Impact of Informal Firm Competition on Formal Firm Productivity: Evidence from Nepal

AAYUSH KAPRI

CONTENTS

LIST OF TABLES

ABSTRACT

This thesis investigates how informal firm competition impacts the productivity of formal firms in Nepal. Utilizing firm-level panel data and the Levinsohn-Petrin method to measure Total Factor Productivity, the study assesses various sectors and firm sizes. Results indicate that informal competition boosts the productivity of formal firms, highlighting the benefits of integrating informal and formal sectors for improved economic efficiency. The study offers policy recommendations to foster a more inclusive business environment, encourage collaboration between informal and formal enterprises, and reduce barriers to formalization.

1 INTRODUCTION

The informal economy refers to economic activities and employment that exist outside of formal regulations, often characterized by a lack of official records, legal protections, and adherence to established standards. This sector typically includes work that is not monitored or taxed by the government, ranging from small-scale businesses to casual labor, and is often driven by factors such as tax evasion, limited access to formal employment, and a lack of social protections. The informal sector plays a substantial role in economies around the globe, contributing significantly to employment, income generation, and economic activity, particularly in regions where formal structures may be limited or inaccessible. It is estimated that 2 billion people, more than 61 percent of the world's employed population, are employed through the informal sector. Even more shockingly, in Africa, 85.8 percent of employment is informal, and the proportion is 68.2 percent in Asia and the Pacific Bonnet, Vanek, Chen, et al. (2019). Despite shifts in economic structures and the emergence of formal sectors, the informal economy has remained resilient, adapting to changing circumstances, and serving as a crucial source of employment, especially for marginalized communities and those with limited access to formal employment and entrepreneurial opportunities.

There are economic, social, and cultural factors why the informal sector is growing in the developing world today. According to De Soto et al. (1989), lack of access to formal jobs due to high unemployment, low skills, or discrimination forces individuals into informal work for survival. Since informal economies thrive on existing social networks, remaining informal provides re-

sources and customers to entrepreneurs Portes and Sassen-Koob (1987). Furthermore, as highlighted by Varshney (2011), the informal sector emerges as the major employment option for women, driven by restricted access to formal employment opportunities and childcare responsibilities.

This research is crucial as it explores the significant impact of informal firms on the productivity of formal firms in Nepal. The informal sector, which operates outside the regulatory framework, often competes directly with formal firms for resources, labor, and market share. In this paper, I study the effect of competition from the informal economy, hereafter referred to as the informal sector, on the total factor productivity (TFP) of formal firms. My goal is to understand to what extent the informal sector affects the efficiency and, consequently, the productivity of formally registered firms. To investigate this, I utilize data from the World Bank Enterprise Survey for Nepalese firms. Nepal is a low-income country where more than 80 percent of economic activity occurs in the informal sector Adhikari (2018). Understanding these dynamics is essential because the informal sector constitutes a large portion of the economy in many developing countries, including Nepal. The presence of informal firms can influence the operational efficiency and overall productivity of formal firms, potentially affecting economic growth and development policies. This study's findings will provide valuable insights for policymakers aiming to enhance the business environment and promote sustainable economic development in Nepal.

The primary objective of this study is to investigate the effects of competition from informal firms on the total factor productivity (TFP) of formal firms in Nepal. Specifically, the study aims to (1) measure the extent of com-

petition from informal firms, (2) quantify its impact on the productivity of formal firms, and (3) identify the channels through which this competition affects formal firms' performance. By achieving these objectives, the research will contribute to a better understanding of the interplay between the informal and formal sectors and offer evidence-based recommendations for policy interventions.

This thesis is structured into five main chapters. The introduction provides the context, motivation, and objectives of the study. The literature review synthesizes existing research on the informal sector and its impact on formal firms, identifying gaps that this study aims to fill. The methodology chapter outlines the research design, data sources, and analytical techniques employed to investigate the research questions. The results and discussion chapter presents the empirical findings and interprets them in the context of the theoretical framework and existing literature. Finally, the conclusion summarizes the key findings, discusses their implications for policy and practice, and suggests directions for future research. This structured approach ensures a comprehensive exploration of the research topic and facilitates a clear and logical presentation of the study's contributions.

