

**Geography and Microenterprises:  
Clustering, Networking, and Knowledge Spillovers**

**Jose Martinez, University of North Texas**

**Michael A. McPherson, University of North Texas\***

**David J. Molina, University of North Texas**

**Jeffrey J. Rous, University of North Texas**

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\* Corresponding author  
University of North Texas  
Dept. of Economics  
1155 Union Circle #311457  
Denton, TX 76203-5017  
940-565-2573 (office)  
940-565-4426 (fax)  
[mcperson@unt.edu](mailto:mcperson@unt.edu)

# **Geography and Microenterprises: Clustering, Networking, and Knowledge Spillovers**

## **Abstract**

Although an examination of the determinants of microenterprise performance has been a frequent area of research in the literature, data shortcomings have prevented a careful study of the effects of firm clustering and networking. Using GPS technology to pinpoint firms' locations, we examine the potential agglomeration benefits not only from the clustering of small businesses, but also the potential benefits of knowledge spillovers benefiting entrepreneurs. We find that for some microenterprises clustering is beneficial in terms of employment growth while for others clustering raises total revenue per worker. Although the size of the owner's informal business network does not appear to improve growth, we find a positive effect on revenue per worker for commercial firms. There is evidence that having lived in a larger city in the past enhances performance for some firms.

**Key Words:** microenterprise, economic geography, clustering, agglomeration benefits

**JEL Codes:** O17, O12

**Paper Type:** Research paper

## **1.0 Introduction**

Small businesses provide employment and income for substantial portions of the populace in many developing countries, and Mexico is no exception. The largest component of the small business sector in Mexico comprises microenterprises, defined by the Mexican government as establishments that have thirty or fewer employees, depending on the type of business.

Estimates suggest that there are approximately three million microenterprises in Mexico, nearly 95% of all businesses in the country, accounting for an estimated 40% of employment in Mexico (INEGI, 2004). Clearly, the microenterprise sector is an important part of the Mexican economy, but even these numbers may understate its true impact. As in much of the developing world, the informal sector in Mexico is largely invisible (Liedholm and Mead, 1999). In fact, the data forming the basis for the above statistics were collected through surveys conducted only in urban areas and even then, most home-based businesses were omitted. As a result, these numbers may

underestimate the actual importance of such firms. The importance to economic development has been recognized by many governments, which have given microenterprises prominent roles in many development plans and strategies (Leidholm and Mead, 1999). More recently, Glaeser (2007) found that the number of small firms in a city's economy is strongly correlated with subsequent economic growth and that the proportion of workers that is self-employed in any given year is strongly correlated with future economic growth.

Over the past 30 years, a modest literature has developed that examines some aspects of why certain firms are successful at this scale while the performance of many others is pedestrian at best. Our work advances the literature along several fronts involving the agglomeration benefits from the clustering of small businesses, as well as the potential benefits of knowledge spillovers benefiting entrepreneurs. First, it represents an initial step into a more thorough investigation of the geographical factors that may explain some part of small firm performance. For example, do firms that exist in clusters of similar firms tend to perform better or worse than more isolated firms? While firms in such clusters may face greater competition from so many proximate rivals (and therefore reduced profits and pressure to decrease the number of workers), certain industries may enjoy agglomeration benefits from being within an industry cluster. In this case, clustering may increase access to labour or other inputs, lower the cost of inputs, attract more customers, or facilitate knowledge spillovers between firms - making each more efficient and successful. For example, shoe stores and furniture stores tend to cluster because the variation of quality and style means that shoppers tend to do more window shopping and clusters attract more consumers. Hagglade et al. (2007, p. 393) and Renkow (2007, p. 198) have argued that careful economic geography studies of microenterprises are among next frontiers in microenterprise research. Up to this point, earlier efforts in the literature to quantify the determinants of microenterprise performance have been unable to control for location and clustering of microenterprises in a satisfactory fashion. Our work represents the first effort of which we are aware to take up this challenge, utilizing firm location data collected via global positioning satellite (GPS) technology.

