. al. (2018) find that the number of domestic plant openings increased significantly in the three-year window following the entry of a greenfield FDI plant in a district. Their study suggests that the benefits from knowledge spillovers outweigh the costs (competition effects) mainly due to labor flows from foreign to domestic plants. In addition, there could possibly be backward and forward linkages in the supply chain, and horizontal linkages that occur because of more casual interactions.

III. Data Description

The data used for this paper comes from the Large and Medium Manufacturing Industries Survey (LMMIS) conducted by the Ethiopian Central Statistical Agency (CSA) on a yearly basis since 1976. LMMIS is a

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[19] Bigsten and Gebreeyesus (2009) find evidence on both self-selection and learning-by-exporting, whereby more productive firms enter exports and over time exporters have higher productivity vis-à-vis non-exporters.

[20] Firms without initial bank ties exhibit significantly lower average investment rates and longer durations of investment inaction relative to firms with initial bank ties. For small enterprises in Ethiopia, access to credit is a binding constraint for their growth as they are 'too big' for microfinance institutions, but they are 'too small' for formal banks in terms of the size of loan, reflecting the 'missing middle financial intermediaries' that serve small enterprises.

[21] This is not contradictory to the findings of Bigsten et al. (2012) because agglomeration puts a competitive pressure on firm products' prices and hence could dissuade them from co-locating.

[22] Lall et al. (2017) suggest that the depressed level of agglomeration externalities in African cities reflects the underlying distortions in the functioning of key factor and product markets, and lack of crucial infrastructure, housing, and commercial structures. Because a typical African city is crowded, costly and disconnected, firms remain scattered, thereby attesting to the failure of labor market pooling and other benefits associated with clustering. Even among clusters, knowledge diffusion remains limited.

[23] Location and the investment climate affect firm performance through their impact on efficiency of production and costs, and through their impact on the entrepreneur's operative decisions (e.g., involving input choices, technology adoption and enterprise size).

census of all manufacturing establishments with ten workers or more that use power-driven machinery.[24] Besides recording information on plant location, industry, legal form and employment, the LMMIS includes relatively detailed balance sheet accounts regarding assets and inputs use.

The data used in this paper are an unbalanced 13-year panel from 1996 to 2009, comprising 13,975 plant-year observations for 3,772 unique plants. This paper uses a definition of high-growth that considers growth over a three-year window, and hence requires that a plant be observed for at least three consecutive years. This limits the number of plant-year observations for this study to 5,962, equivalent to 1,218 unique plants. Of these, 57 establishments are dropped due to lack of information on capital assets or raw materials as TFP cannot be estimated for these plants.

Although the count of registered formal manufacturing plants grew rapidly from 623 in 1996 to 1,948 in 2009, plant activity has been less dynamic.[25] Average plant size fell from close to an average of 136 employees in 1996 to less than 70 employees in 2009, while the median plant size remains close to 20 employees throughout the sample period. These results imply that new plants entering the market are mostly small and hence may lack the necessary economies of scale needed to serve the global market. There is a lot of churning in Ethiopian manufacturing with gross entry rates recording an average 7.6 percent per year, while the exit rates among new plants are also high. Research suggests that 60 percent of manufacturing plants in Ethiopia exit the market within 3 years of entry (Gebreeyesus, 2008).[26]

Manufacturing in Ethiopia is concentrated in five main towns, with Addis Ababa hosting over 61 percent of plants in 1996, while the other four towns being Dire Dawa, Bahir Dar, Hawassa and Nazreth add another 10 percent to total plant count. By 2009, the importance of the capital city declined to less than 40 percent, while the share of top five locations dropped to 51 percent during the same period. Indeed, between 2000 and 2011, a number of cities have managed to expand their manufacturing base – in particular, Adwa, Sebeta, Debreziet, Awassa, and Mekele, witnessed an increase in the share of the total manufacturing plants from 12.2 percent in 2000 to 22.2 percent in 2011 (Mukim, 2016).

Defining High-Growth Firms

The literature on high growth firms considers various indicators and methods to identify HGFs. The OECD definition, for example, imposes a percentage cut-off on growth rate, typically on a three-year period. In practice, OECD defines HGFs as those firms that experience an annualized compound growth rate in employment by at least 20 percent over a three-year period. A criticism of this definition is that it is more likely to assign HGF status to smaller firms that start from a lower base. This shortcoming is addressed by the "Birch Index", which scales the relative growth rate by absolute change in employment to reflect the differences in initial size. In the context of Ethiopian data that includes plants with a threshold of 10 employees, using the OECD definition does not seem to be problematic. Nevertheless, the paper will also consider robustness checks with the Birch qualified HGFs.

In terms of the choice of indicators, employment is the chosen metric for two reasons. First, from a development perspective, factory employment is often a desirable economic outcome at the household level and is associated with income growth and development. Second, given the possibility of negative

[24] In practice, however, some plant-year observations have recorded fewer than ten workers. This could perhaps be because once an establishment crosses the ten-employee threshold and has been surveyed, it remains part of the census even if its size shrinks below this threshold. It should be noted that the year 2005 is peculiar because CSA sampled only some industries in this year.
[25] In 2001/02, about 97 percent of the manufacturing establishments were micro firms employing fewer than 10 people.
[26] Using data from six developing countries, Cusolito and Maloney (2019) document entrepreneurial dynamism through entry and exit rates, and again Ethiopia stands out in terms of high exit rates.

association of productivity and employment growth, using an employment-based definition ensures that this link is not overstated.

TFP Estimation

Several techniques tackle the simultaneity issue inherent in TFP estimations. These methods typically use readily observable data as proxies for productivity shocks, such as investment (Olley and Pakes, 1996) or intermediate inputs (Levinsohn and Petrin, 2003). The LMMIS database has rather poor information on investment but high-quality information on the use of intermediate inputs. Thus, the paper uses the Levinsohn and Petrin (LP) estimator to estimate plant-level TFP.[27] More recently, frontier literature on productivity measures emphasize the importance of estimating physical output based measures of TFP (referred as TFPQ), vis-à-vis the widely-used revenue based measure (referred as TFPR) (e.g. Foster et al., 2008). The criticism for using TFPR is that differences in revenue-based efficiency measures could reflect differences in price, elasticity and scale economies rather than efficiency or quality. One limitation of estimating TFPQ is that it requires detailed information on product-level prices. Although such information exists for Ethiopia and certain studies have successfully computed TFPQ (e.g. Bigsten et al. 2012), it is nonetheless less meaningful in the context of a study on HGFs. This is so because TFPQ can be meaningfully estimated only for products that are homogenous, that is, where quality differentiation cannot be argued to play a role in determining price differences among products. Considering such product categories dramatically reduces the observation count from 13,975 to 5,565.[28] Furthermore, this is even more complicated for multiproduct plants where the methodology approximates TFPQ by considering only the major product of the firm.[29] In an analysis where firm growth is measured by change in overall employment, it would be misleading to consider plant TFPQ of the major product of the plant.[30]

Distances to Cities/Urban Agglomerations

This work uses GIS software to compute distances between every town in the LMMIS data and five major Ethiopian cities that are considered to be centers of broader agglomerations. The five cities/urban agglomerations are Addis Ababa, Awassa, Bahir Dar, Dire Dawa and Mekele. Besides the agglomeration center itself, the following distance bands are defined from the nearest agglomeration center à la Ghani et al. (2016): 0-50 kilometer (km), 50-100 km, 100-150 km, and the residual category of towns that are located over 50 km away.

Measuring Spatial Clustering

The Ellison-Glaeser index (EGI) measures the extent of spatial concentration in a given industry. It takes negative values when the industry is more dispersed than what random assignment would lead to, while positive values where industries show greater levels of concentration.[31] The EGI for industry s at time t is defined as:

[27] The project also experimented with alternative definitions of TFP and found the results to be robust to such changes. Another problem related to TFP estimation is measurement errors; these are arguably all the more pervasive in the context of developing countries.
[28] Examples of such products include bricks of clay, cement blocks, nails, sugar, bread and wheat flour.
[29] Since most data-sets do not have disaggregate information on inputs by products of the firms, the share of inputs feeding into the major product is extrapolated.
[30] About 50 percent of observations pertain to single product plants but restricting to homogenous products, only 26 percent of observations are suitable for TFPQ estimation.
[31] The main advantage of the index is its robustness to the level of spatial aggregation, provided that the agglomeration externalities apply within the defined spatial unit and not between units. It is also independent of the industry distribution and the size distribution of establishments.

$$egi_{s,t} = \frac{G_{s,t} - H_{s,t}S_t}{(1 - H_{s,t})S_t}$$

Where $G_{s,t} \equiv \sum_l (share_{s,l,t} - share_{l,t})^2$ is a measure of the sum of squared deviations of the share of industry s employment in location l from the share of national employment in that location.

$H_{s,t} \equiv \sum_j \left(\frac{empl_{j,l,t}}{\sum_j empl_{j,l,t}}\right)^2$ and $S_t \equiv 1 - \sum_l \left(share_{l,t}\right)^2$ is a correction factor.

