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Urban density, trust, and knowledge sharing in Lusaka, Zambia



- In brief**
- This project aims to investigate the channels through which urban agglomeration can foster (or hinder) firm growth in developing countries.
 - This brief presents the first stage of this research agenda, the collection of a new dataset mapping the spatial distribution of all the businesses in Lusaka: the Lusaka Census of Urban Entrepreneurs (47,428 firms), integrated with a short survey administered to manufacturers with less than 20 employees (2,216 firms).
 - The combination of these datasets allows researchers to provide evidence of agglomeration patterns within the city and to investigate correlates of business density, such as trust in other individuals.
 - The quantitative evidence supports the view that spontaneous agglomerations of firms within cities are a potential source of knowledge spillovers and business opportunities, which can inform growth policies. However, more research into the mechanisms of business cooperation and growth within clusters is needed.

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Summary

This project brief provides micro-level descriptive evidence on the spatial patterns of economic activity among small business owners in one of the fastest-developing cities in southern Africa: Lusaka. The results presented in this document are a first step of the researchers' agenda, which aims to investigate the channels through which urban agglomeration can foster (or hinder) firm growth in developing countries and allow firms to successfully integrate into national and international value chains.

In this brief we present a new dataset mapping the spatial distribution of all the businesses in Lusaka: the Lusaka Census of Urban Entrepreneurs (47,428 firms). This spatial mapping – conducted by the research team in 2016 – has been integrated with a short survey administered to all manufacturers with less than 20 employees (2,216 firms), which collects information about the business and the owners' level of trust in other individuals, cooperative behavior, and demographics.

We begin by providing an overview of the business environment in Lusaka. Much like firms elsewhere in the developing world, the vast majority of firms in Lusaka are small (<5 employees) and a substantial number are informal (~50% are not registered individually or as part of a cooperative). We then exploit our novel microdata to uncover differences in the business practices of men and women business owners. Our census provides evidence for substantial differences in business practices by gender, including substantial variation in occupational structure, the number of hours worked, as well as differences in how the business was learned.

Last, we explore the extent to which business density is correlated with the levels of trust of business owners. While positive externalities associated with firm agglomeration could provide an impetus for firm growth in the developing world, we posit that these externalities may only be realised if there is a sufficiently high level of trust among business owners. Using GIS techniques, we find that there is clustering of economic activity within the city, a result that is consistent with the common observation on the ground of spontaneous clusters of small manufacturing and retailing enterprises engaged in a range of activities within the same industry. We then show that there is substantial spatial heterogeneity in owners' trust levels across the city, and trust is positively correlated with agglomeration in the location where the business is located.

Our quantitative evidence supports the view that spontaneous agglomerations of firms within cities is a potential source of skills development and innovation, which can inform growth policies. However, our results cannot determine the direction of causality – i.e., whether density leads to trust and knowledge sharing or vice versa. Therefore, understanding the mechanisms underlying the activities within clusters and whether such activities are profitable for businesses is crucial for the design of effective programs. Our future research agenda will attempt to investigate the causes and consequences of these patterns.

Introduction

The developing world is rapidly urbanising: according to the United Nations, the urban population in developing countries will increase by approximately 2.5 billion people by 2050 (2014). It estimates that the number of urban dwellers in Zambia will increase by four times by 2050 to almost 26 million individuals, while in Africa as a whole, the number of urban dwellers is expected to increase by almost three times to around 1.3 billion people (2014).¹ Rapid urbanisation could potentially facilitate firm growth; economists have long recognised the benefits associated with agglomeration economies (see Krugman 1991 for seminal work). The Zambian government recognises the critical role that urbanisation plays in the country's future and is currently developing a National Urbanisation Plan, acknowledging that “by ensuring density diversity and innovation, cities can boost economic activities”.²

Taking advantage of the opportunities offered by urban density requires capabilities such as trust, interpersonal skills, and access to social networks (Glaeser, 2001). Indeed, several studies in economics have shown that trust is positively correlated with economic development (Knack and Keefer, 1997). However, the effect of cities on trust is ambiguous. While cities increase the scope for social interactions and flows of information, they also increase the costs associated with monitoring behaviour, hence potentially inducing greater moral hazard. This tension threatens the capacity of individuals and firms to reap the benefits afforded by urban density. In societies lacking trust and social capital, the positive externalities generated by proximity may be left unexploited.

Understanding the barriers to firm collaboration in urban environments is of substantial relevance to policymakers in the developing world. Many governments in the developing world have a longstanding interest in diversifying their economies away from basic industries and towards the manufacturing sector. To achieve diversification, many countries have enacted policies aiming to integrate local suppliers – in both urban and rural environments – into international value chains (Kruljkenko et al., 2016; Webber and Labaste, 2009). However, it is unclear how a myriad of small-scale, urban manufacturing firms could take up opportunities for vertical linkages and be ultimately transformed into an engine driving economic growth.