2 LITERATURE REVIEW

Lewis et al. (1954) dual perspective on informality perceives the formal and informal economies as predominantly separate entities, producing distinct goods through varied inputs of labor, capital, and entrepreneurship and cater-

ing to different customer bases. La Porta and Shleifer (2014) provides further evidence that, as formal firms are obliged to comply with regulations and pay taxes, informal firms are reluctant to convert into formal entities, even when encouraged through subsidies. They emphasize that informal firms are inherently too small and inefficient to compete with formal counterparts. As the economy grows, informal firms are replaced by formal ones, and it is the formal firms that contribute to economic growth, rather than the informal ones.

The parasite view asserts that the informal sector is fundamentally detrimental to the economy. Farrell (2004) highlights that informal firms deliberately remain small to evade detection, compromising their efficiency in production. However, the view contends that the substantial cost advantage gained through the avoidance of taxes and regulations outweighs their inherent drawbacks, allowing informal firms to undercut formal firms in terms of pricing. Informal firms hinder formal firms by capturing market share and remaining stagnant in terms of productivity growth. This "parasite" nature not only impedes economic progress but also hampers entrepreneurial development. Farrell (2004) additionally suggests that the government should strive to eliminate informal firms through tax interventions and stricter regulations.

Mendi and Costamagna (2017) finds that competition originating from the informal sector positively influences the innovation of formal firms; however, there is only a positive marginal effect on innovation at low levels of competitive pressure, which diminishes as the intensity of competition increases. In contrast to the "parasite view," De Soto et al. (1989) proposes a "romantic" view of the informal sector where informal sectors are brimming with

innovation and harbor the potential to reach the efficiency levels of formal firms. However, their transition is held back by government regulations, limited access to finance, and insufficient legal property rights. With adequate regulations, informal firms can expand and spark economic growth.

There is an ample body of literature elucidating the impact of competition on firms, which highlights its positive aspects, such as fostering innovation, efficiency, and improved product quality ((Nickell, 1996), (Blundell, Griffith, & Van Reenen, 1999)). Simultaneously, it also underscores the potential negative repercussions, including market saturation, pricing pressures, and sustainability challenges. Furthermore, an existing body of literature explores the impact of competition from the informal sector on various productivity measures, such as labor productivity. Notably, Amin and Okou (2020) demonstrate that, on average, the labor productivity of informal firms is approximately one-fourth that of formal firms. Importantly, their findings remain robust across diverse firm and country characteristics, with additional checks addressing potential endogeneity concerns. This paper makes a unique contribution by addressing a gap in the current literature—specifically, the absence of research measuring the impact of competition from informal firms on the total factor productivity of formal firms. This exploration adds novel insights to our understanding of the dynamics between informal and formal sectors.

3 DATA

The Nepalese firm-level data used for this study for the years 2009 and 2013 were extracted from The World Bank Enterprise Survey (ES)[1]. Since 2002, the World Bank has been systematically gathering firm-level data across more than 130 countries and 130000 firms. The surveys are conducted among a representative sample of formal or registered firms with 5 or more employees within the formal non-agricultural and non-financial private economy. This includes small, medium, and large enterprises across diverse sectors, including manufacturing, services, transportation, and construction. The sample design of the ES is based on stratified random sampling. In the case of the Nepalese Economic Surveys (ES), three levels of stratification are employed: the sector of activity (Manufacturing, Retail, Service), size (Small, Medium, Large), and location (East, Central, West). We focus only on the manufacturing sector to keep the sample relatively homogeneous.

For our baseline results, the sample consists of ...

3.1 Dependent Variable

Numerous metrics exist for evaluating firms' productivity — labor productivity, return on investment, total factor productivity — each possessing its distinct strengths and weaknesses. The selection among these metrics is contingent upon the intended purpose of the productivity measurement and,

1 World Bank Enterprise Surveys, http://www.enterprisesurveys.org

often, the availability of data. In my study, I utilize total factor productivity (TFP) as the measure of firm productivity.