IV. High Growth in Ethiopian Manufacturing: A Descriptive Analysis

This section presents a descriptive analysis on the incidence of HGFs along several dimensions, their persistence over time and the relationship with productivity and agglomeration.[32]

Incidence of High-Growth in Ethiopian Manufacturing

Since the HGF dummy is computed over a three-year period, table 1a starts with the year 1999, noting various descriptive on plant count and shares for every other year till 2009. The columns present split on plant count and shares across various dimensions, indicating the extent of manufacturing concentrated in small and medium enterprises (SMEs, that is, plants with 10-49 employees) in column 2, young plants in column 3 (age less than or equal to 5 years), plants with bank loans in working capital in column 4 (that is, plants that reported non-zero loans from a bank) and those that had some form of FDI in column 5. The count and share of plants in the food and beverages industry, the largest industry in Ethiopian manufacturing, is presented in column 6. Columns 7 and 8 present plant count (shares) based in Addis Ababa, the capital city of Ethiopia and those in the top five agglomeration centers. These agglomeration centers include, Addis Ababa, Awassa, Bahir Dar, Dire Dawa and Mekele. Finally, the last column shows the count and shares of HGFs using the OECD definition.

Table 1a: Nearly 7 percent of establishments in Ethiopia are HGFs

Year	Plants	SME	Young	Bank ties	FDI	Food ind.	Addis Ababa	Aggl. center	HGF
	(1)	(2)	(3)	(4)	(4)	(5)	(6)	(7)	(8)
1999	725	503	247	262	53	208	393	469	36
		(.694)	(.341)	(.361)	(.0731)	(.287)	(.542)	(.647)	(.0497)
2001	721	508	210	118	59	217	390	473	46
		(.707)	(.292)	(.164)	(.0821)	(.302)	(.542)	(.658)	(.0640)
2003	939	661	213	146	78	271	511	619	59
		(.706)	(.228)	(.156)	(.0833)	(.290)	(.546)	(.661)	(.0630)
2005	761	439	163	165	76	210	447	521	114
		(.578)	(.215)	(.217)	(.100)	(.277)	(.589)	(.686)	(.150)
2007	1339	952	431	255	91	345	648	814	132
		(.712)	(.322)	(.191)	(.0680)	(.258)	(.484)	(.608)	(.0987)
2009	1945	1483	830	270	115	480	786	1032	105
		(.764)	(.428)	(.139)	(.0593)	(.247)	(.405)	(.532)	(.0541)
Total	13975	9903	4354	2334	1001	3807	7151	8777	884
		(.710)	(.312)	(.167)	(.0718)	(.273)	(.513)	(.629)	(.0742)

Notes: Establishment count, with share of total establishments in parenthesis

[32] Although the paper uses plant-level data, the text will refer to the plants identified as high growth, as per the OECD definition, as HGFs. It should, nonetheless, be kept in mind that the LMMIS data-set records establishments.

The table shows that nearly three-quarters of the plants are in the size range of 10-49 employees (this is referred as the SME category), and by 2009 about 43 percent were young, implying that young entrants were disproportionately SMEs. It is also clear that more than half of the plants are spatially concentrated in Addis Ababa and the top 5 agglomeration centers (columns 7 and 8). Although this share has consistently declined over the years, they still represent a sizeable share of economic activity. Finally, over the period 1999-2009, 7 percent of establishments in Ethiopia recorded high-growth, starting with nearly 5 percent in 1999, rising up to 15 percent in 2005 and declining back again to 5 percent in 2009 (column 9).[33]

Table 1b splits the count of identified HGFs along the same dimensions as in Table 1a. It appears that HGFs in Ethiopia are largely SMEs but not necessarily young. HGFs are drawn primarily from a low-tech sector (food and beverage). In terms of location, the importance of capital city and agglomeration centers in hosting HGFs is considerably high, however, has been declining prior to the reforms in 2003. Industrial policy changes seem to have accentuated the importance of locational factors in that the share of HGFs in these locations increased after the reform period.

Table 1b: In absolute terms, HGFs in Ethiopia are typically older SMEs in low-tech sectors

Year	Plants	SME	Young	Bank ties	FDI	Food ind.	Addis Ababa	Aggl. center
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1999	36	24	11	13	2	9	25	27
		(.667)	(.306)	(.361)	(.0556)	(.250)	(.694)	(.750)
2001	46	28	9	8	4	15	32	36
		(.609)	(.196)	(.174)	(.0870)	(.326)	(.696)	(.783)
2003	59	36	9	13	4	14	32	39
		(.610)	(.153)	(.220)	(.0678)	(.237)	(.542)	(.661)
2005	114	65	15	26	9	21	60	82
		(.570)	(.132)	(.228)	(.0789)	(.184)	(.526)	(.719)
2007	132	67	14	31	9	46	79	90
		(.508)	(.106)	(.235)	(.0682)	(.348)	(.598)	(.682)
2009	105	50	13	18	7	47	69	81
		(.476)	(.124)	(.171)	(.0667)	(.448)	(.657)	(.771)
Total	884	471	121	182	67	245	533	637
		(.533)	(.137)	(.206)	(.0758)	(.277)	(.603)	(.721)

Notes: Establishment count, with share of total establishments in parenthesis

Given that plants in Ethiopia are also concentrated along certain dimensions, such as size, sector and location, I propose a concept of "relative prevalence quotient" (RPQ) which is akin to the Revealed comparative advantage (RCA) index.

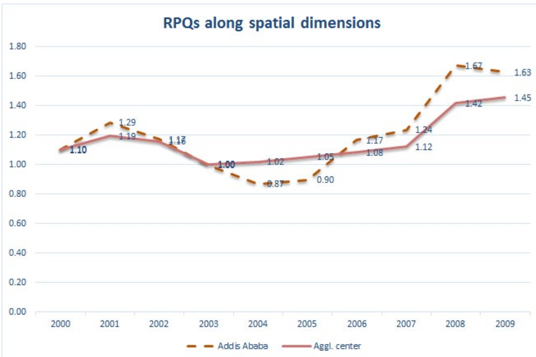
$$RPQ_i = \frac{HGF\ count_i / Total\ count_i}{HGF\ count_{ETH} / Total\ count_{ETH}}$$

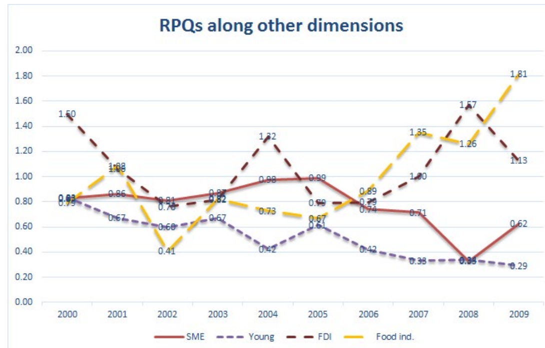
Where *i* represents a given dimension such as size/age category, location, sector and so on. RPQ measures the prevalence of HGFs along these dimensions relative to their prevalence in the overall country. An RPQ greater than 1 illustrates that the prevalence of HGFs along the given dimension is higher than the national average and vice versa. The left panel of Figure 1 shows that the relative prevalence of HGFs have heightened in Addis Ababa and top agglomeration centers post the industrial policy reforms. The right panel of Figure 1 shows the relative prevalence of HGFs along a range of dimensions such as plant size (SMEs),

[33] Share of HGFs in the last column is based on total firm count from 1999-2009, while the share on other dimensions is based on firm counts from 1996-2009. The observed spike in the incidence of HGFs in 2005 could be a result of sampling bias in that year.

age (young plants), ownership (FDI) and sectors (food and beverages). Contrary to the typical view that HGFs are found in high-tech sectors, Ethiopian data show that a low-tech sector such as food and beverages can also host a disproportionately larger share of HGFs. Likewise, the perception that HGFs are disproportionately SMEs or young does not seem to be true for Ethiopian manufacturing.

Figure 1: HGFs concentrated in Addis-Ababa, but not necessarily young, small or in high-tech sectors





Persistence and Survival of High-Growth Episodes

Transition matrices illustrate the difficulty in sustaining high growth, or even remain in the market at all. Table 2 shows these matrices for HGFs (employment-based, OECD) averaged over the full period 1996-2009, which reduces the impact of volatility associated with good and bad times. Within each of the matrices, the numbers in each cell represent the probability that a firm in one of three possible states during an initial three-year period—having just entered the market (birth), having grown at an average rate of less than 20 percent per year (survival), or having grown at an average of 20 percent per year or more (high growth)—either continues growing or exits the market in the next three-year period.