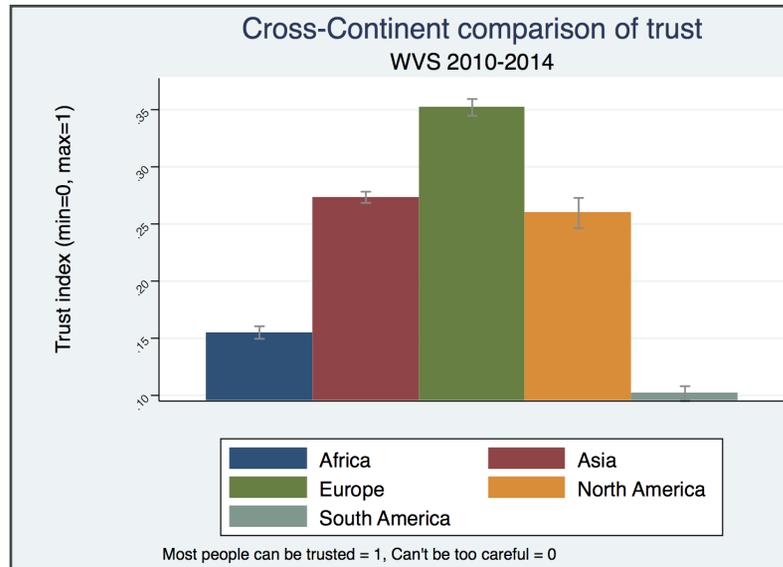
One way in which SMEs could successfully integrate into value chains is by working together, given that collaboration allows them to overcome scale constraints and be able to take up opportunities for value chain integration. Governments around the world seem to be aware of this: a common goal of multi-facility economic zones and clusters is to facilitate both horizontal and vertical linkages between firms. Yet these policies have not always been successful, and it is possible that a trust deficit may impede these small firms from collaborating and taking up the opportunities afforded by urban density.

A lack of trust may be particularly relevant in many fast-growing African cities. Data from the World Values Survey shows that African countries have generally low levels of trust (Figure 1).

1. <https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Highlights.pdf>

2. <http://www.urbangateway.org/icnup/sites/default/files/ICNUP%20Zambia.pdf>

Figure 1: Continental levels of trust (data from World Values Survey, 2010-2014 wave)



It is thus an empirical question whether African cities can induce economic growth and diversification by fostering business collaboration and the spread of ideas and knowledge, or whether low levels of trust limit these possibilities. This study is a first step towards answering these questions.

Scope of the study and data resources

Between May and September 2016, we conducted a massive data collection and spatial mapping of the economic activities in the city of Lusaka. The outcome is the Lusaka Census of Urban Entrepreneurs, which includes, for each establishment across all industrial sectors: 1) location geo-code, 2) industrial classification at the North-American Industry Classification System (NAICS) four-digit level, 3) number of employees, and 4) location description (e.g., type of site, electrification).

We collected data on all businesses in Lusaka operating from a fixed location (n=47,428). A business was considered to operate from a fixed location if 1) the business operated from a permanent structure with concrete foundations, 2) the business maintained either stock or machinery on site overnight, and 3) the permanent structure in question was not exclusively used for storage. Our analysis split Lusaka into sub-regions called Census Supervisory Areas (CSAs), and our census covered all the businesses in 90% of all CSAs in Lusaka district.^{3 4}

3. For security reasons, we excluded the 8 census statistical areas (CSA) in the region surrounding Chibolya compound (Harry Mwaanga Nkumbula ward), and also excluded areas of low population density in the following wards: Kabulonga, Lubwa, Lilayi, Munkolo, Mwebeshi, Kamulanga, Munali, Roma and Mpulungu.

4. Zambia is divided into 10 provinces, which are subdivided into 105 districts. The districts are then broken into constituencies, which are subdivided into wards. Each ward consists of a number of Census Supervisory Areas (CSAs) which are further subdivided into Standard Enumeration Areas (SEAs)

We also administered a short survey to business owners⁵ with less than 20 employees belonging to the following industries: manufacturing, mining, and construction (2,216 respondents, which accounts for 58.3% of the total population in these sectors).⁶ We collected data on their business practices and history, their beliefs and levels of trust, collaborative behaviour with other businesses, and demographics.

These data provide unique first-hand evidence on the distribution, size, and characteristics of economic activities in a fast-urbanising environment, which supplements the official datasets currently available (Economic Census 2012).

Overview of the business environment in Lusaka

The Lusaka Census of Urban Entrepreneurs comprises a total of 47,428 businesses. Given that the number of businesses listed in Lusaka District in the 2012 Economic Census was 16,063, this corresponds to a growth of 200% in four years, a figure that is hard to believe when compared to city population growth of 18% in the last four years. Differences in methodology may account for some of the gap. As compared to the 2012 Economic Census, there is a greater proportion of small firms, with 90% of the firms having fewer than five employees, 6% between five and ten employees, and less than 1% with 50 or more employees.⁷

Figure 2: Map of businesses in Lusaka

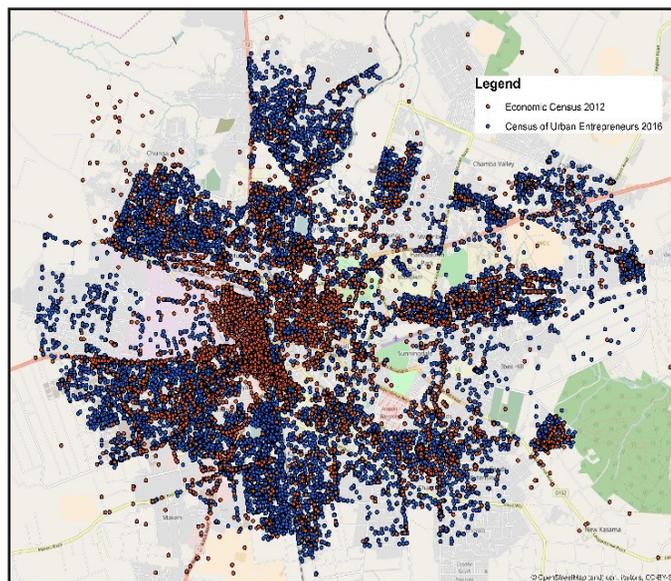


Table 1 presents the distribution of businesses across industries at the NAICS 2-digit level and some characteristics associated with the businesses. We can see that the largest sectors (by number of businesses) are retailing, the accommodation

5. If the owner was not available, the interview was conducted with the main manager.

6. 23.5% didn't give consent for the interview and 18% were not found after three attempts.