TFP at the firm level will be calculated using the Levinsohn and Petrin (2003) method. I use intermediate inputs to proxy the unobservable productivity variable. This approach allows me to correct the simultaneity bias in the choice of inputs, whereas ordinary least square estimates of production functions are biased and lead to biased estimates of productivity. The mathematical specification for the calculation is given below:

Consider the Cobb-Douglas production function,

$$Y_{it} = A_{it} L_{it}^{\beta_1} K_{it}^{\beta_2} Q_{it}^{\beta_4} \tag{1}$$

where Y_{it} stands for output for the firm i at time t and A_{it} stands for productivity for the firm i at time t. Similarly, L, K and Q stand for labor, capital and intermediate input, respectively. Taking the natural logarithm of the above equation yields:

$$y_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_q q_{it} + w_{it} + \varepsilon_{it} \tag{2}$$

where $va_{it} = y_{it} - \beta_q q_{it}$ represents the natural logarithm of the value added.

Estimating the above Eqs. (1) or (2) using OLS will lead to biased coefficients of labor and capital since each firm's input choice will be correlated with its productivity. On average, the coefficient for labor is overestimated and the coefficient for capital is underestimated when estimated by OLS. In or-

der to obtain consistent estimates of the input coefficients β_l and β_k I will employ the Levinsohn and Petrin (2003) methodology. Then, I will use these estimates to derive the natural logarithm of the TFP for each firm using the following equation:

$$\log TFP_{it} = va_{it} - \beta_l l_{it} - \beta_k k_{it} \tag{3}$$

where β_l and β_k are coefficients for labor and capital estimated by using the Levinsohn and Petrin (2003) method, respectively. After estimating log TFP, I normalize it by its average.

3.2 Independent Variable

The Enterprise Surveys (ES) questions whether firms compete against informal sector entities. This is going to be my main explanatory variable. Specifically, they ask: *Does This Establishment Compete Against Unregistered Or Informal Firms?*

One of my main control variable is firm size, which is the log of the total number of employees in the firm during the last fiscal year. Firm size has a significant impact on firm productivity, as evidenced by various studies. Pagano and Schivardi (2003) found that a larger firm size fosters productivity growth, enabling firms to take advantage of increasing returns associated with research and development. Moreover, Bartelsman, Haltiwanger, and Scarpetta (2009) discussed the correlation between firm size and productivity, emphasizing the variations in this correlation across different countries.

Next, we account for the top manager's experience as a control variable, which is used as proxy for the human capital. Lazear (2004) argued that experience contributes to the accumulation of tacit knowledge, which is essential for decision-making and problem-solving in complex and uncertain environments. In the specific context of Nepal, where the education system is perceived to be poor, the relevance of experience as a proxy for human capital becomes even more pronounced. Research by Winkelman, Kelley, and Savrin (2012) suggested that in settings with inadequate educational infrastructure in advanced nursing practicing, experience serves as a critical mechanism for skill development and knowledge acquisition. This is particularly relevant for top managers who are responsible for strategic decision-making and leadership within organizations.

I also control for export size, which is the amount of net export a firm conducts in the last financial year. Using firm-level data from chemical industries in the United Kingdom, Yu (2004) find that exporters are more productive than non-exporters, and the superior productivity performance among exporters appears to be caused by both self-selection and learning-by-exporting effects.

I also use access to credit as a control variable. It is a dummy variable where the firms are questioned *At this time does this establishment have a line of credit or a loan from a financial institution?*.Love and Gatti (2006) find that firms that have access to credit or overdraft facilities are positively and strongly associated with total factor productivity in firms in Bulgaria.

One of my important control variables is whether the firm sells only one product in the market. More specifically, the survey asks the firm, *In the*

last fiscal year, what was this establishment's main product, that is, the product that represented the largest proportion of annual sales? This is a continuous variable; however, I turn it into a dummy variable if the answer to the question is 100%. Delgado, Fariñas, and Ruano (2002) find that firms that sell only one product have higher total factor productivity due to the specialization they can achieve over a single product. These results are documented based on Spanish firm-level data from 1991-1996.

I also control for the usage of foreign technology in the firm's production process. Sharma and Mishra (2022) find that firms that engage in R&D and foreign technology transfer have a competitive edge in terms of productivity, and thus foreign technology plays a significant role in output growth.

My next control is related to the business environment in Nepal. In order to proxy for this, I use tax burden in Nepal as my variable, i.e., *How Much Of An Obstacle: Tax Rates* answer to which is a categorical variable that ranges range from 0, which signifies no obstacle at all, to 4, indicating a very severe obstacle.