As a related issue, the success of microenterprises depends largely on the entrepreneurial acumen of the owner of the business, which may be augmented via knowledge spillovers resulting from interaction with other small business owners in their area or from work experience accumulated while in other markets and large cities. Interestingly, evidence suggests that these

benefits may be long lasting. Research in the US suggests that time spent working in larger cities allows human capital to accumulate more quickly due to increased exposure to productivity-enhancing ideas either within or across industries and jobs (Glaeser and Mare, 2001). In Mexico, there is evidence that migrants to the U.S. are more likely to become entrepreneurs once back in Mexico (Massey and Parrado, 1998).

In this paper, we find some evidence supporting each of these hypotheses. First, we find evidence that for microenterprises in the service industry, clustering is beneficial for employment growth while for manufacturing and construction firms, clustering raises total revenue per worker. Second, while the size of the owner's informal business network does not appear to improve growth, we do find a positive effect on revenue per worker for commercial firms – perhaps indicating a knowledge spillover effect. Finally, we find evidence that having lived in a larger city in the past increases revenue per worker for commercial and service industry firms, suggesting that cities provide experiences that make workers more productive, at least for certain microenterprises.

## **2.0 Why Do Microenterprises Grow?**

### **2.1 *A Literature Review***

Gibrat (1931) argued that firm growth is not affected by firm size, but is instead an apparently random process. Since that time however, a sizeable number of studies have led most scholars to abandon this argument (particularly in the developing country setting). In its place, Jovanovic's "learning theory" has emerged. In Jovanovic's (1982) model, managers of firms learn about their efficiency over time, with firms expanding when managers' suppositions about their efficiency prove to be underestimates of the true efficiency level. Learning models suggest that firm growth rates should be inversely related to firm age and to the initial size of firms. Pakes and Ericson (1989) augmented learning theory to allow proprietors to increase their firms' efficiency by means of investing in their own human capital. Most of the literature provides empirical support for learning theory and the augmented learning theory, at least in the case of developed countries. Fajnzylber et al. (2006) find that microenterprises demonstrate dynamics that are generally in accordance with this theoretical literature.

Since the late 1980s, a number of empirical examinations of small firm dynamics in developing countries have been carried out. For example, Liedholm and Mead (1987), Little et al. (1987), Cortes et al. (1987), Chuta and Liedholm (1990), and McPherson (1996) presented

descriptive evidence from several countries suggesting that small firm growth differs according to a number of characteristics of the firm and its proprietor. These generally find an inverse relationship between growth and firm size and age as posited by learning theory. There is also strong evidence in this literature that human capital embodied in the proprietor or its workers promotes firm growth (see, for example Mead and Liedholm (1998), Van der Sluis et al. (2005), Brown et al. (2005), and Akoten and Otsuka (2007). Others, such as Downing and Daniels (1992), have suggested that the gender of a firm's proprietor may affect its performance, perhaps due to discrimination or because the traditional domestic responsibilities of female entrepreneurs may cause them to have different business objectives or to be more risk averse than males. Empirical evidence does suggest that firms with female proprietors grow more slowly (McPherson, 1996; Goedhuys and Sleuwaegen, 2000).

Business formation seems to require by nature some tolerance for risk. As a result, the conventional wisdom has been that attitudes toward risk might be related to business formation and size of firms, implying that entrepreneurs are more likely to be risk-loving than the general public. Theoretical models with risky technology predict that less risk-averse individuals are less likely to become wage workers and more likely to run larger firms than more risk-averse individuals. For the latter, the idea is that risk aversion causes people to under-invest, and hence have higher revenue per worker. However, there is limited empirical evidence of this in the literature (Elston, et al. (2005); Keh, et al. (2002)). Del Mel, et al. (2008) studied a program in which small firms were randomly awarded funding. They found no growth differential across entrepreneurs with different risk aversion profiles. Similarly, the conventional wisdom is that men are more risk-loving than women, and that this affects firm's performance, but there is little evidence pointing to this (De Mel et al. (2008)).

The degree of microenterprise formality has also been considered in the literature. Hanson (2010) claimed that informality in Mexico is a drag on productivity growth, suggesting that informal firms tend to grow at smaller rates than formal firms. Businesses in the formal sector may be better able to borrow when the need arises and advertising might be easier for such firms. Others, such as Sleuwaegen and Goedhuys (2002), argued that formalization may project legitimacy and stability to potential customers. McPherson and Liedholm (1996) found that firm sector, location, and size affect the probability of microenterprise registration in sub-Saharan

Africa, while others find that formalized microenterprises grow faster than those that are informal.