The matrices in table 2 provide three main insights. *First*, high growth is difficult to sustain. For example, the likelihood of repeating a high-growth event in the next three-year period is 6.5 percent. *Second*, in Ethiopia, the probability of attaining high growth in the next period is *not* larger for HGFs as compared with plants that did not experience high growth in the previous period. *Third*, high growth does not lend much assurance of survival. More than a quarter of Ethiopian plants that experienced a high-growth event are likely to exit the market altogether in the next three years, which is comparable to the exit probabilities of plants that did not experience a high-growth event. These findings are not very different for HGFs in the capital city (Addis Ababa) nor in OECD countries (Daunfeldt et al., 2014; Hölzl, 2014).

Table 2: High growth does not lend much assurance of survival or subsequent high-growth episodes

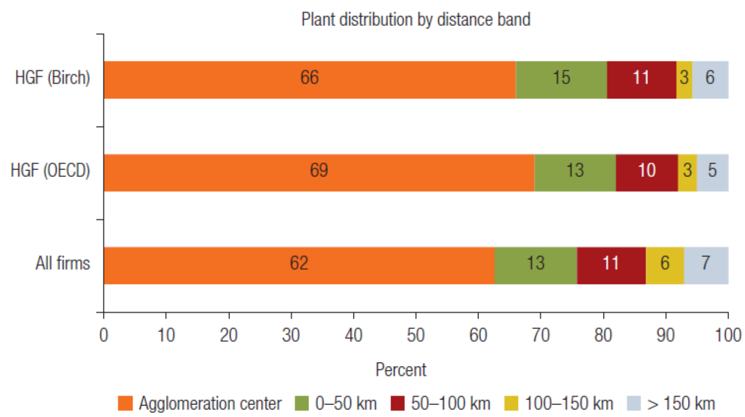
	Ethiopia				Addis Ababa			
	Death	Survival	High growth	Total	Death	Survival	High growth	Total
Birth	46.7	42.4	10.9	100.0	44.3	42.1	13.7	100.0
	(462)	(419)	(108)	(989)	(201)	(191)	(62)	(454)
Survival	24.1	65.9	10.0	100.0	23.5	65.8	10.8	100.0
	(551)	(1509)	(229)	(2289)	(307)	(860)	(141)	(1308)
High growth	25.8	67.7	6.5	100.0	22.8	71.7	5.5	100.0
	(64)	(168)	(16)	(248)	(33)	(104)	(8)	(145)
Total	30.5	59.4	10.0	100.0	28.4	60.6	11.1	100.0
	(1077)	(2096)	(353)	(3526)	(541)	(1155)	(211)	(1907)

Notes: Transition to High growth status using the OECD definition - Pooled Markov probabilities, frequencies in parenthesis. The table considers pooled transition probabilities for four periods (1997-2000, 2000-2003, 2003-2006, 2006-2009)

Clustering in Agglomeration Centers

Figure 2 shows that Ethiopian HGFs are more likely to be found in an agglomeration center—defined as one of the country's top five agglomerations (Addis Ababa, Hawassa, Bahir Dar, Dire Dawa, and Mekelle)—or towns closer to these centers. Moving away from the top five agglomeration centers, the share of economic activity consistently declines, and the pace of decline is sharper for HGFs, suggesting that HGFs may be benefiting disproportionately from the externalities offered by agglomeration centers.

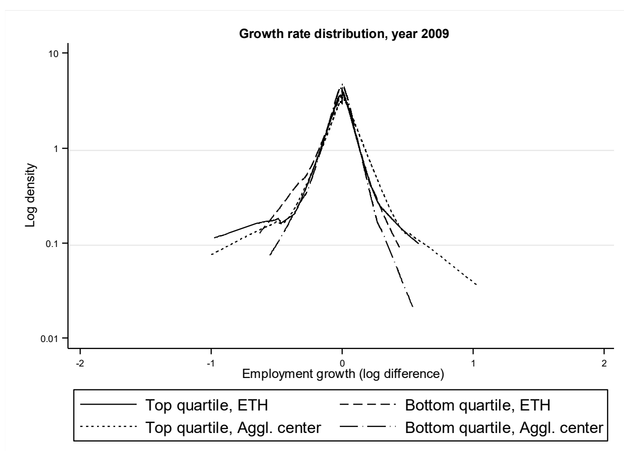
Figure 2: HGFs in Ethiopia are More Common in or Close to Agglomeration Centers



Agglomeration, Productivity and Growth Distributions

Figure 3 shows the kernel density of employment growth for plants in the top and bottom quartiles of the productivity distribution. These plots are generated separately for Ethiopia as well as for agglomeration centers. The tent shape of the plant growth distribution in Figure 3 suggests that overall most plants do not grow and very few of them experience extreme growth events, whether positive or negative.[34] However, plants in the top quartile of the productivity distribution, and especially those located in the agglomeration center have a higher density of extreme positive growth episodes.[35] Next, I test this hypothesis more rigorously.

Figure 3: Productive plants in agglomerations more likely to experience high-growth



[34] See, for instance, Stanley et al., (1996).

[35] The pattern of growth distribution appears to be broadly consistent across years.

V. Empirical Methodology

This section presents the empirical framework for estimating the correlation of high growth experience with plant-level characteristics, particularly relating to productivity and spatial location.

From Productivity to High-Growth: Do Productive Plants Experience High-Growth?

The base empirical specification exploring the supply side of the incidence of high-growth, takes the following form:

$$(0,1)hgf_{j,s,l,t} = \alpha + \beta * tfp_{j,s,l,t-3} + \zeta' * Z_{j,s,l,t-3} + \upsilon_s + \omega_t + \rho_l + \varepsilon_{j,s,l,t}$$
(1)

Where $(0,1)hgf_{j,s,l,t}$ is a latent binary variable that indicates the high growth status of plant j, in industry s and location l at time t. In this empirical framework, the probability of HGF depends on three year lagged value of $tfp_{j,s,l,t-3}$, which is 3-year lagged values of TFPR computed using the Levinson and Petrin's (2003) method.[36]

$Z_{j,s,l,t-3}$ is the vector of plant specific controls, lagged by three years, while υ_s, ω_t and ρ_l are industry, time and location fixed effects.

Although endogeneity is unlikely to be an issue in the specified model as all regressors are lagged by three periods, nonetheless, the paper does not dismiss this possibility in case there is persistence in plant productivity over its life cycle. Thus, unobserved plant heterogeneity may help plants grow their employment and at the same time also be correlated with productivity growth. For example, unobservable characteristics such as managerial capabilities can be a critical factor explaining plant-level productivity, while it is associated with plant growth. To address unobserved heterogeneity, this paper follows Du and Temouri (2015) in using a dynamic panel model approach proposed by Wooldridge (2005). This technique helps mitigate endogeneity caused by the additive unobserved plant heterogeneity. The dynamic Probit estimation can also account for the potential high-growth path dependence. For example, if a plant has experience of being a high-growth performer, it is likely to possess plant specificity that links with the drivers of high growth and more likely to repeat high-growth. A dynamic random effects panel estimator sufficiently addresses the initial condition problem and provides consistent estimates.

Among the set of plant-specific traits, the literature has typically considered plant's age, size, industry characteristics as well as several proxies for performance including export status, foreign direct investment (FDI) and human capital (average wages).[37] Initial values of such covariates (3-year lags) are included in the vector $Z_{j,s,l,t}$. Industry characteristics such as high-tech intensity and specialization patterns in manufacturing (e.g. food and beverages) are controlled for through the fixed effects component υ_s. Finally, year fixed effects ω_t account for the effects of business cycles.

To understand the association of the spatial factors on productivity and high-growth, I augment the Du and Temouri set-up by including spatial indicator of the plant location in terms of its proximity to the nearest urban agglomeration.

[36] To the best of my knowledge, Du and Temouri (2015) is the only study that explicitly links productivity with high-growth. However, their work considers TFPR in growth terms rather than levels. I experiment with both levels and growth but present results with level regressions.

[37] The positive coefficient on this variable is not free from a purely mechanical correlation between human capital and employment growth.

The modified specification in the model is:

$$(0,1)hgf_{j,s,l,t} = \alpha + \beta * tfp_{j,s,l,t-3} + \zeta' * Z_{j,s,l,t-3} + \emptyset\,(0,1)DISTBAND_{j,l} + \upsilon_s + \upsilon_t + \varepsilon_{j,s,l,t} \qquad (2)$$

Where $(0,1)DISTBAND_{j,l}$, a vector of dummies which contains four distance bands to the nearest agglomeration center. These distance bands are created for towns within 0-50 km, 50-100 km, 100-150 and over 150 km of the nearest agglomeration center. In a follow-up specification, the impact of industry concentration on the latent high growth variable is also assessed using the Ellison and Glaeser index (EGI) to assess whether industry agglomeration in a given town increases the probability of attaining HGF status.

$$(0,1)hgf_{j,s,l,t} = \alpha + \beta * tfp_{j,s,l,t-3} + \zeta' * Z_{j,s,l,t-3} + \emptyset\,(0,1)DISTBAND_{j,l} + \varphi * EGI_{s,t-3} + \gamma * EGI_{s,t-3} * (0,1)DISTBAND_{j,l} + \upsilon_s + \upsilon_t + \varepsilon_{j,s,l,t} \qquad (3)$$

Where $EGI_{s,t-3}$ captures the spatial concentration of industry *s* at time *t-3*. If measured at the appropriate level of spatial aggregation, the magnitude of the index should reflect agglomeration economies that raise plant performance, hence increasing an incentive to agglomerate.