7. Data on the number of employees is not available for 17% of the firms, so these percentages are about the 40,202 respondents to this question. In the 2012 Economic Census, the percentages were respectively 71%, 11% and 3%. It should be noted that some larger businesses were unwilling to share their employee numbers as part of our census. In total 84% of businesses disclosed their employment figures to us during the survey.

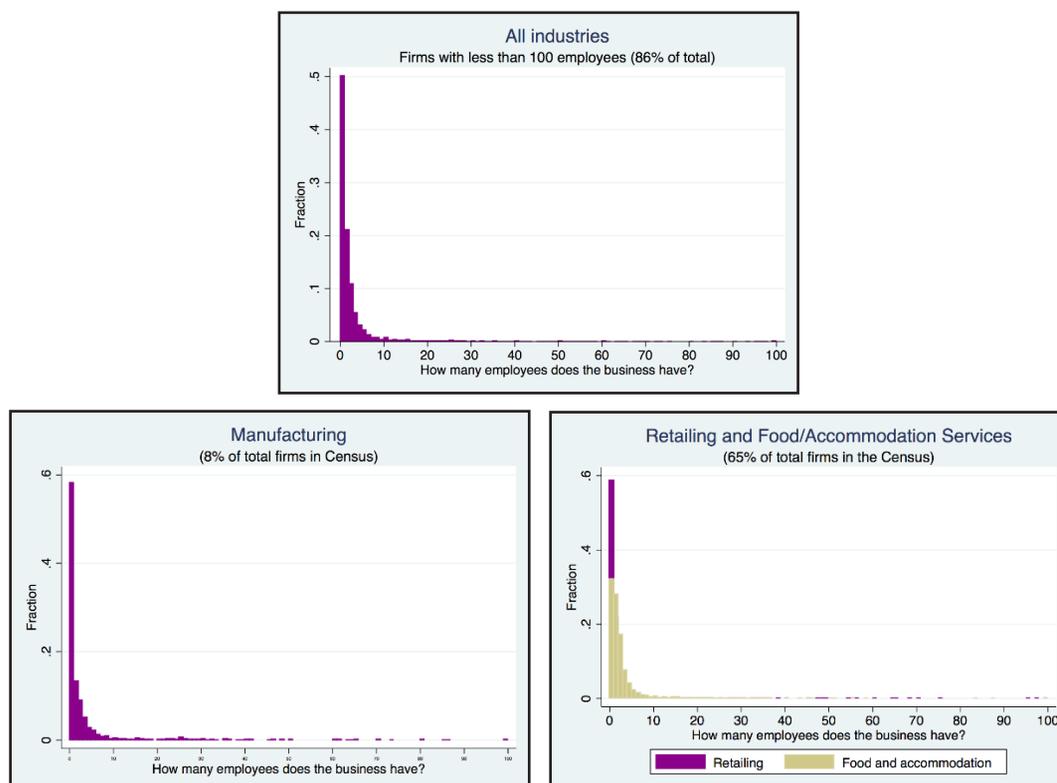
and food industry, and other services (the vast majority hair dressers), although retailing is also characterized by firms of a smaller size on average (as measured by the number of employees). Our census also marked the spatial location of markets: we counted a total of 80 markets in Lusaka, 52 cooperative, 23 council, and five street markets. 30.53% of businesses appear to be located in markets of any type.

Table 1: Descriptive statistics. Lusaka Census of Urban Entrepreneurs.

	Mean	No. Of Observations
Number of employees	2.28	40,202
<i>Sector (NAICS2)</i>		
Retailing industry	0.51	47,095
Manufacturing industry	0.08	47,095
Accomodation/food services industry	0.14	47,095
Other services industry	0.13	47,095
All other industry	0.13	47,095
<i>Number of employees by sector</i>		
Number Emp. retail ind	1.13	20,308
Number Emp. manufacturing ind	3.86	3,619
Number Emp. acoom/food services ind	2.34	5,825
Number Emp. other services ind	1.20	5,511
Number Emp. other ind	7.07	4,848
Business is part of a chain	0.04	47,428
Business has standalone structure (bricks)	0.12	47,428
Business in building with multiple businesses	0.71	47,428
Business has standalone structure (cardboard)	0.03	47,428
Business is in residential house	0.15	47,428

Number of observations may vary by question due to missing values

The following figures show the firm size distribution for all businesses with less than 100 employees across all industries, in retailing, food and accommodation, and manufacturing. These graphs show a clear pattern across industry: more than 70% of businesses with less than 100 employees have between zero and ten employees.



In the following paragraphs, we focus our attention on the manufacturing, mining, and construction sectors, which were the target group for the short survey.