Access to capital is another strand in this literature. Many have argued that a firm that can borrow may be better able to take advantage of opportunities by investing (and thereby expand), although Johnson et al. (2000), Akoten et al. (2006), and McPherson and Rous (2010) found that the businesses that have had loans do not have better growth prospects. This may be because firm growth is more strongly influenced by other factors - entrepreneurial zeal perhaps - with growth actually affecting a firm's probability of getting a loan rather than the other way around. In that respect, the use of remittances instead of or in addition to credit has been considered. Woodruff and Zenteno (2007) found evidence of the importance of access to credit in Mexico, measured by remittances, in microenterprise development. However, recent research finds that neither access to credit nor access to remittances significantly affects microenterprise performance (McPherson et al., 2010).

## ***2.2 Optimal Location***

In order to maximize the impact of government programs that promote MEs, it would be extremely useful to understand not only whether one type of location is more favorable to the success and growth of such small firms, but also what locational characteristics are most favorable. Conventional economic wisdom suggests two competing possibilities. First, microenterprises should have a better chance at success and growth in locations in which they face substantially less competition. The resulting market power should allow firms to charge a price higher than in a more competitive location, increasing profitability and the probability of success. Alternatively, clusters of firms may enjoy benefits over microenterprises that are less concentrated. These benefits may include lower input prices caused by greater competition, lower transactions costs for acquiring inputs - e.g. better access to capital, suppliers, labour, business services, transportation, etc. - increased demand because of lower cost to consumers from shopping in a cluster, and knowledge spillovers which make the owner and workers more productive (Porter, 1998). In short, clusters of microenterprises within cities create a number of agglomeration benefits that could make individual firms more successful.

## ***2.3 Human Capital Formation through Work Experience***

Glaeser and Mare (2001) find not only that cities facilitate knowledge spillovers that produce human capital for their inhabitants, but that this human capital is portable. That is, they find that recent migrants to a larger city will initially be paid less than otherwise similar long-time residents. However, they also find that over a period of time, migrants' wages will rise more quickly and eventually match the wages enjoyed by long-time residents. Strikingly, instead of simply finding a wage effect from being in an urban area, they also find that these wage gains do not degrade once migrants return to less populated areas. Their evidence suggests that not only does working in a city increase the productivity of workers (through higher levels of human capital, more efficiently scaled infrastructure, etc.), but that cities also provide experiences that make workers more productive. Their analysis provides evidence that cities confer a durable increase in the human capital of residents.

### **3.0 Data**

Information about microenterprises in developing countries is frequently inaccurate; because many operate informally they normally defy the efforts of government statistical bureaus to learn about them. In the current context, the Mexican government conducts a survey of microenterprises (La Encuesta Nacional de Micronegocios), but this only captures data on microenterprises in several of the larger urban areas. In addition, this survey is conducted as part of the national employment survey and thus the sampling is based on registered business, largely missing informal sector firms. The survey that generated the data used in the present paper is based on a data collection technique known as the GEMINI method, developed by researchers at Michigan State University in the late 1980s. This method involves a random selection of geographic clusters, which are then canvassed by enumerators. Each household, shop, and production facility in selected areas is visited.

Enumerators collected data on firms with 25 or fewer employees (inclusive of any working proprietors), although nearly 90% of our sample are firms with four or fewer workers. Our sample includes information on approximately 1,200 firms gathered by enumerators from the Autonomous University of the State of Mexico during the summer of 2009. The survey was carried out in the city of Toluca. 13 areas were randomly selected from a total of 85 using a detailed map of the city.

As noted above, this survey is distinctive in its focus on the effects of geography on firm performance. To this end, enumerators were equipped with hand-held GPS units. These were

used to ascertain the precise coordinates of each firm that was enumerated. This allows our analysis to include a level of geographic detail not previously possible since the number of other businesses in proximity to each business can be computed. Because to the greatest extent possible enumerators collected data on all businesses in each area and not only the ones surveyed, we have a good representation of the number of firms in each area and their industry group.