From High-Growth Experience to Productivity: Does High-Growth Experience Reinforce Productivity Growth?

To understand whether high-growth experience itself accentuates future growth in plant productivity, the following quantile regression specification can help trace the effects of HGF experience on the entire distribution of TFP growth:

$$quantile_\theta\left[growth\left(tfp_{j,s,l,t,t-3}\right) | (0,1)hgf_{j,s,l,t}, Z_{j,s,l,t-3}, DISTBAND_{j,l}, EGI_{s,t-3},\ EGI_{s,t-3} * (0,1)DISTBAND_{j,l}\right] = \alpha_\theta + \beta_\theta * (0,1)hgf_{j,s,l,t} + \zeta_\theta{}' * Z_{j,s,l,t-3} + \emptyset_\theta(0,1)DISTBAND_{j,l} + \varphi_\theta * EGI_{s,t-3} + \gamma_\theta * EGI_{s,t-3} * (0,1)DISTBAND_{j,l} + \upsilon_s + \upsilon_t + \varepsilon_{j,s,l,t} \qquad (4)$$

where

$quantile_\theta\left[growth\left(tfp_{j,s,l,t,t-3}\right) | hgf_{j,s,l,t}, Z_{j,s,l,t-3}, DISTBAND_{j,l}, EGI_{s,t-3},\ EGI_{s,t-3} * (0,1)DISTBAND_{j,l}\right]$ is the conditional quantile of TFP growth. The main variable of interest in these equations is the dummy variable $hgf_{j,s,l,t}$, which is defined to take the value 1 if in any of the previous periods the plant experiences high-growth. Thus, high growth experience in any of the previous periods can potentially affect productivity, even if it happened in the beginning of the sample period. The coefficient β being positive and significant attests that high growth experience is positively associated with plant-level TFP, controlling for other factors and plant unobserved heterogeneity.

VI. High-Growth, Productivity and Agglomeration

Table 3 presents the baseline specification in Column 1, where the dependent variable, HGF status (dummy defined using the OECD definition of high-growth) is regressed on plant-level TFP, (LP measure), average wages, plant's age and size as well as the interaction between plant size and age. Following Shiferaw (2016), baseline estimations control for bank ties using a dummy variable that takes a value of 1 if the plant has bank loans listed as one of the sources of working capital. Ownership (FDI) and export status are also included as plant specific controls. All variables are taken at the initial value (3-year lags). Town level fixed effects, 2-digit industry fixed effects and a time trend are also controlled for. To correct for heteroskedasticity, all estimations report standard errors clustered at the individual plant level. These models are estimated using a pooled static Probit technique.

Column 2 subsequently introduces control for plant location in one of the top five agglomeration centers and the corresponding distance bands (and henceforth town FE are dropped). It also controls for initial spatial concentration, using EGI. Finally, the specification in column 3 introduces the interaction of initial EGI with the spatial location dummy. The coefficient for this interaction can be used to ascertain if industry concentration in agglomeration centers is particularly important in enhancing the probability of high-growth. Columns 4-5 repeat the specifications in columns 2 and 3 using a dynamic Probit random effects model. Columns 6 and 7 repeat the specifications in columns 2 and 3 using the Birch definition for high growth and estimate it using the static Probit model, while columns 8 and 9 repeat the latter two estimations using a dynamic Probit random effects model.

Is Initial Plant Productivity Pivotal for High-Growth Episodes?

The most striking result of Table 3 is the consistently positive and significant coefficient of initial plant-level TFP across all specifications, that is, irrespective of the estimation technique and definition of high-growth, there is a strong and positive correlation between high-growth and initial plant-level productivity.[38] This provides strong evidence that, ceteris paribus, initial plant-productivity is tightly linked with the probability of high-growth. The magnitudes of the coefficient on initial TFP levels are also noteworthy: in both the static and the dynamic Probit models, the coefficient for initial TFP is larger for specifications using the Birch index to define HGFs relative to the OECD definition. Since the OECD definition captures smaller firms, while Birch has a bias towards picking up relatively mid to large sized firms, these results suggest that higher initial TFP is relatively more important for larger sized plants in terms of enhancing their probability of high-growth.

Industry and Spatial Agglomeration for High-Growth

The positive and highly significant coefficient for the agglomeration center dummy suggests a significantly higher probability in achieving high-growth among plants located in agglomerations, relative to those located over 150 km from the nearest center. In fact, plants located in towns that are within 50 km of the nearest agglomeration center also have a higher chance of experiencing a high-growth episode relative to those located farther away (although the coefficient for the dummy variable recording plant location within 50 km from agglomeration center is not always significant). Qualitatively, these results are consistent with standard arguments that go in favor of agglomeration and clustering (e.g. due to noted benefits from thicker markets for resources, knowledge spillovers and reduced transaction costs).

By comparison, the coefficient on initial industry-level clustering, measuring using EGI, is negative and significant, implying that agglomeration within the same broadly defined industries generates congestion externalities and competition for similar resources which discourages a high-growth spell. These results are consistent with the findings of Bigsten et al. (2012) who use the same Ethiopian data-set to suggest that although agglomeration generates positive externalities, it also increases competitive pressures in underdeveloped factor and product markets.

By introducing the interaction of initial industry clustering with plant location, the full specification in column 3 seeks to understand the association of clustering in agglomeration centers with the probability of attaining high-growth. Although the coefficient for the interaction term is positive (but insignificant), its sum with EGI and with agglomeration center dummy is negative (e.g. -.054 in column 3), implying that

[38] The coefficient size with respect to TFP growth rather than levels is smaller in magnitude. The effect is significant only with the Birch definition. First, firms that have higher levels of TFP are not the same as those with higher growth in TFP. Second, Birch HGF firms are more than double the size of OECD defined HGFs and their TFP levels are also, on average nearly three times higher.

overall industry clustering generates negative externalities for high-growth in agglomeration centers. Said differently, although locating in agglomeration centers have positive externalities (e.g. due to access to better skills, connectivity, knowledge), yet, negative externalities from industry concentration (e.g. competition in product and factor markets) dominate. This result is reminiscent of the work of Lall et al. (2017), who find that cities in Africa have a fragmented spatial form, thereby making it difficult to realize agglomeration benefits. By comparison, the sum of EGI and the interaction of EGI with the dummy for locations that are 0-50 km (or even 50-100 km) from agglomeration centers is positive, implying that plants in these towns may benefit from industry clustering in terms of their probability of achieving an HGF status. It appears that industry clustering in these locations substitutes for the network externalities of big cities.

Small versus Large and Old versus Young

Since the seminal work of Birch (1979), it is believed that HGFs are smaller than an average firm. Although this finding has been contradicted in recent studies in developed and developing countries alike, Ethiopian manufacturing supports the conventional wisdom that high-growth is negatively and significantly associated with size.[39] This negative coefficient on plant size is consistent across all specifications and holds true irrespective of the definition of high-growth or the estimation methodology. This result is in agreement with the findings of Page and Soderbom (2015) who find that small firms (2-19 employees) generate 50 percent of new jobs.[40]

In the United States, Haltiwanger, et al., (2013; 2017) show that HGFs are disproportionately young, and evidence from Colombia shows that young firms (aged 0–4 years) grow two to three times more rapidly than the rest (Eslava and Haltiwanger, 2013). For several developing countries, Grover, Medvedev and Olafsen (2019) also show that HGFs are more likely young firms. Unlike the United States and Colombia, Table 3 shows that in Ethiopia older plants are more likely to have a higher growth spell. This corroborates the finding of Page and Söderbom (2015) who find exit rates for younger firms to be exceptionally large in Ethiopia. The interaction term of initial plant size and age is negative and significant across all specifications, suggesting that the growth advantage of old plants diminishes as they grow in size and that there are serious constraints to growth among larger plants.

[39] See Grover, Medvedev and Olafsen (2019) for an exposition on this topic, covering 10 other developing countries. In the United States, the correlation of high growth firms with size disappears once the age of the firm is controlled for (Haltiwanger et al, 2013). Over the period 2005-08, HGFs in the United Kingdom started with an average size of 60 employees, which tripled to over 170 employees in 2008 (Anyadike-Danes et al., 2009), suggesting that the conventional wisdom on HGFs being small is no longer valid.

[40] However, when the higher exit rates of small firms are taken into account, the hypothesis that small enterprises are net job creators may not be valid, at least in developing countries.