Table 2 provides descriptive statistics regarding the demographics of the business owners in these sectors. Two interesting facts stand out. First, the proportion of female owners is low, at 29% of the surveyed businesses. However, there is great variability across sectors. For instance, while 50% of business owners of apparel manufacturing businesses are women, only 2% of owners of wood products manufacturing businesses are women. Secondly, the average level of formal education is low, with more than 50% of the manufacturers having ended their education before or at primary school.

Table 2: Demographic information for business owners of the subsample of manufacturing, construction, and mining businesses.

Descriptive Statistics - Survey Subsample		
	Mean	No. Of Observations
Demographics		
Gender (female=1)	0.29	2,216
Age	38.74	2,172
Education		
University Educated	0.04	2,212
Technical Diploma	0.12	2,212
Non-Technical Diploma	0.04	2,212
Completed Secondary School	0.22	2,212
Completed Primary School	0.42	2,212
Some Primary Schooling	0.13	2,212
No Formal Education	0.02	2,212

Table 3 provides descriptive statistics regarding business characteristics of the small-scale firms in manufacturing, mining, and construction. While the average business has one full-time employee, around half of all the different types of workers employed (e.g., apprentices, part-time, non-paid) are family members. The data also indicates that there is a large share of informal businesses: overall, 52% of businesses are not registered either individually or in a cluster/cooperative.

Table 3: Business information for the subsample of manufacturing, construction, and mining businesses.

Descriptive Statistics - Survey Subsample		
	Mean	No. Of Observations
Business Information		
<i>Industry NAICS3</i>		
Apparel Manufacturing	0.44	2,216
Food Manufacturing	0.18	2,216
Wood Product Manufacturing	0.15	2,216
Fabricated Metal Manufacturing	0.08	2,216
Printing	0.07	2,216
Non metallic mineral production	0.03	2,216
Other manufacturing	0.06	2,216
Business registered as part of Coop/Cluster	0.21	2,147
Business registered individually	0.37	2,169
Is the business electrified?	0.93	2,210
Business age	11.15	2,141
Days worked (per week)	5.92	2,214
Number of employees that are family members	0.44	2,148
Business keeps written records	0.48	2,209
Businesses use records (subsample)	0.88	1,054
Businesses keeps budget	0.34	2,151
Ever participated training (mgmt/Entrep)	0.23	2,201
Sales yest (Kw)	604.94	2,021
Sales in good week (Kw)	9,559.27	2,020
Sales in bad week (Kw)	1,126.13	2,025
Has spouse ever provided capital	0.25	1,732

Number of observations may vary by question due to missing values

The census allows us to explore gender differences in business practices and history. We find that out of 28% of female business owners across manufacturing sectors, the majority of them operate in apparel and food manufacturing (Figure 3). While the majority of both male and female business owners started their businesses from scratch (86% and 87% respectively), female business owners are more likely to have learned the job through formal training (Figure 4). Female business owners also tend to work fewer hours than male business owners (9.75 vs 10.45 hours per day respectively), potentially because of competing demands for their time in the household (Figure 5).