Table One reports summary statistics for sampled firms. About 60% of all businesses are engaged in vending or retailing. Just over 23% are service providers (most commonly hairdressers and barbers) and the balance comprises small scale manufacturers (with food preparers being the most frequent type encountered).

[TABLE ONE]

As noted earlier, the purpose of this study is to determine those geographically related factors that affect performance of Mexican microenterprises in our sample. We measure performance in two ways. First, we consider employment growth. This sort of growth (as opposed to growth in sales or assets) is most commonly used in the literature mainly because surveys are typically based on recall data and proprietors remember fluctuations in the number of workers more accurately than changes in sales, assets, or profits. Therefore, our first dependent variable, employment growth, is the average annual percentage change in the number of workers since the microenterprise began operating. This includes working proprietors, paid and unpaid workers, and apprentices. Some researchers have explored the determinants of small firm growth using both sales and employment as dependent variables. Sleuwaegen and Goedhuys (2002) and Johnson et al. (2000) report broadly similar results for the alternative specifications. On average, firms in our sample have grown 6.3% per annum. However, it is worth noting that the majority of firms have never added workers, implying that a relatively small proportion of microenterprises grew very rapidly.

We also collected data allowing estimates of revenues over the previous year. This allows us to construct our second dependent variable: revenue per worker. While this is not a measure of growth, it gives an indication of a firm's recent performance. As noted above, while other measures of firm performance (such as growth in sales, profits, or assets) might be interesting to study, it is problematic to collect reliable data on them.



As noted earlier, the number of businesses located nearby may affect the performance of a particular firm in several competing ways. A firm that has many other firms near it may face greater competition, but clusters of firms may also enjoy certain benefits over microenterprises that are more geographically isolated. As a measure of clustering, we calculate the density of similar businesses, sharing the same 4-digit International Standard Industrial Code grouping, within 100 meters of each surveyed business for the variable *business density*.

In addition, we include two owner-specific variables that address previous learning in cities and potential knowledge spillover benefits from networking with other microenterprise owners. The first variable, *incitysize*, is the log of the population of the largest city where the owner has ever lived. 79.01% of the owners responded that Toluca was the largest city in which they had ever lived. This variable is included to measure the knowledge spillover benefit from living in a larger city in the past. Second, we include the business owner's self-reported number of microenterprise owners with whom he or she is acquainted, *network*. This variable is included to capture local network spillover benefits.

In addition, much of the earlier literature has considered characteristics of the entrepreneur as determinants of small firm performance. We control for the owner's education level with an education index based on 11 different ordered educational levels completed ranging from no education to graduate or professional degree. As owner's education is not the focus on this paper, and because dummy variables used to indicate educational achievement did not materially affect the results, we decided to use the simpler index instead.

In addition, we create a dummy variable, *female owned*, that takes on a value of one if all proprietors in a given firm are women. 36.4% of the firms in our sample are of this description.

Finally, we control for firm age (*age of business*) and initial size (*number of workers at startup*). The earlier literature typically finds an inverse relationship between these variables and firm performance, in keeping with the learning and augmented learning theories discussed earlier. The average firm in our sample has been in existence for 7.3 years, and began with 2.2 workers.

Because it is likely that the survey areas themselves could possess unobservable characteristics that affect small business performance, we included fixed-effects dummy variables indicating the survey area. As a whole, the estimated coefficients on these dummies were statistically significant.

## 4.0 Results

### 4.1 *Employment Growth as Dependent Variable*

Regression results using growth as the dependent variable are presented in Table Two. We run separate regressions for commercial, manufacturing firms, and service-related firms. Each specification includes area specific fixed effects, although these are not reported for the sake of brevity.

[TABLE TWO]

With respect to the variable measuring clustering, *business density*, only for the service industry does it appear to have an economically meaningful and statistically significant effect. Evidently, for firms in the service industry the advantages of clustering outweigh the disadvantages and estimates suggest that having an additional business with the same four digit code within 100 meters results in a four percent higher employment growth rate. The positive sign could be caused by several different factors. First, knowledge spillovers could make employees more productive within the cluster. Second, clients and consumers might be more likely to patronize an area with multiple firms to choose between. Third, labour market information within the cluster might improve the efficiency of that input market, lowering the cost of growth. Fourth, clustering could mean that competition promotes larger businesses or that competition pressures firms to achieve their profit maximizing employment level more rapidly. Looking simply at the firm size data, we find that service industry firms in clusters are not statistically significantly larger than firms outside of clusters. Paired with the positive growth effect of clustering suggests that clustering either allows or forces firms to reach the efficient size more quickly.