Table 3: Initial plant-productivity and location in agglomerations positively associated with high-growth

	OECD High growth Definition					Birch High growth definition			
	Static Probit with Fixed Effects			Dynamic Probit with Random Effects		Static Probit with Fixed Effects		Dynamic Probit with Random Effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Initial TFP	0.174***	0.163***	0.163***	0.205***	0.203***	0.212***	0.212***	0.268***	0.268***
	(0.030)	(0.029)	(0.029)	(0.037)	(0.037)	(0.038)	(0.038)	(0.051)	(0.051)
Initial age	0.621***	0.671***	0.674***	0.968***	0.965***	0.379**	0.371**	0.431*	0.424*
	(0.169)	(0.169)	(0.169)	(0.222)	(0.221)	(0.184)	(0.185)	(0.253)	(0.253)
Initial size	-0.274***	-0.198**	-0.200**	-0.486***	-0.487***	0.120	0.116	-0.093	-0.097
	(0.078)	(0.078)	(0.078)	(0.129)	(0.129)	(0.074)	(0.075)	(0.114)	(0.114)
Initial age x Initial size	-0.739***	-0.792***	-0.794***	-1.082***	-1.078***	-0.490***	-0.480***	-0.514**	-0.504**
	(0.170)	(0.170)	(0.170)	(0.223)	(0.222)	(0.184)	(0.185)	(0.251)	(0.251)
Initial bank ties dummy	0.073	0.070	0.066	0.070	0.066	0.038	0.034	-0.025	-0.027
	(0.071)	(0.071)	(0.071)	(0.091)	(0.091)	(0.073)	(0.073)	(0.098)	(0.098)
Initial FDI dummy	-0.000	-0.097	-0.092	-0.043	-0.041	-0.096	-0.096	0.054	0.044
	(0.112)	(0.110)	(0.109)	(0.177)	(0.176)	(0.112)	(0.111)	(0.177)	(0.176)
Initial exporter dummy	0.175	0.162	0.159	0.360	0.361	0.073	0.079	0.114	0.127
	(0.163)	(0.161)	(0.157)	(0.228)	(0.223)	(0.128)	(0.127)	(0.166)	(0.164)
Initial average wage	0.198***	0.208***	0.212***	0.398***	0.402***	0.144**	0.145**	0.348***	0.347***
	(0.058)	(0.056)	(0.056)	(0.077)	(0.077)	(0.064)	(0.064)	(0.089)	(0.089)
Agglomeration center dummy		0.352***	0.421***	0.459**	0.531***	0.279**	0.400**	0.287	0.415*
		(0.130)	(0.140)	(0.198)	(0.205)	(0.141)	(0.181)	(0.214)	(0.252)
0-50km from Aggl. center		0.246	0.321**	0.439*	0.512**	0.203	0.320	0.247	0.359
		(0.155)	(0.162)	(0.232)	(0.237)	(0.168)	(0.201)	(0.257)	(0.286)
50-100km from Aggl. center		0.121	0.237	0.248	0.386	-0.025	0.137	0.077	0.236
		(0.167)	(0.183)	(0.257)	(0.273)	(0.177)	(0.214)	(0.278)	(0.316)
100-150km from Aggl. center		-0.034	-0.120	-0.046	-0.096	-0.038	-0.017	-0.046	-0.011
		(0.190)	(0.228)	(0.298)	(0.346)	(0.232)	(0.262)	(0.353)	(0.398)
Initial EGI		-0.056	-0.391*	-0.047	-0.465	-0.122	-0.651*	-0.151	-0.793*
		(0.081)	(0.224)	(0.104)	(0.286)	(0.088)	(0.361)	(0.121)	(0.431)
Aggl. center x Initial EGI			0.337		0.418		0.552		0.689
			(0.218)		(0.281)		(0.366)		(0.438)
0-50km from Aggl. center x Initial EGI			0.416*		0.498		0.551		0.606
			(0.236)		(0.323)		(0.375)		(0.466)
50-100km from Aggl. center x Initial EGI			0.502*		0.672*		0.659*		0.751
			(0.293)		(0.404)		(0.395)		(0.477)
100-150km from Aggl. center x Initial EGI			-0.493		-0.309		-0.155		-0.025
			(0.492)		(0.687)		(0.501)		(0.695)
Number of Observations	5063	5258	5258	5258	5258	5210	5210	5210	5210
Number of plants	1065	1116	1116	1116	1116	1104	1104	1104	1104

Notes: Estimations consider HGF dummy for Ethiopian manufacturing using establishment data from 1996 to 2009 from the Large and Medium Manufacturing Industries Survey from the Ethiopian Central Statistical Agency. Explanatory variables of interest include 3-year lagged plant-level TFP computed using the Levinsohn and Petrin methodology. Estimations report standard errors, clustered at the plant level. Agglomeration center is a dummy variable for plant location in top-five towns, which is defined as 1 if plant is located in any of the following cities/towns: Addis Ababa, Awassa, Bahir Dar, Dire Dawa and Mekele. Further indicators for distance from the nearest agglomeration centers are also considered. Industry concentration, measured through the Ellison-Glaeser index, and its interaction with location dummies are also included in full specification. These estimations consider the effects relative to towns that are more than 150 km from the nearest agglomeration center.

Other Correlates of High-Growth

Consistent with the findings for the United Kingdom (Du and Temouri, 2015), average wages, which proxy for the importance of human capital, are consistently positive and significant. Comparing across the definitions of HGFs in Table 3, viz., OECD and Birch, this effect is marginally more pronounced for HGFs picked using the OECD definition (relatively smaller ones) vis-à-vis those identified using the Birch definition.

Among the other correlates of high-growth, Table 3 suggests that global linkages through the exports channel have a positive association with high-growth, while having FDI investment is most often negatively correlated. In neither case, however, the results are statistically significant. The lack of significance could be driven by the lack of variation in data due to small number of globally linked plants. Less than 100 plants in a total of 1,100 plants are globally linked. Finally, as in Shiferaw (2016) who emphasize the importance of bank ties for credit constrained plants in Ethiopia, the coefficient for this variable has a positive, although insignificant, association with high-growth.

Robustness of the Results

Table 4 presents robustness checks for the results pertaining to productivity, plant location and industry concentration. Using dynamic Probit random effects model as the main estimation methodology, columns 1-2 in Table 4 repeat the specifications in columns 4 and 5 of Table 3, where the effect of agglomeration centers is measured relative to all locations (and hence drops the distance bands). Columns 3-4 repeat the estimations in columns 1 and 2, using the Birch definition of HGFs. Columns 5-8, repeat specifications in columns 1-4 using only the capital city (Addis Ababa) as the possible agglomeration, given the dominance of the city. The next eight columns repeat specifications in columns 1-4 by splitting the sample into two sub-periods, before and after the massive industrial policy reforms in 2003, taking 2004 as the watershed year.

Table 4 suggests that irrespective of the definition used for identifying HGFs, initial plant-productivity and location in agglomeration (or Addis Ababa) matters significantly in increasing the probability of high-growth for an average Ethiopian manufacturing plant. The results with respect to age, size, location and industry concentration of plants in affecting the probability of becoming high-growth are also robust to alternative specification tests. Interestingly, the results in columns 9-12 suggest that the association of initial TFP levels with high-growth is heightened for OECD defined HGFs (smaller firms) post the industrial policy reforms, as observed in the magnitude of the coefficient in columns 9-10 vis-à-vis those in 13-14. It is also noteworthy that the coefficient on industry concentration, although always negative for most specifications, is larger and significant in the pre-reform period relative to that observed after the reforms. This suggests that the congestion and competition for similar resources in agglomerations may have been partially addressed by trade reforms but perhaps there is still potential to alleviate this pressure through coordinated action on spatial policy (e.g. transport, urban infrastructure).

Table 4: Robustness checks – Results hold irrespective of specification, or sample period