Figure 3: Gender distribution of business owners across manufacturing sectors

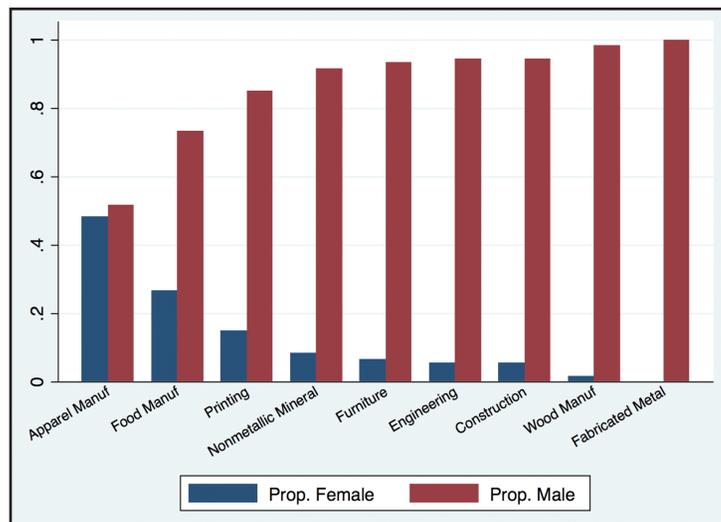


Figure 4: How did male & female business owners learn their trade

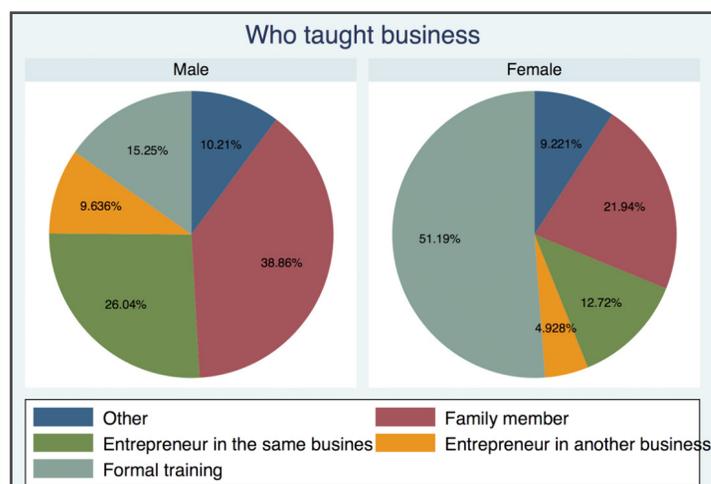
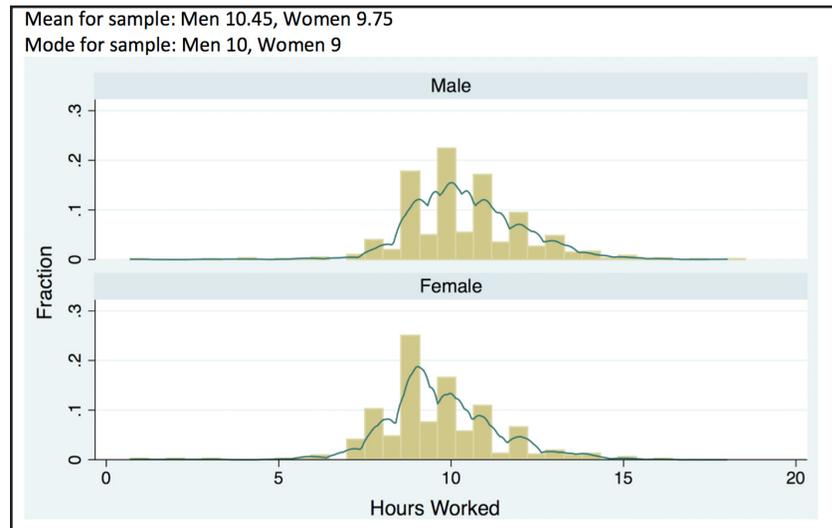


Figure 5: Hours worked per day by male & female business owners



Agglomeration and trust in the manufacturing sector

Agglomeration

We find evidence of substantial agglomeration, defined as businesses within the same sector being concentrated in certain geographical areas. This is particularly true in the manufacturing sector, suggesting the presence of economies of scale.

We present results on spatial agglomeration using Global Moran's I – a measure of spatial autocorrelation in an outcome measure across an entire population, where the null hypothesis is that the outcome is randomly spatially distributed across the area of interest. Global Moran's I statistics calculated for the spatial distribution of business density for the manufacturing and retail sectors reject the null hypothesis of random distribution at the 1% level, suggesting that there is clustering of economic activity in these sectors across Lusaka.

For each NAICS 3 classification in the manufacturing sector, we compute an additional measure of agglomeration using a discrete version of the Ellison and Glaeser index (1997).⁸ The sector with the greatest degree of spatial agglomeration is the Leather and Allied Products manufacturing; out of a total of 36 businesses

8. To compute the index, we overlay a grid of 1-squared kilometer cells on the map of Lusaka. We compute the index using the formula:

$$index_A = \frac{\sum_{i=1}^N \left(\frac{\#Firms_{Ai}}{\#Firms_A} - \frac{1}{N} \right)^2}{1 - \sum_{i=1}^N \left(\frac{1}{N} \right)^2}$$

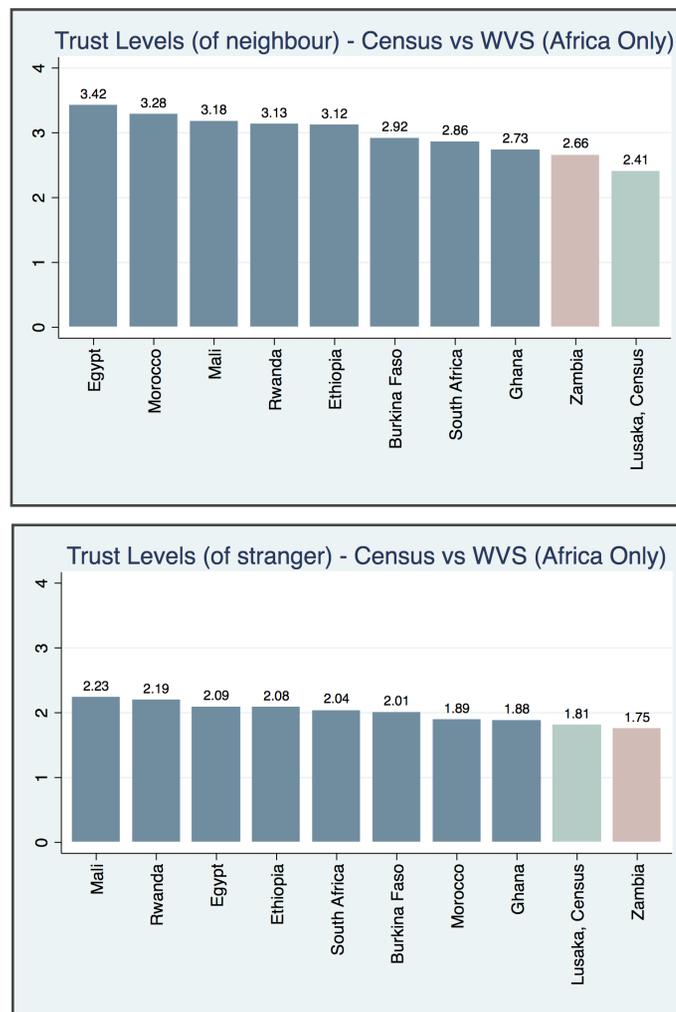
where $i = \{1, \dots, N\}$ is the number of cells in the grid and A is the industrial sector (Naics3). $\#Firms_{Ai}$ is the number of firms in sector A in cell i and $\#Firms_A$ is the total number of firms in sector A. The index compares the actual distribution with a random spatial allocation; it is 0 when the businesses in sector A are evenly distributed across all cells and 1 when they are all concentrated in one cell. We restrict observations to sectors with at least 20 businesses (leaving us with 97.4% of all businesses in surveyed sample).