Neither the size of the largest Mexican city in which the proprietor has worked nor the size of the owner's network appear to have any discernible effect on this measure of firm growth. That is, neither having worked in larger cities nor being acquainted with more owners of microenterprises seem to allow entrepreneurs to gain knowledge accelerating to firm growth.

Neither owner gender nor their education has any apparent effect on growth of microenterprises in our sample. However, consistent with the literature, we find evidence that the age of the business and the initial number of workers at the firm both lead to lower growth. Of the six variables addressing this issue, all six coefficients are negative and four of the six are statistically significant.

#### **4.2 *Positive Employment Growth as Dependent Variable***

Because employment growth is rather skewed, with a high proportion of firms with zero employment growth and several firms with a high employment growth rate, we also decided to estimate a probit specification with the dependent variable equal to 1 if employment growth was greater than zero (0 otherwise). While the results (see Table Three) do not differ dramatically from the results presented above, there are a few exceptions. First, in the commerce sector equation, the coefficient on the age of the business is now positive and statistically significant rather than negative. The difference may not be altogether surprising: employment growth might be expected to slow as firms mature, while at the same time, firms that have been around for a longer period of time might be more likely to have grown since startup.

[TABLE THREE]

In the manufacturing and construction sector estimation there are two notable changes from the previous section. First, while the coefficient on owner's education remains positive, the coefficient is statistically significant at the 90% level. Second, and similarly, the size of the owner's network continues to have a positive effect, but again, the effect is statistically significantly positive at the 90% level.

Finally, in the service sector equation there are again two notable differences from the employment growth estimation described earlier. First, while owner's education was not statistically significant in the previous section, the effect of education is now positive and statistically significant, albeit at the 85% level. Second, while business density had a positive and statistically significant effect on employment growth, the effect in the probit estimation is negative and statistically significant at the 95% level. The disparity here is difficult to reconcile as the implication is that service firms in areas with lots of other service oriented firms are less likely to grow, but they grow faster.

#### **4.3 *Revenue Per Worker as Dependent Variable***

Table Four presents evidence that when firm performance is measured by total revenue per worker, the effect of having an additional firm sharing the same four digit ISIC code within 100 meters causes total revenue per worker to increase by about 19,200 pesos per year (roughly \$1,575) for firms in the manufacturing and construction industry. Out of 177 manufacturing and construction oriented firms in the analysis, 58 had between one and five firms sharing the same four digit ISIC code within 100 meters. There is no statistically significant business density

effect for vendors and retailers. Perhaps this indicates that for commercial firms the costs of having competitors in close proximity outweighs the benefits.

[TABLE FOUR]

It is also interesting that commercial and service firms with proprietors who have worked in larger cities tend to have higher revenue per worker. Evidently working in larger cities allows the accumulation of skills that are transferable to the operation of higher revenue businesses. Although positive, the effect is not statistically significant for firms in manufacturing and construction.

Alternatively, having a larger network of microenterprise owners does affect revenue per worker for commercial firms, with each contact worth about 1,720 pesos (\$130). The median network size for a commercial firm is 10 business owners. So the median extra revenue per worker earned by these firms due to knowledge spillover may be 17,200 (\$1,300) pesos per year.

There is strong evidence that owner education positively effects total revenue per worker with each one unit increase in the education index worth 18,060 (\$1,365) pesos, 12,800 pesos (\$967) and 7,275 pesos (\$550) for commercial, manufacturing and service firms, respectively. As with growth, proprietor gender does not have a significant effect on total revenue per worker, but all the coefficients are negative.

The age of the business and number of workers at startup are not statistically significant with two exceptions. For manufacturing firms, the number of workers at startup has a statistically significant negative effect on revenue per worker, while for service firms, there is a statistically significant positive effect from being larger at startup.