	Dropping distance bands				Using Addis Ababa as the only Aggl.				Sample period 1999-2004				Sample period 2005-09			
	OECD		Birch		OECD		Birch		OECD		Birch		OECD		Birch	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Initial TFP	0.201***	0.201***	0.266***	0.265***	0.209***	0.208***	0.271***	0.270***	0.176***	0.174***	0.300***	0.302***	0.250***	0.252***	0.289***	0.290***
	(0.037)	(0.036)	(0.051)	(0.051)	(0.037)	(0.036)	(0.050)	(0.050)	(0.060)	(0.061)	(0.088)	(0.089)	(0.050)	(0.050)	(0.058)	(0.058)
Initial age	0.956***	0.956***	0.427*	0.424*	0.940***	0.934***	0.416	0.415	1.474***	1.475***	0.826**	0.741*	0.622**	0.618**	0.369	0.368
	(0.223)	(0.223)	(0.253)	(0.253)	(0.224)	(0.223)	(0.254)	(0.254)	(0.373)	(0.377)	(0.412)	(0.413)	(0.294)	(0.293)	(0.317)	(0.317)
Initial size	-0.489***	-0.489***	-0.094	-0.097	-0.504***	-0.502***	-0.099	-0.098	-0.330*	-0.342*	-0.063	-0.083	-0.523***	-0.524***	0.100	0.097
	(0.130)	(0.130)	(0.114)	(0.114)	(0.132)	(0.131)	(0.115)	(0.115)	(0.186)	(0.189)	(0.152)	(0.157)	(0.158)	(0.157)	(0.135)	(0.136)
Initial age x Initial size	-1.071***	-1.072***	-0.510**	-0.506**	-1.058***	-1.053***	-0.503**	-0.500**	-1.541***	-1.539***	-0.746*	-0.670	-0.830***	-0.827***	-0.611*	-0.608*
	(0.223)	(0.223)	(0.251)	(0.252)	(0.225)	(0.224)	(0.252)	(0.252)	(0.371)	(0.375)	(0.405)	(0.407)	(0.295)	(0.293)	(0.319)	(0.319)
Initial average wage	0.406***	0.406***	0.353***	0.354***	0.399***	0.399***	0.348***	0.347***	0.345***	0.360***	0.404***	0.412***	0.403***	0.401***	0.279**	0.276**
	(0.077)	(0.077)	(0.089)	(0.089)	(0.077)	(0.077)	(0.089)	(0.089)	(0.120)	(0.121)	(0.145)	(0.144)	(0.104)	(0.104)	(0.113)	(0.112)
Agglomeration center dummy	0.224**	0.220**	0.171	0.194	0.298**	0.331***	0.256*	0.295**	0.360	0.551*	0.232	0.781**	0.600**	0.610**	0.415	0.424
	(0.101)	(0.103)	(0.124)	(0.129)	(0.121)	(0.123)	(0.133)	(0.138)	(0.263)	(0.313)	(0.262)	(0.363)	(0.276)	(0.276)	(0.280)	(0.301)
Initial EGI	-0.048	-0.027	-0.153	-0.253	-0.051	-0.228	-0.151	-0.359	-0.005	-0.614*	0.030	-1.395***	-0.051	-0.173	-0.394*	-0.524
	(0.104)	(0.156)	(0.121)	(0.165)	(0.104)	(0.163)	(0.120)	(0.221)	(0.124)	(0.346)	(0.168)	(0.483)	(0.166)	(0.430)	(0.236)	(0.744)
Aggl. center x Initial EGI	0	-0.029	0	0.141	0	0.176	0	0.245	0	0.615*	0	1.538***	0	0.113	0	0.139
	0	(0.128)	0	(0.142)	0	(0.157)	0	(0.206)	0	(0.339)	0	(0.473)	0	(0.432)	0	(0.764)

Notes: See Table 3.

Did Industrial Policy Enhance the Value of Addis Ababa's Locational Fundamentals?

Figure 1a provides visual evidence of policy reforms interacting with spatial location of plants in Ethiopia. After the reforms in 2003, the relative prevalence of HGFs in Addis Ababa increased remarkably, appearing as if the reforms increased the probability of a high-growth episode for a disproportionately larger share of plants based in the capital city. Thus, policy reforms could have instigated growth in certain industries and sectors that accentuate the impact of locating in Addis Ababa. To provide a more robust support to the finding in Figure 1a, Table 5 repeats estimations 5-8 from Table 4 by breaking it into two periods: 1999-2004 (pre-reform) and 2005-09 (post-reform).

There is an ongoing debate about the influence of local geography on economic activity and economic development. Local geography often referred to as first nature characteristic or locational fundamental represents a time-invariant, location-specific characteristic. These results suggest that while the geographical characteristics, as such, do not change over time, its values can. Industrial policy reforms appear to have enhanced the values of locational fundamentals important for high-growth. Table 5 shows that the coefficient for the Addis Ababa dummy is smaller and mostly insignificant in the pre-reform period, irrespective of the HGF definition used.

Table 5: The locational advantages of capital city is accentuated after the reforms

	Sample period 1999-2004				**Sample period 2005-09**			
	OECD		**Birch**		**OECD**		**Birch**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Initial TFP	0.174***	0.171***	0.298***	0.303***	0.256***	0.259***	0.291***	0.293***
	(0.061)	(0.061)	(0.088)	(0.089)	(0.050)	(0.050)	(0.057)	(0.057)
Initial age	1.437***	1.425***	0.801**	0.759*	0.575*	0.580**	0.355	0.365
	(0.375)	(0.378)	(0.409)	(0.410)	(0.296)	(0.295)	(0.318)	(0.318)
Initial size	-0.334*	-0.343*	-0.064	-0.077	-0.542***	-0.536***	0.094	0.101
	(0.189)	(0.191)	(0.152)	(0.153)	(0.160)	(0.160)	(0.136)	(0.136)
Initial age x Initial size	-1.508***	-1.495***	-0.726*	-0.688*	-0.792***	-0.803***	-0.601*	-0.616*
	(0.373)	(0.376)	(0.401)	(0.403)	(0.297)	(0.296)	(0.319)	(0.318)
Initial average wage	0.350***	0.357***	0.406***	0.407***	0.397***	0.394***	0.278**	0.275**
	(0.120)	(0.120)	(0.146)	(0.146)	(0.104)	(0.104)	(0.112)	(0.112)
Addis Ababa dummy	0.190	0.239	0.155	0.321	0.404***	0.415***	0.311**	0.314**
	(0.170)	(0.176)	(0.196)	(0.208)	(0.148)	(0.149)	(0.155)	(0.157)
Initial EGI	-0.006	-0.189	0.030	-0.424	-0.049	-0.088	-0.390*	-0.361
	(0.125)	(0.205)	(0.169)	(0.291)	(0.167)	(0.254)	(0.237)	(0.319)
Addis Ababa dummy x Initial EGI	0	0.186	0	0.593**	0	0.026	0	-0.045
	0	(0.210)	0	(0.288)	0	(0.225)	0	(0.251)

Notes: See Table 3.

From High-Growth to Productivity Dynamics: Is High-Growth Experience Self-Reinforcing?

Using TFP growth as the dependent variable, quantile regression estimations in Table 6 establish the association of prior high-growth experience with TFP growth in subsequent periods.[41] The table suggests that past high-growth experience is positively and significantly associated with growth in TFP across all quantiles of the distribution. Interestingly, the coefficient for the high-growth dummy increases consistently along the quantiles of the TFP growth distribution, implying that high-growth experience reinforces higher

[41] The table shows only the variables of interest, while a full model has been used for estimations.

TFP growth among plants that experience greater employment growth. This result holds for both the definitions of HGFs: OECD as well as Birch.

Table 6: High-growth experience reinforces subsequent productivity growth

	OECD High growth definition					Birch High growth definition				
	q10	q25	q50	q75	q90	q10	q25	q50	q75	q90
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
HGF Experience	0.018	0.027	0.101***	0.278***	0.691***	0.012	0.032	0.111***	0.282***	0.527***
	(0.017)	(0.019)	(0.033)	(0.057)	(0.211)	(0.024)	(0.021)	(0.027)	(0.062)	(0.165)
	0	0	0	0	0					
Initial age	-0.005	-0.010	-0.067***	-0.141***	-0.307***	-0.004	-0.012	-0.071***	-0.141***	-0.293***
	(0.009)	(0.010)	(0.012)	(0.027)	(0.088)	(0.010)	(0.008)	(0.015)	(0.038)	(0.080)
Initial size	0.045***	0.058***	0.049***	0.026	-0.043	0.044***	0.053***	0.041***	-0.003	-0.088*
	(0.006)	(0.007)	(0.012)	(0.028)	(0.069)	(0.010)	(0.010)	(0.013)	(0.019)	(0.050)
Initial age x Initial size	-0.004	-0.044**	-0.095***	-0.322***	-0.925***	-0.001	-0.044***	-0.102***	-0.326***	-0.944***
	(0.017)	(0.017)	(0.030)	(0.062)	(0.167)	(0.017)	(0.011)	(0.024)	(0.044)	(0.182)
Initial average wage	0.041	0.045	0.104***	0.147**	0.429**	0.044	0.049	0.092**	0.138***	0.224**
	(0.030)	(0.031)	(0.035)	(0.071)	(0.187)	(0.032)	(0.032)	(0.039)	(0.040)	(0.112)
Agglomeration center dummy	0.043	0.037	0.007	0.031	0.471**	0.041*	0.038	0.013	0.033	0.423**
	(0.030)	(0.036)	(0.039)	(0.060)	(0.239)	(0.021)	(0.041)	(0.045)	(0.095)	(0.176)

Notes: The dependent variable is TFP growth over a three year window.All regressors measure their initial level. All regressor included in Table 4 are included in these estimations, but results are presented for the select few. Estimations report standard errors, clustered at the plant level.