in the sector, nine of them (25%) are in Chifundo market. This is followed by the furniture and related products manufacturing sector and the printing sector. The lowest degree of agglomeration is for businesses in food manufacturing, plastic and rubber products manufacturing and non-metallic mineral product manufacturing. The 160 businesses in the latter sector, for instance, are spread on 84 different CSAs, with a maximum of ten businesses (6.25%) in one CSA.

Trust

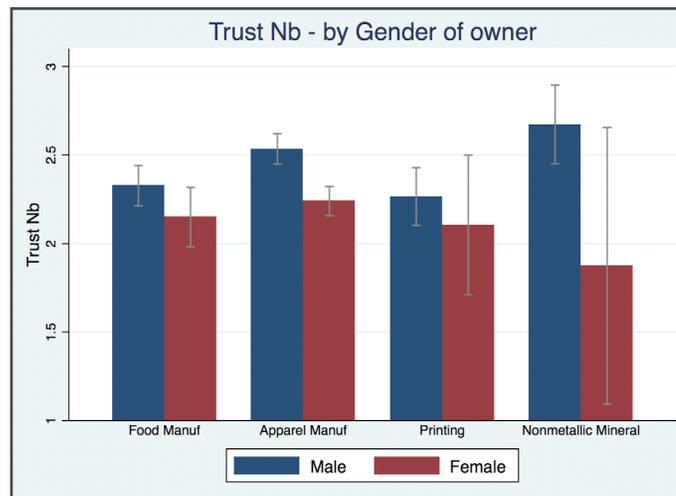
We asked two questions to gauge respondents' levels of trust, asking i) the extent to which they trusted their neighbours and ii) the extent to which they trusted strangers respectively (trust completely = 4, somewhat = 3, not very much = 2, not at all = 1). The average level of trust with respect to both neighbours and strangers in the interviewed population of manufacturers is particularly low when compared with Africa as a whole (World Value Survey, wave 2005-2010). With an average level of trust in neighbours of 2.41, interviewed entrepreneurs have a lower level of trust with respect to Zambia as whole in 2007 (2.66) and also many other countries in Africa, such as South Africa in 2006 (2.87) and Ethiopia in 2007 (3.12).

Figure 6: Trust levels in African countries (WVS, wave 2005-2010 and Census data, 2016)



We also find interesting gender differences in trust levels (Figure 7). Female business owners have a lower trust level than their male counterparts across different manufacturing sectors. Potentially, this could result from business women facing greater crime-related risks, discrimination against female entrepreneurs, or insufficient access to bank accounts or safe money storage.

Figure 7: Trust level of male and female business owners across manufacturing sectors



These average figures mask the degree of spatial heterogeneity, which we investigate in the following maps and charts. First, Figure 8 shows us that there is variation in the levels of trust among business owners between different wards of the city. In some wards, such as Munali and Chakunkula, entrepreneurs are characterised by average levels of trust of both neighbours and strangers which are below the national average from the World Value Survey (Figure 6); however, there are also wards where both measures are above the national average, like Kapwepwe and Chaisa.

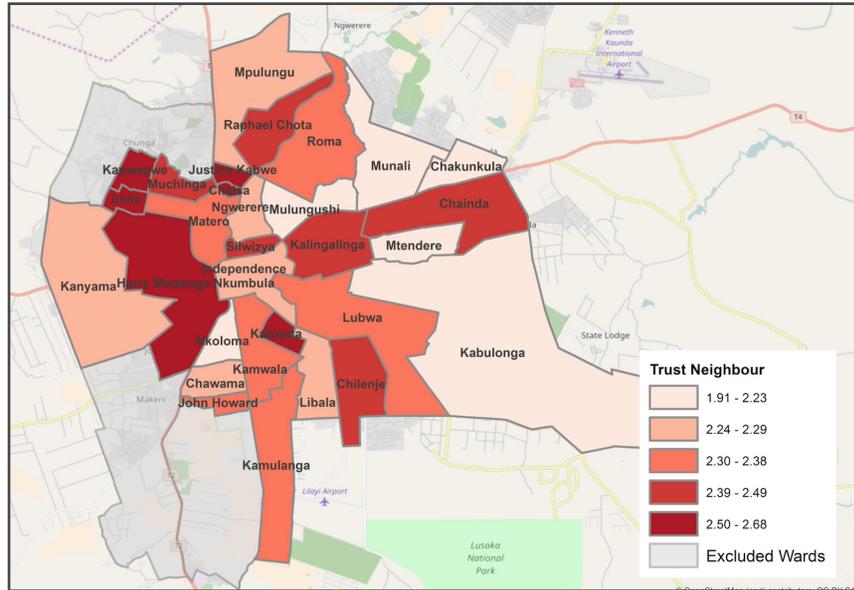
Another observation from this figure is that average trust in neighbours tends to be higher than average trust in strangers, a pattern which confirms the aggregate results in Figure 6. This is true for the majority of wards, with only few exceptions where, on average, entrepreneurs trust strangers more than neighbours (such as Nkoloma and Mulungushi).