Considering both regressions' results, there is a possibility that the coefficients for business density might be biased toward finding no clustering effects due to the inclusion of area-specific fixed effects. The idea is that the fixed effects might pick up part of the clustering effects specific to the different areas. For example, the fixed effects coefficients for an area with high business density capture area-common effects that differ from other areas, which might have very low business densities. If clustering effects are part of the differing effects between areas, business density variables, if truly related to business performance, might become statistically insignificant. In alternative results, we drop the fixed effect dummies and include instead census data for the neighborhoods surrounding the specific business in the next 100 meters. We include composite measures of household wealth, literacy rates, and the percentage

of population with high school education or equivalent and higher. Once included, almost consistently, the business density coefficients for most estimations not previously statistically significant increase. They remain statistically insignificant, but that might be a function of the sample size.

Finally, we expect that the clustering effects might be different for different microenterprise types within each industry. For example, the clustering effects for convenience stores and shoe stores, both part of the commerce industry, might be significantly different. Convenience stores might benefit from the lack of competition nearby, while shoe stores, typically located in clusters, might benefit from increased customer traffic and efficiency spillover effects. To consider these differential effects, one solution would be to disaggregate the industries and run separate regressions, but given our sample size, it would result in some firm types with too few observations.

## **5.0 Conclusion**

In this paper we focus on the geographical and networking characteristics that might have an impact on businesses' performance for different industries, using for the first time GPS technology to pinpoint firms' locations with respect to each other. Our estimations include also business and owner characteristics as described by the existing literature. Our main results are consistent with the learning and augmented learning theory of business success, as they typically show that the age of business and the number of workers at startup is negatively related to employment growth and total revenues per worker. Network spillovers are for the most part positive, but only statistically significant for total revenues per worker for firms in the commerce industry. Similarly, some of our results suggest having work experience in large cities is correlated with higher employment growth and revenue per worker, which suggests that people acquire more human capital when residing in larger cities. For the most part, clustering effects on firms' performance are positive, but only statistically significant for the service sector in employment growth and for the manufacturing and construction sector in total revenue per worker. This paper provides evidence that, at least for some industries, the benefits of having potential competitors nearby outweigh its costs. More generally, we find that a consideration of the role of economic geography in microenterprise performance is a fruitful approach.

Given the evident importance in the economies of countries such as Mexico, promoting microenterprise growth may be a reasonable goal for policy-makers concerned about

employment and poverty. For instance, in our sample microenterprises generate considerable revenue per worker - an average of approximately \$7,700 per worker per year. Our research provides some evidence that networking effects may be important in some cases, perhaps suggesting that efforts to facilitate interaction between entrepreneurs would be fruitful. In line with the previous literature, our results suggest that efforts to promote investment in human capital will positively affect microenterprise performance. Reaching conclusions regarding policy implications related to clustering may be more difficult. While we find that for many sorts of microenterprises the benefits of being located near potential competitors outweighs its costs, this is not true for all firms. Our research does not address whether or not efforts to actively encourage certain firms to cluster would be a wise use of public resources. Nevertheless, to the extent that ordinances and regulations may discourage clustering, policy-makers should perhaps reconsider them.

The use of GPS technology to pinpoint the location of microenterprises with respect to each other seems to be a fruitful approach. Future research in this area could expand on our work by collecting larger data sets across broader geographic areas. One advantage of this would be the ability to examine how clustering might affect rural firms differently than those in urban settings. Another possibility is that a larger sample would permit finer distinctions between types of businesses. These advances would permit a much more thorough examination of the economic geography of microenterprises.

Table One: Descriptive Statistics

Variable Name	Observations	Mean	Standard Deviation
Total Revenue per Worker	1066	100,645 pesos*	452,340 pesos
Employment Growth Rate	1212	6.30	25.36
Owner's education, index	1234	5.94	2.67
Female ownership, dummy	1234	.364	.481
Age of business	1234	7.34	9.00
Number of workers at startup	1234	2.23	2.03
Network	1234	35.13	89.71
Business density	1234	1.64	3.16
Ln (city size)	1234		