VII. Conclusions

This paper fills a critical knowledge gap in our understanding of HGFs in Africa by documenting the incidence and persistence in the performance of high-growth plants in Ethiopia. It also explores the correlates of the exceptional performance of HGFs, particularly emphasizing the link with plant-level productivity, agglomeration and industry concentration. Over the period 1996-2009, HGFs in Ethiopia represent, on an average, 7 percent of establishments, a share that is comparable to that in OECD countries.[42] One critical finding of this paper is that high-growth is an episode that occurs in the life-cycle of some select firms, which is different from the concept of "high-growth firm" as most HGFs find it very difficult to sustain a higher growth trajectory. Said differently, high firm growth is difficult to sustain and the likelihood of a repeated episode, either immediately or later in the firm's life cycle, is low. Some firms move from high growth to low growth or vice versa, while many others exit the market altogether following an episode of high growth.[43] In the case of Ethiopia specifically, high-growth only marginally improves the likelihood of survival and the probability of repeating a high-growth episode is small, and lower than other firms experiencing similar growth spurt.

[42] For example, Bravo-Biosca et al. (2016), show that the share of HGFs in 10 high-income economies varies between 3 percent in Austria and Norway to some 6 percent in Spain, the United Kingdom, and the United States.
Other studies establish a similar range, with 5 percent in Finland (Deschryvere 2008), 6 percent in Sweden (Daunfeldt et al. 2014) and the United Kingdom (Anyadike-Danes et al. 2009), up to 10 percent in the Republic of Korea (Choi et al. 2017).

[43] Given this fragility of high growth, Grover, Medvedev and Olafsen (2019) recommend distinguishing between the concept of a "high-growth episode" and a "high-growth firm" since all of the previously documented benefits of HGFs take place only within this narrow window and do not appear to be a permanent attribute of the firm.

Contrary to the findings in Grover, Medvedev and Olafsen (2019), most HGFs in Ethiopia are drawn from the size category with 10-49 employees, however, a very small share of HGFs are young. This finding is consistent with prior studies on Ethiopia and similar countries in Africa. In terms of the sectors of origin, it is not necessarily a high-tech sector that generates a disproportionate share of HGFs, as exemplified in Ethiopia. A relatively large share of HGFs in Ethiopia are drawn from the food and beverages industry, a traditionally low-tech sector. Finally, when it comes to HGFs, geography plays a critical role, with Addis Ababa, the capital city accounting for nearly 60 percent of all HGFs during the period of study.

Empirical analysis on the correlates of HGFs suggests that, *first,* initial period plant productivity level has a strong, positive and significant association with the probability of attaining high-growth. This relationship is heightened after the industrial policy reforms. *Second,* plants located in top cities and agglomeration centers and those within 0-50-kilometer bands have a greater probability of achieving high-growth vis-à-vis plants that are located father away. *Third*, industry concentration is negatively associated with high growth. Plants operating in concentrated industries are at a relative disadvantage when locating in agglomeration centers as they compete for the scare resources. These results are robust to several specification tests and also after controlling for unobserved plant heterogeneity. *Fourth*, the industrial policy reforms in 2004 appear to have accentuated the locational fundamentals critical for high growth in the sense that locating in Addis Ababa heightened the probability of attaining high-growth after the reforms. *Finally,* high-growth is a positive and self-reinforcing experience in Ethiopia that helps plants enhance their subsequent productivity growth.

The results of this paper point to one area as a clear avenue for future research: The paper establishes a positive link between initial plant productivity and the probability of high-growth, and also that experiencing a high-growth episode is associated with accelerated productivity growth. Given that high firm growth is difficult to sustain and that it does not lend much assurance of survival, there is much fragility in high growth and the link between high-growth and survival is weak for Ethiopia. Taken together, what does this result imply for the relationship between productivity and firm survival? At what stage of a firm's life-cycle does productivity matter for survival and if this threshold is not met, does the firm exit the market? Based on the findings of this paper, future research in this field could explore the link between productivity and firm survival.

References

Abebe, G., M. McMillan and M. Serafinelli. (2018). "*Foreign Direct Investment and Knowledge Diffusion in Poor Locations: Evidence from Ethiopia*," NBER Working Papers 24461, National Bureau of Economic Research, Inc.

Acs, Zoltan J., William Parsons and Spencer Tracy, (2008). "*High-impact firms: gazelles revisited*." Washington, DC: U.S. Small Business Administration

Anyadike-Danes, M., Bonner, K., Hart, M., and Mason, C. (2009). *"Measuring Business Growth–High-growth firms and their contribution to employment in the UK."* ERINI. Economic Research Institute of Northern Ireland, Monograph, (44).

Anyadike-Danes, M., K. Bonner, and M. Hart. (2013). "*Exploring the Incidence and Spatial Distribution of High Growth Firms in the UK and Their Contribution to Job Creation."* Working Paper 13/05, National Endowment for Science, Technology and the Arts, London

Audretsch, D. B., and M. P. Feldman. (1996). "*Innovative Clusters and the Industry Life Cycle*." Review of Industrial Organization 11 (2), 253–73.

BERR (2008). "*High growth firms in the UK: Lessons from an analysis of comparative UK performance*". BERR economics paper 03.

Bigsten, A., M. Gebreeyesus and M. Söderbom (2016). "*Tariffs and Firm Performance in Ethiopia, The Journal of Development Studies*", 52(7), 986-1001

Bigsten, A., and Gebreeyesus, M, Siba, E., and Söderbom, M. (2012). *"Enterprise agglomeration, output prices, and physical productivity: Firm-level evidence from Ethiopia."* WIDER working paper. No. 2012/85.

Bigsten, A., and Söderbom, M. (2006). "*What have we learned from a decade of manufacturing enterprise surveys in Africa*?" World Bank Research Observer, 21(2), 241–265.

Bigsten, A., and Gebreeyesus, M. (2007). *"The small, the young, and the productive: Determinants of manufacturing firm growth in Ethiopia."* Economic Development and Cultural Change, 55(4), 813-840.

Bigsten, A., and Gebreeyesus, M. (2009). *"Firm productivity and exports: Evidence from Ethiopian manufacturing."* The Journal of Development Studies, 45(10), 1594-1614.

Bigsten, A., Gebreeyesus, M., and Söderbom, M. (2009). *"Gradual trade liberalization and firm performance in Ethiopia."* University of Oxford. Department of economics. Centre for the study of African economies (CSAE).

Birch, David L., (1979). *The Job Generation Process*. Cambridge, MA: MIT Program on Neighborhood and Regional Change.

Bogas, P., and N. Barbosa. (2015). "*High-Growth Firms: What Is the Impact of Region-Specific Characteristics?*" In Entrepreneurship, Human Capital, and Regional Development, edited by Rui Baptista and João Leitão, 295–308. Cham, Switzerland: Springer.

Bottazzi, G., and Secchi, A. (2003). *"Common properties and sectoral specificities in the dynamics of US manufacturing companies."* Review of Industrial Organization, 23(3), 217-232.

Bravo-Biosca, A., C. Criscuolo, and C. Menon. (2016). "*What Drives the Dynamics of Business Growth?"* Economic Policy 31 (88), 703–42.

Bravo-Biosca, A. (2011). *"A look at business growth and contraction in Europe."* In 3rd European Conference on Corporate R&D and Innovation CONCORD-2011.

Choi, T., A. Rupasingha, J. C. Robertson, and N. G. Leigh. (2017). "*The Effects of High Growth on New Business Survival*." Review of Regional Studies 47 (1), 1–23.

Coad, A., Daunfeldt, S. O., Hölzl, W., Johansson, D., and Nightingale, P. (2014). *"High-growth firms: introduction to the special section."* Industrial and Corporate Change, 23(1), 91-112.

Collier, P., and A. J. Venables. 2008. "*Managing the Exploitation of Natural Assets: Lessons for Low Income Countries*." Paper prepared for the African Research Consortium annual conference, Nairobi, Kenya.

Cusolito, A. P., and W. F. Maloney. (2019). Productivity Revisited: Shifting Paradigms in Analysis and Policy. Washington, DC: World Bank.

Diao, X., J. Kweka, and M. McMillan (2016). "*Economic Transformation in Africa from the Bottom up: Macro and Micro Evidence from Tanzania*". NBER Working Paper 22889. National Bureau of Economic Research.

Daunfeldt, S. O., Elert, N., and Johansson, D. (2010*). "The economic contribution of high-growth firms: Do definitions matter."* Ratio working papers, 151.

Daunfeldt, S-O., Elert, N and Halvarsson, D. (2014) *"The Economic Contribution of High-Growth Firms: Do Policy Implications Depend on the Choice of Growth Indicator*?" Journal of Industry, Competition and Trade, 14(1), 337-365.

Daunfeldt, S.-O., and D. Halvarsson. (2015) "*Are High-Growth Firms One-Hit Wonders? Evidence from Sweden*." Small Business Economics 44 (2), 361‑83.

Daunfeldt, S-O and Halvarsson, D. and Mihaescu, O. (2015a) *"High-growth firms: Not so vital after all?"* HUI Working Papers 114, HUI.

Daunfeldt, S-O., Johansson, D. and Halvarsson, D. (2015b). *"A cautionary note on using the Eurostat-OECD definition of high-growth firms."* Journal of Entrepreneurship and Public Policy, 4(1), 50-56.

Daunfeldt, S-O., Elert, N. and Johansson, D. (2016) *"Are high-growth firms overrepresented in high-tech industries?"* Industrial and Corporate Change, pp. 1-21.