Second, Figure 9 shows that there is no clear relationship between trust and density at the ward level. Areas of high trust seem to be characterised by either low or high population and business density. A natural next step is therefore to quantitatively assess whether owners' trust is correlated with higher business density at a more granular geographical level. This is described in the next paragraph, which reports the results of our regression analyses.

Figure 8: Spatial distribution of trust (neighbour & stranger) across Lusaka

A darker red corresponds to a higher average level of trust among business owners.

Trust Neighbour



Trust Stranger

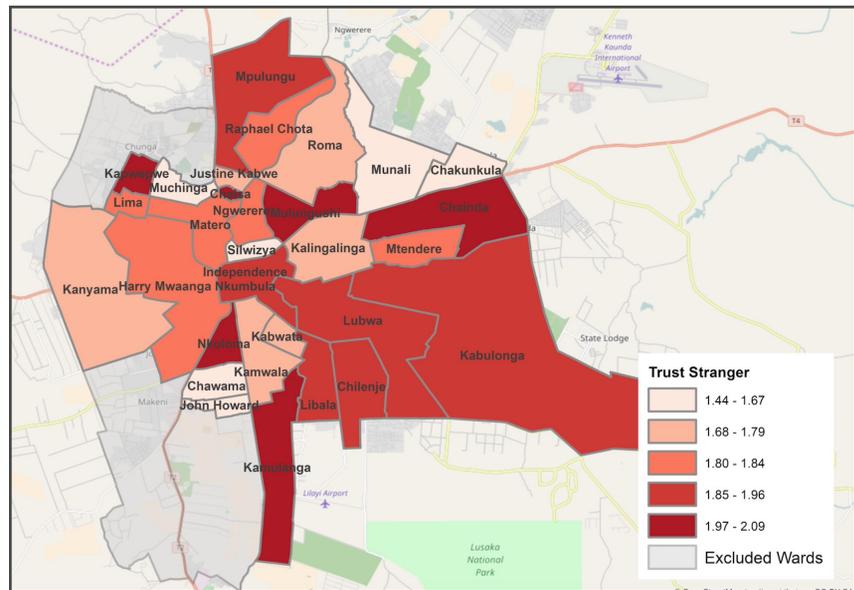
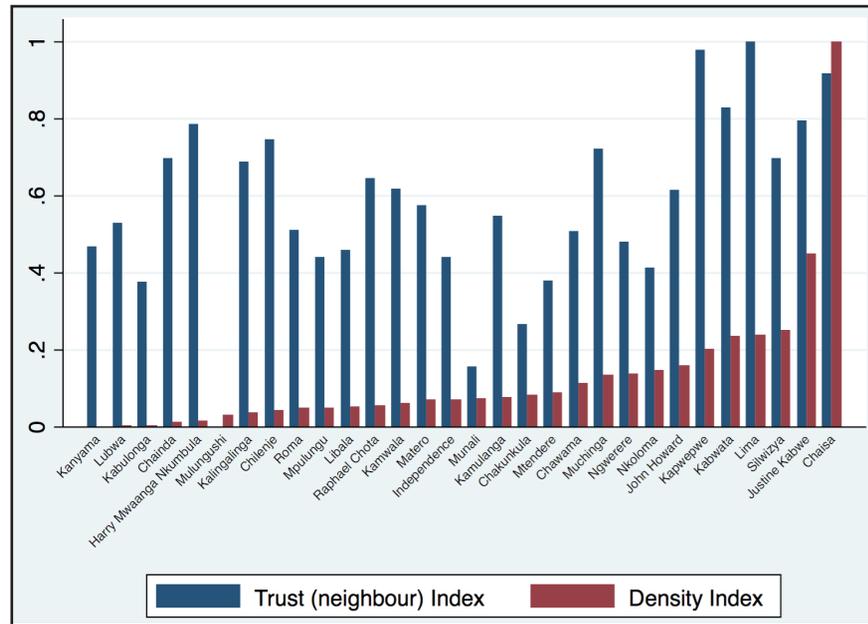


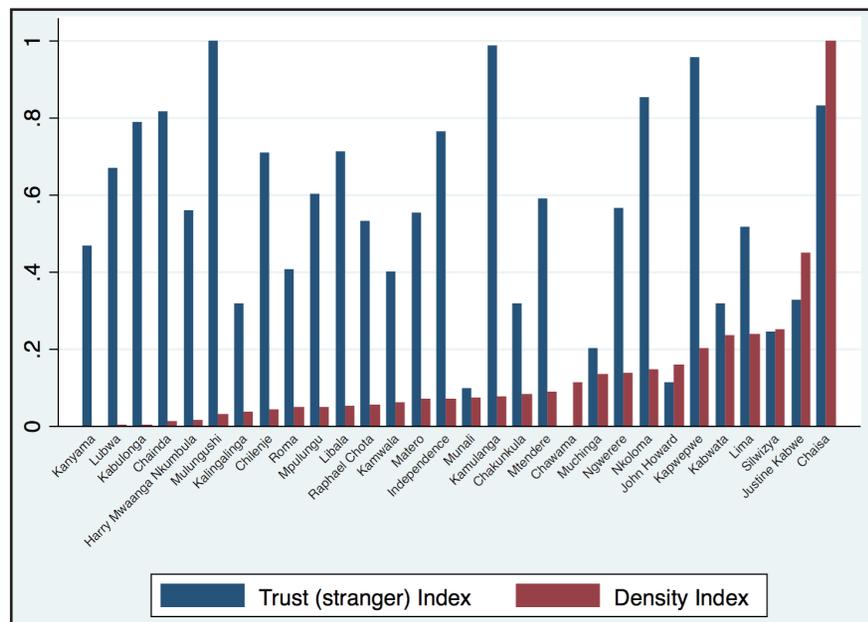
Figure 9: Average levels of trust (neighbour & stranger) against ward-level business density.