4 METHODOLOGY

In this paper, I perform an empirical analysis on data from 158 Nepalese firms to show the effect of competition from informal firms to the total factor productivity of formal firms. To do so, I utilize panel regression to estimate eight different specifications. The general form of the regression equation is presented below:

Table 1: Summary Statistics of the variables

Variable	N	Mean	Std Dev	Min	25th percentile	Median	75th percentile	Max
Informal	182	0.34	0.48	0.00	0.00	0.00	1.00	1.00
Size	182	58.62	76.78	4.00	15.00	25.00	48.50	900.00
Experience	182	17.90	11.30	1.00	10.00	15.00	25.00	43.00
Export	182	9.51	24.13	0.00	0.00	0.00	0.00	100.00
Credit	182	0.51	0.50	0.00	0.00	1.00	1.00	1.00
one product	182	0.51	0.50	0.00	0.00	1.00	1.00	1.00
Foreigntech	182	0.07	0.25	0.00	0.00	0.00	0.00	1.00
Tax burden	182	1.31	1.03	0.00	0.00	1.00	2.00	4.00

$$\mathrm{lntfp}_{it} = \beta_0 + \beta_1 \mathrm{comp}_{it} + \gamma X_{it} + \alpha_i + \varepsilon_{it} \tag{4}$$

Where:

lntfp_{it} is the dependent variable for firm i at year t,

comp_{it} is the main independent variable for firm i at year t,

X_{it} is the set of controls that include exper, credit, size, tech, tax, permit and local

α_i is the random effect for firm i,

ε_{it} is the error term.

The regression is estimated using a random effects model on the panel data. The rationale for using a random effects model is based on the Durbin–Wu–Hausman test.

5 RESULTS AND DISCUSSION

Table 2 shows the results of the regression equation (4), which illustrates the effect of informal competition on the Total Factor Productivity of formal firms in Nepal. Column (1) presents the point estimate for the baseline specification. In columns (2) to (8), I present the results after controlling for experience, credit, size, foreign technology, tax burden, business permit, and local base, respectively. In all specifications, the coefficient for informal competition is statistically significant. The point estimate for informal competition in the baseline specification is 0.400 and is significant at 1% level, which implies that formal firms competing with informal firms see their Total Factor Productivity increase by 49%.

Regarding various controls, the size of the firms is very negative and statistically significant to the total factor productivity of the firm. Firms that have taken credit from financial institutions have greater Total Factor Productivity. There are also differences in the productivity of firms that only sell one product in the market, as firms that only sell one item have significantly less productivity than firms that sell more than one. I find that firms that integrate foreign technology into their production process also have significantly lower Total Factor Productivity, and lastly, firms that have a big tax burden tend to perform better in terms of productivity. Overall, with all the controls, formal firms competing with informal firms see their Total Factor Productivity increased by 27%. and is significant at 10% level.

These results support the 'romantic view' of informal competition, suggesting that informal firms play a crucial role in fostering a dynamic and compet-

itive business environment. Contrary to the 'parasite view,' which posits that informal firms undermine formal firms, the 'romantic view' argues that informal firms can enhance overall economic efficiency by providing flexible and innovative solutions that meet market demands. In the context of Nepal, informal firms often fill gaps in the market by offering goods and services that formal firms might not provide due to regulatory constraints or higher operational costs. This complementary relationship can stimulate competition, driving formal firms to improve their productivity and efficiency to maintain their market position.

Comparing these findings with existing literature, we observe that studies in other developing economies, such as those by de Soto (1989) and Gerxhani (2004), also highlight the positive aspects of informal sector activities. These studies suggest that informal firms can act as incubators for entrepreneurial talent, offering a pathway for small businesses to grow and eventually formalize. The specific context of Nepal, with its unique economic challenges and a large informal sector, provides a valuable perspective on how informal firms contribute to economic resilience and adaptability. In Nepal, informal firms often operate in sectors where formal firms are less prevalent, thereby expanding the overall economic landscape and creating job opportunities.

The positive impact of informal competition highlights the need for nuanced policy interventions that recognize the contributions of informal firms while addressing their challenges. Policymakers could consider creating a more inclusive regulatory environment that encourages the formalization of informal firms without imposing prohibitive costs. Providing access to credit, business training, and infrastructure support could help informal firms tran-

sition into the formal sector, thereby enhancing their productivity and growth potential. Additionally, policies that facilitate better integration of informal firms into formal supply chains can create synergistic benefits for both sectors.