Daunfeldt, S-O, Elert, N. and Johansson, D., (2014). *The economic contribution of high-growth firms: do policy implications depend on the choice of growth indicator*? Journal of Industry, Competition and Trade 25(1), 1—21.

Decker, R. A., Haltiwanger, J., Jarmin, R. S., and Miranda, J. (2016). *"Where has all the skewness gone? The decline in high-growth (young) firms in the US."* European Economic Review, 86, 4-23.

Deschryvere, M. (2008). *"High growth firms and job creation in Finland."* ETLA discussion paper 1144, Research Institute of the Finnish Economy, Helsinki.

Du, J., and Temouri, Y. (2015). *"High-growth firms and productivity: evidence from the United Kingdom."* Small Business Economics, 44(1), 123-143.

Du, J., Y. Gong, and Y. Temouri. (2013). "*High Growth Firms and Productivity—Evidence from the United Kingdom.*" Working Paper 13/04, National Endowment for Science, Technology and the Arts, London.

Eslava, M., and J. Haltiwanger. (2013). "*Young Businesses, Entrepreneurship, and the Dynamics of Employment and Output in Colombia's Manufacturing Industry."* Working paper, CAF, Caracas.

Foster, L., J. Haltiwanger, and C. Syverson. (2008). "*Reallocation, Firm Turnover, and Efficiency: Selection on Productivity or Profitability*?" American Economic Review 98 (1), 394–425.

Fox, J. T., and Smeets, V. (2011). *"Does input quality drive measured differences in firm productivity?"* International Economic Review, 52(4), 961-989.

Fujita, M., P. Krugman, and A. J. Venables. 1999. The Spatial Economy: Cities, Regions and International Trade. Cambridge, MA: MIT Press.

Gebreeyesus, M. (2008). “*Firm turnover and productivity differentials in Ethiopian manufacturing.”* Journal of Productivity Analysis (Special issue on Transitioning Economics), 29(2), 113-129

Gebreeyesus, M. (2009). “*Innovation and microenterprises growth in Ethiopia*”. (UNU-WIDER Working Paper WP/2009/51). Helsinki, Finland: UNU-WIDER.

Gebreeyesus, M. (2013). Industrial policy and development in Ethiopia: Evolution and present experimentation (UNU-WIDER Working Paper WP/2013/125). Helsinki, Finland: UNU-WIDER.

Gebresilasse, M. M. (2016). *“Industrial Policy and Misallocation in the Ethiopian Manufacturing Sector.”* Boston University, Unpublished draft

Gebrewolde, T. M., and Rockey, J. (2016). *“The Effectiveness of Industrial Policy in Developing Countries: Causal Evidence from Ethiopian Manufacturing Firms.”* Working Papers CEB 16-020, ULB -- Universite Libre de Bruxelles.

Ghani, E., Grover, A. G., and Kerr, W. R. (2016). *“Highway to success: The impact of the Golden Quadrilateral project for the location and performance of Indian manufacturing.”* The Economic Journal, 126(591), 317-357.

Gilbert, B. A., P. P. McDougall, and D. B. Audretsch. 2006. “*New Venture Growth: A Review and Extension.*” Journal of Management 32 (6), 926–50.

Goedhuys, M., and Sleuwaegen, L. (2010). *“High-growth entrepreneurial firms in Africa: a quantile regression approach.”* Small Business Economics, 34(1), 31-51.

Grover, A., D. Medvedev, and E. Olafsen. (2019). High-Growth Firms: Facts, Fiction, and Policy Options for Emerging Economies. Washington, DC: World Bank.

Haltiwanger, J., R. S. Jarmin, R. Kulick, and J. Miranda. 2017. “*High-Growth Firms: Contribution to Job, Output and Productivity Growth.*” In Measuring Entrepreneurial Businesses: Current Knowledge and Challenges, edited by John Haltiwanger, Erik Hurst, Javier Miranda, and Antoinette Schoar, 11–62. Chicago: University of Chicago Press.

Haltiwanger, John, R. S. Jarmin and J. Miranda, (2013). “*Who creates jobs? Small versus large versus young”.* Review of Economics and Statistics 95(2), 347—361

Helpman, E., Melitz, M. J., and Yeaple, S. R. (2003). *“Export versus FDI.”* National Bureau of Economic Research. (No. w9439).

Hölzl, W. (2014). “*Persistence, Survival, and Growth: A Closer Look at 20 Years of Fast-Growing Firms in Austria.*” Industrial and Corporate Change 12 (1), 199–231.

Hölzl, W. (2013). *“Persistence, survival, and growth: a closer look at 20 years of fast-growing firms in Austria.”* Industrial and corporate change, 23(1), 199-231.

Jorgenson, D.W., Ho, M.S. and Stiroh, K.J. (2005) *“Information Technology and the American Growth Resurgence”* (Cambridge, MA: MIT Press).

Lall, S., Henderson, J. Vernon and Venables, A. (2017). *“Africa's Cities: Opening Doors to the World.”* Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/25896.

Lechner, C., and M. Dowling. 2003. "*Firm Networks: External Relationships as Sources for the Growth and Competitiveness of Entrepreneurial Firms*." Entrepreneurship and Regional Development 15 (1), 1–26.

Levinsohn, James and Almin Petrin, (2003). "*Estimating production functions using inputs to control for unobservables*". Review of Economic Studies 70(2), 317—342

Mason, C., and Brown, R. (2013). *"Creating good public policy to support high-growth firms."* Small Business Economics, 40(2), 211-225.

Mason, C., and R. Brown. (2010). "High Growth Firms in Scotland." Scottish Enterprise, Glasgow.

Mason, G., Bishop, K., and Robinson, C. (2009). *"Business Growth and Innovation: The wider impact of rapidly-growing firms in UK city-regions."* edited by NESTA.

Matsuyama, K. (1991). "*Increasing Returns, Industrialization, and Indeterminacy of Equilibrium*." Quarterly Journal of Economics 106 (2), 617–50.

Melitz, M. J. (2003). *"The impact of trade on intra-industry reallocations and aggregate industry productivity."* Econometrica, 71(6), 1695-1725.

Moller, L. C. (2015). *"Ethiopia's great run: the growth acceleration and how to pace it."* The World Bank Group, Washington, DC.

Mukim, M. (2016). "*How Do Cities in Ethiopia Create Jobs?"* World Bank Policy Research Working Paper No. 7866.

NESTA (National Endowment for Science, Technology and the Arts). 2009. "*The Vital 6 Percent: How High-Growth Innovative Businesses Generate Prosperity and Jobs*." NESTA, London.

Oliner, S. D., Sichel, D. E., and Stiroh, K. J. (2008). *"Explaining a productive decade."* Journal of policy Modeling, 30(4), 633-673.

Olley, G. S., and A. Pakes. (1996). "*The Dynamics of Productivity in the Telecommunications Equipment Industry*." Econometrica 64 (6), 1263–97.

Page, J., and M. Soderbom (2015). "Is Small Beautiful? Small Enterprise, Aid and Employment in Africa". African Development Review, 27(1), 44–55.

Penrose, E. T. (1959). *"The theory of the growth of the firm."* New York: Sharpe.

Rijkers, B., M. Soderbom and J. L. Loening. (2010). "*A Rural-Urban Comparison of Manufacturing Enterprise Performance in Ethiopia.*" World Development 38(9), 1278-1296.

Shane, S. (2009). *"Why encouraging more people to become entrepreneurs is bad public policy."* Small business economics, 33(2), 141-149.

Shiferaw, A. (2016). "*Constraints to Private Investment in a High-Growth Environment: Firm-level Evidence from Ethiopia*". Unpublished manuscript.

Shiferaw, A., Söderbom, M., Siba, E., and Alemu, G. (2015). *"Road infrastructure and enterprise dynamics in Ethiopia."* The Journal of Development Studies, 51(11), 1541-1558.

Stanley, M. H., Amaral, L. A., Buldyrev, S. V., Havlin, S., Leschhorn, H., Maass, P., and Stanley, H. E. (1996). *"Scaling behaviour in the growth of companies."* Nature, 379(6568), 804-806.

Tarfasa, S., T. Ferede, S. Kebede, and D. Behailu. (2016). "*Determinants of growth of micro and small enterprises (MSEs), Empirical evidence from Ethiopia*"

Van Ark, B., O'Mahony, M., and Timmer, M. P. (2008). *"The productivity gap between Europe and the United States: trends and causes."* The Journal of Economic Perspectives, 22(1), 25-44.

Van Ark, B. and E. Monnikhof (1996) *"Size Distribution of Output and Employment: A Data Set for Manufacturing Industries in Five OECD Countries, 1960s-1990."* OECD Economics Department Working Papers, No. 166, OECD Publishing, Paris.

Van Biesebroeck, J. (2005). *"Firm size matters: Growth and productivity growth in African manufacturing."* Economic Development and Cultural Change, 53(3), 545-583.