Trust and density are transformed in indexes between 0 and 1, where 0 is the minimum value across wards and 1 is the maximum. See footnote 4 for a list of the wards affected by the exclusion.

Trust Neighbour



Trust Stranger



Are co-located business owners more trusting?

We conducted regression analysis to quantify the degree to which trust is correlated with business density. We restrict observations to sectors with at least 20 businesses (leaving us with 97.4% of all businesses in surveyed sample) and we compute the measures of density at the CSA level. We find that the greater the concentration of businesses in the same sector (at the NAICS 3 level, e.g., wood manufacturing), the higher the owners' trust in neighbours, but not in strangers.⁹ This correlation can be explained by a selection effect, if more trusting business owners decide to co-locate next to each other, or by a neighborhood effect, if proximity to similar businesses fosters reciprocal trust, or a combination of the two. In other words, trust can foster density or vice versa; unfortunately, our current dataset does not allow us to disentangle these different explanations, but our research agenda will provide further insights into this issue.¹⁰

The spatial co-location of businesses, especially when combined with higher levels of reciprocal trust, should increase the opportunities for knowledge spillovers. Preliminary analyses show this is indeed the case in Lusaka.

Confounds – Ethnicity?

One potential concern with our interpretations is that our measure of density may be proxying for other unobserved factors. In particular, one frequently cited factor in determining interpersonal trust in Africa is ethnicity – with the hypothesis being that individuals are more likely to trust their co-ethnics. Hence, we reran our regressions also controlling for neighbourhood level ethnicity characteristics.

We constructed two measures of the ethnic heterogeneity of an area. The first of these is what the economics literature terms a “fractionalisation index”. This index measures the probability that two individuals chosen at random from the neighbourhood are the same ethnicity, and thus equals one if a neighbourhood is completely ethnically homogeneous. Some economists, however, have argued that fractionalisation per se is not the correct way to measure ethnic heterogeneity and have proposed a “polarisation index” (which has been used particularly in the conflict literature). This index follows the logic that highly homogeneous and highly heterogeneous societies tend not to suffer ethnic strife, which is concentrated in societies with an ethnic majority that faces a (sizable) ethnic minority. Hence, our index, based on Montalvo and Reynal-Querol (2002), reaches a maximum when the population distribution is split 50-50 between two groups and decreases as the population moves away from this distribution.

Regression results suggest that our results are robust to the inclusion of ethnicity characteristics of the neighborhoods businesses are in – that is – holding the level of ethnic fractionalisation constant, density still appears to have positive correlations with trust.

9. Given a certain industrial sector (e.g., Wood manufacturing), we measure business density in a CSA as the ratio between the logarithm of the total number of businesses in the same sector and the CSA area. For each business owner, the higher this measure, the greater the number of competitors around the business.

10. The correlation is robust to the inclusion of covariates including several characteristics of the owner (e.g., gender and experience), the business (e.g., number of employees) and the CSA (e.g., total number of businesses).

Concluding remarks

We introduce a unique dataset of business location (across all industries) and characteristics of small business owners (in manufacturing, construction, and mining with less than 20 employees) for the city of Lusaka. Our data show that the firm size and sectorial distribution in Lusaka is similar to other countries in Sub-Saharan Africa, with a prevalence of small-scale retailers. Zooming into small-scale manufacturing, we find substantial agglomeration of businesses in the same industry, which we show to be positively correlated with higher levels of trust in neighbors, but not with higher trust with respect to strangers.

Two caveats should be kept in mind. First, our results cannot answer the direction of causality – they are consistent with both a causal mechanism of density on trust or a selection mechanism, in which business owners with higher levels of trust co-locate. Second, without robust evidence on the financial performance of these firms, it is not clear whether greater trust in dense urban areas leads to enhanced profitability.

The patterns described in the research hold important insights. In particular, they call for a deeper understanding of the relationship between agglomeration and trust in fast-growing urban environments. Clusters are at the heart of the innovation policies of many OECD countries – including Argentina, Belgium, France, and Portugal – as well as Sub-Saharan countries, but little is known about the mechanisms, which lead clusters to succeed or to fail.

In Zambia, Multi-Facility Economic Zones and clusters have been created to encourage industrial diversification, which has been a policy objective almost from independence onwards. However, the results of these initiatives have been mixed and with little impact on the integration of Zambian local suppliers into international value chains. In follow up work, we hope to explore whether offering to integrate small firms into such value chains improves their business performance, as well as the extent to which such opportunities induce collaboration as opposed to competition among small business owners.

The data that we collected could potentially answer many more questions of interest for policymakers and organisations interested in business growth and urban issues. For instance, our data reveal interesting gender differences in trust levels and business experiences. These differences could translate into differential effects of entrepreneurship policies on women versus men business owners, but more research is needed in this area.

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