6 CONCLUSION

The positive impact of informal competition highlights the need for nuanced policy interventions that recognize the contributions of informal firms while addressing their challenges. Policymakers could consider creating a more inclusive regulatory environment that encourages the formalization of informal firms without imposing prohibitive costs. Providing access to credit, business training, and infrastructure support could help informal firms transition into the formal sector, thereby enhancing their productivity and growth potential. Additionally, policies that facilitate better integration of informal firms into formal supply chains can create synergistic benefits for both sectors.

Future research should explore additional dimensions of informal-formal sector interactions, such as innovation diffusion, customer satisfaction, and social capital formation, to provide a deeper understanding of the benefits informal firms bring to the economy. Longitudinal studies examining the transition pathways of informal firms into the formal sector could offer insights into the factors that facilitate successful formalization. Comparative studies across different regions within Nepal and other developing countries

could further illuminate the diverse impacts of informal competition on formal firms and overall economic development.

In conclusion, this study underscores the potential positive impact of informal firm competition on the productivity and dynamism of formal firms in Nepal, aligning with the 'romantic view' prevalent in some economic theories. The unique economic context of Nepal reveals how informal firms can complement formal sector activities and contribute to a more robust and adaptive economy. By adopting inclusive and supportive policies, policymakers can harness the strengths of the informal sector, fostering a business environment that promotes innovation, resilience, and sustainable economic growth.

REFERENCES

Adhikari, D. B. (2018). Informal economy and poverty in urban nepal. *The Economic Journal of Nepal*, *41*(3), 12–24.

Amin, M., & Okou, C. (2020). Casting a shadow: Productivity of formal firms and informality. *Review of Development Economics*, *24*(4), 1610–1630.

Bartelsman, E., Haltiwanger, J., & Scarpetta, S. (2009). Measuring and analyzing cross-country differences in firm dynamics. In *Producer dynamics: New evidence from micro data* (pp. 15–76). University of Chicago Press.

Blundell, R., Griffith, R., & Van Reenen, J. (1999). Market share, market value and innovation in a panel of british manufacturing firms. *The review of economic studies*, *66*(3), 529–554.

Bonnet, F., Vanek, J., Chen, M., et al. (2019). Women and men in the informal

economy: A statistical brief. *International Labour Office, Geneva*, *20*.

Delgado, M. A., Fariñas, J. C., & Ruano, S. (2002). Firm productivity and export markets: a non-parametric approach. *Journal of International Economics*, *57*, 397-422. Retrieved from https://api.semanticscholar.org/CorpusID:7320641

de Soto, H. (1989). Hernando de soto. *The Other Path: The Invisible Revolution in the Third World," Harper Row, New York*.

De Soto, H., et al. (1989). *The other path*. Harper & Row New York.

Farrell, D. (2004). hidden dangers. *The McKinsey Quarterly*, *3*, 26.

Gerxhani, K. (2004). The informal sector in developed and less developed countries: A literature survey. *Public choice*, *120*(3), 267–300.

La Porta, R., & Shleifer, A. (2014). Informality and development. *Journal of economic perspectives*, *28*(3), 109–126.

Lazear, E. P. (2004). Balanced skills and entrepreneurship. *American Economic Review*, *94*(2), 208–211.

Levinsohn, J., & Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. *The review of economic studies*, *70*(2), 317–341.

Lewis, W. A., et al. (1954). Economic development with unlimited supplies of labour.

Love, I., & Gatti, R. V. (2006). Does access to credit improve productivity? evidence from bulgaria. *Emerging Markets: Finance*. Retrieved from https://api.semanticscholar.org/CorpusID:153689680

Mendi, P., & Costamagna, R. (2017). Managing innovation under competitive pressure from informal producers. *Technological Forecasting and Social*

Change, *114*, 192–202.

Nickell, S. J. (1996). Competition and corporate performance. *Journal of political economy*, *104*(4), 724–746.

Pagano, P., & Schivardi, F. (2003). Firm size distribution and growth. *Scandinavian Journal of Economics*, *105*(2), 255–274.

Portes, A., & Sassen-Koob, S. (1987). Making it underground: Comparative material on the informal sector in western market economies. *American journal of Sociology*, *93*(1), 30–61.