\* Exchange rate approximately 13 pesos/\$US

Table Two: Employment Growth Estimation Results

	Employment Growth Rate Since Startup		
	Commerce	Mfg.&Const.	Service
Owner's education, index	-0.2375 (0.3258)	0.0765 (0.8706)	-0.3752 (0.7665)
Female ownership, dummy	-0.9102 (1.6757)	2.2724 (4.4596)	-3.9217 (4.888)
Age of business	-0.2010*** (0.0993)	-0.1881 (0.1926)	-0.4257** (0.2347)
Number of workers at startup	-1.5906**** (0.4903)	-1.7036*** (0.8063)	-1.0504 (0.8397)
Network	-0.0029 (0.0095)	0.0182 (0.0267)	0.0033 (0.0278)
Business density	-0.0236 (0.2370)	0.2913 (1.9733)	4.2686*** (2.0631)
Ln (city size)	-0.0706 (0.6888)	0.8466 (1.5386)	1.6233 (1.7836)
Constant	9.6135 (10.3078)	-0.7952 (22.8343)	-12.1517 (27.1195)
Observations	727	192	279
R <sup>2</sup>	0.0547	0.0808	0.0862

\* denotes statistical significance with 85% confidence (t-score > 1.445)

\*\* denotes statistical significance with 90% confidence (t-score > 1.645)

\*\*\* denotes statistical significance with 95% confidence (t-score > 1.960)

\*\*\*\* denotes statistical significance with 99% confidence (t-score > 2.576)



Table Three: Positive Growth Probit Estimation Results

	Growth		
	Commerce	Mfg.&Const.	Service
Owner's education, index	0.01620 (0.02326)	.08164** (.04890)	.05714* (.03511)
Female ownership, dummy	-0.4169**** (0.1215)	-.1748 (.2622)	-.3068 (.2313)
Age of business	0.02857**** (0.00681)	.01078 (.01091)	.01317 (.009814)
Number of workers at startup	-0.06808** (0.0348)	-.1082*** (.05222)	-.02029 (.04073)
Network	-0.0002346 (0.000704)	.002523** (.001517)	0.0003979 (.001148)
Business density	0.002259 (0.002315)	.002307 (.002739)	-.007458*** (.003045)
Ln (city size)	-0.04689 (0.04983)	.05584 (.08798)	.1007 (.07684)
Constant	-0.5859 (0.9362)	-2.1077 (1.490)	-.7752 (1.366)
Observations	727	192	270
R <sup>2</sup>	0.0955	0.0892	0.1165

\* denotes statistical significance with 85% confidence (t-score > 1.445)

\*\* denotes statistical significance with 90% confidence (t-score > 1.645)

\*\*\* denotes statistical significance with 95% confidence (t-score > 1.960)

\*\*\*\* denotes statistical significance with 99% confidence (t-score > 2.576)

Table Four: Revenue per Worker Estimation Results

	Total Revenue Per Worker		
	Commerce	Mfg.&Const.	Service
Owner's education, index	18,059.73*** (9111.19)	12,808.60**** (4,131.83)	7,273.118**** (2,925.742)
Female ownership, dummy	-65,581.68 (47,090.73)	-26,063.84 (21,555.20)	-14,610.03 (19,148.36)
Age of business	-2,031.71 (3,088.33)	433.2936 (919.1844)	-408.7321 (850.7514)
Number of workers at startup	-18,277.13 (12,673.50)	-6,884.169** (3,586.821)	10,391.03**** (3,062.56)
Network	1,721.44 (284.77)****	89.2990 (123.8991)	114.6103 (109.2507)
Business density	3223.43 (6448.09)	19,189.57*** (9,094.68)	3,916.578 (7,745.075)
Ln (city size)	30,732.71* (18,955.97)	7,593.718 (7474.174)	21,476.46**** (6,811.003)
Constant	-405,310.8 (288,830.1)	-87,919.16 (111,014)	-337,163.3**** (103,276.9)
Observations	627	177	250
R <sup>2</sup>	0.1071	0.2136	0.1581

\* denotes statistical significance with 85% confidence (t-score > 1.445)

\*\* denotes statistical significance with 90% confidence (t-score > 1.645)

\*\*\* denotes statistical significance with 95% confidence (t-score > 1.960)

\*\*\*\* denotes statistical significance with 99% confidence (t-score > 2.576)

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