Sharma, C. K., & Mishra, R. K. (2022). Foreign technology transfer, r&d and innovation: Resolving the technology–productivity conundrum. *Science, Technology and Society*, *27*, 630 - 654. Retrieved from https://api.semanticscholar.org/CorpusID:253056158

Varshney, S. (2011). Role of women in informal sector. *Economic affairs*, *56*(2), 177–181.

Winkelman, C., Kelley, C., & Savrin, C. (2012). Case histories in the education of advanced practice nurses. *Critical Care Nurse*, *32*(4), e1–e17.

Yu, Z. (2004). Globalisation , productivity and technology research paper 2004 / 01 firm level interactions between exporting and productivity : Industry specific evidence.. Retrieved from https://api.semanticscholar.org/CorpusID:186218179

7 APPENDIX

Table 2: Random effect Panel Regression Models Without any effect

	Dependent variable:							
	avetfp							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Informal	0.400***	0.342**	0.338**	0.353**	0.358**	0.250*	0.241*	0.243*
	(0.153)	(0.145)	(0.145)	(0.146)	(0.143)	(0.144)	(0.143)	(0.141)
log(Size)		−0.319***	−0.315***	−0.334***	−0.293***	−0.281***	−0.251***	−0.293***
		(0.065)	(0.066)	(0.068)	(0.068)	(0.067)	(0.068)	(0.069)
Experience			0.004	0.004	0.002	0.003	0.003	0.004
			(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
export				0.003	0.003	0.003	0.003	0.003
				(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Credit					−0.402***	−0.431***	−0.484***	−0.458***
					(0.138)	(0.136)	(0.137)	(0.135)
one_product						−0.409***	−0.393***	−0.350***
						(0.137)	(0.136)	(0.135)
Foreigntech							−0.581**	−0.629**
							(0.273)	(0.270)
Tax_burden								0.124**
								(0.051)
Constant	−0.138	0.962***	0.872***	0.912***	1.004***	1.205***	1.167***	1.095***
	(0.090)	(0.240)	(0.279)	(0.282)	(0.278)	(0.280)	(0.278)	(0.276)
Observations	182	182	182	182	182	182	182	182
R^2	0.036	0.149	0.151	0.156	0.195	0.234	0.253	0.277
Adjusted R^2	0.031	0.140	0.137	0.137	0.172	0.208	0.223	0.244
F Statistic	6.831***	31.558***	31.859***	32.985***	42.800***	53.661***	59.249***	66.712***
Note:								*p<0.1; **p<0.05; ***p<0.01

Table 3: Fixed effect model

	Dependent variable:							
	avetfp							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Informal	0.662**	0.753**	0.769***	0.734**	0.731**	0.705**	0.705**	−0.089
	(0.288)	(0.289)	(0.287)	(0.284)	(0.285)	(0.288)	(0.288)	(0.165)
local		0.547*	0.658**	0.628*	0.630*	0.622*	0.622*	0.080
		(0.316)	(0.323)	(0.319)	(0.321)	(0.322)	(0.322)	(0.178)
Experience			0.024	0.023	0.022	0.028	0.028	−0.004
			(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.010)
Credit				−0.461*	−0.476*	−0.449	−0.449	−0.043
				(0.271)	(0.273)	(0.285)	(0.285)	(0.158)
log(Size)					−0.181	−0.120	−0.120	−0.003
					(0.313)	(0.319)	(0.319)	(0.171)
Foreigntech						−0.364	−0.364	−0.263
						(0.602)	(0.602)	(0.335)
export						−0.014	−0.014	0.007
						(0.015)	(0.015)	(0.008)
Tax_burden								−0.028
								(0.065)
Observations	183	183	183	183	183	183	183	183
R^2	0.064	0.099	0.124	0.156	0.160	0.175	0.175	0.035
Adjusted R^2	-1.185	-1.130	-1.098	-1.047	-1.065	-1.084	-1.084	-1.509
F Statistic	5.302** (df = 1; 78)	4.213** (df = 2; 77)	3.580** (df = 3; 76)	3.477** (df = 4; 75)	2.823** (df = 5; 74)	2.188** (df = 7; 72)	2.188** (df = 7; 72)	0.318 (df = 8; 70)

Note: *p<0.1; **p<0.05; ***p<0.01

Figure 1: Heterogeneity of Productivity across two years

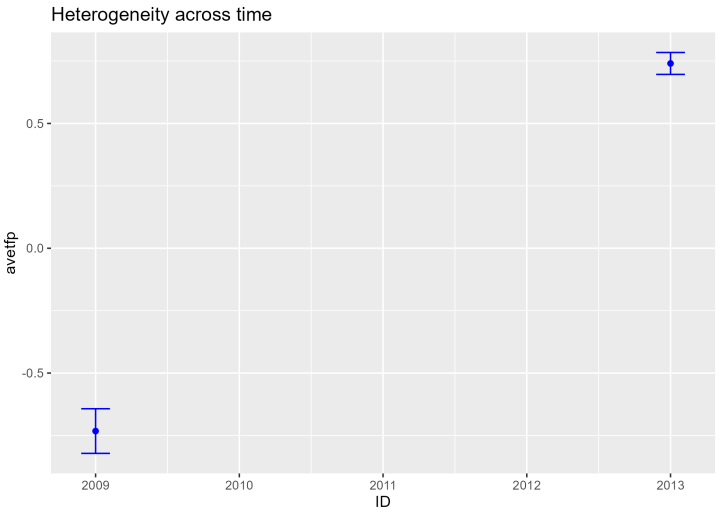

Figure 2: Histograms of Independent Variables

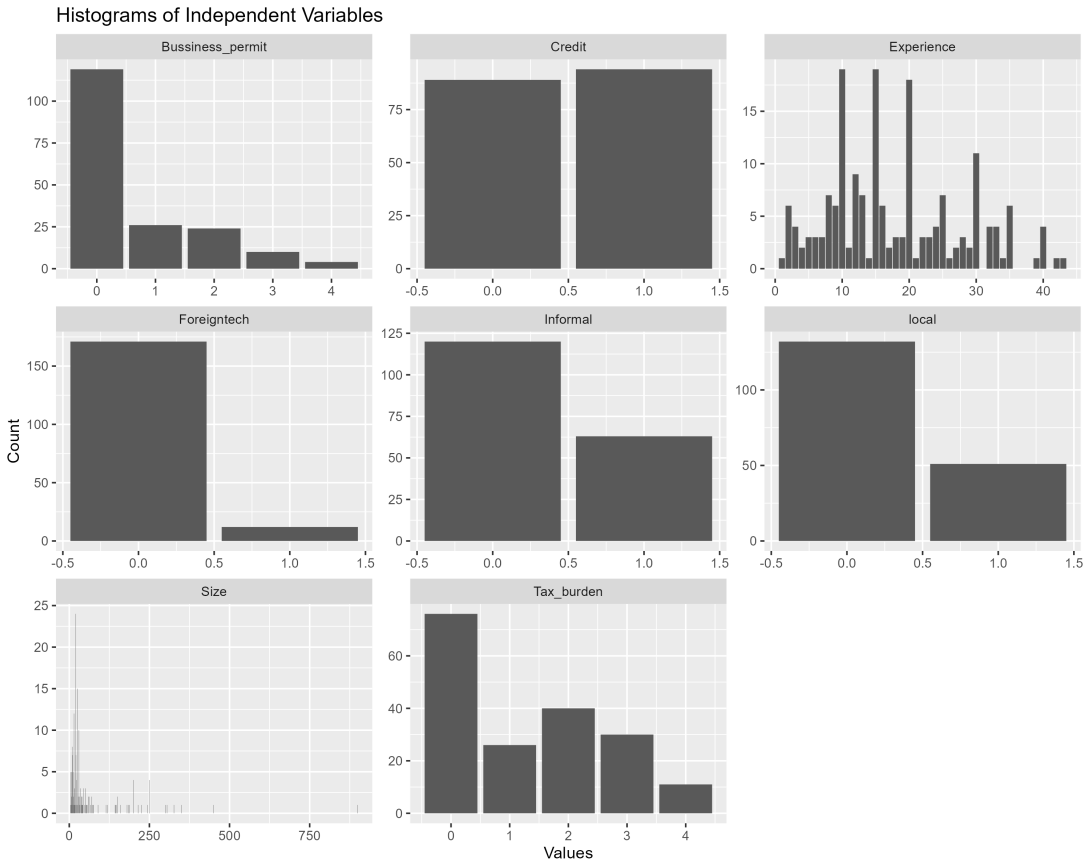

Figure 3: Relation between Dependent and Independent Variable