Assessing the Productivity-Investment Nexus in Informal Economy: Evidence from India

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Abstract

Capital investment is deemed as one of the key factors in boosting the growth of a business. This study attempts to examine the relationship between productivity and capital investments in various sectors of the informal economy, utilizing unit-level data from the Annual Survey of Unincorporated Sector Enterprises (ASUSE) 2023-24. The primary objective is to assess how capital investment influence productivity in informal firms, with particular attention to sectoral and operational distinctions. The analysis also incorporates auxiliary variables such as the adoption of information and communication technology (ICT) and access to financial assistance. The findings reveal a statistically significant association between capital investment and productivity across all three major sectors—manufacturing, trade, and services. However, the magnitude of the effect is notably higher for self-run establishments in the manufacturing sector, while the relationship is weak for establishments employing hired workers. Moreover, the study uncovers that ICT adoption and financial assistance significantly enhance productivity, particularly among self-operated businesses in the manufacturing and services sectors. Conversely, for establishments with hired labour, investment in human capital—through emoluments and wages—emerges as the primary driver of productivity gains. These findings contribute to our understanding of the complex dynamics between capital investment, productivity, and labour across different sectors and establishment types, offering implications for resource allocation and policy considerations.

Keywords: Informal Sector, Investment, Productivity, Efficiency, Capital

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1. Introduction

India's economic structure has evolved considerably since independence, transitioning from an agrarian foundation to a more diversified composition encompassing industry and services. The liberalization reforms initiated in 1991 played a pivotal role in accelerating this transformation, particularly in sectors such as information technology, telecommunications, finance, and real estate. Despite these developments, agriculture continues to employ a substantial proportion of the workforce, approximately 46% as of 2023–24, while manufacturing and construction together account for 23.4% (PLFS 2023–24). This suggests that structural change has progressed unevenly across sectors.

A notable characteristic of India's labour market is the predominance of informal employment. As of recent estimates from Periodic Labour Force Survey (PLFS), nearly 73% of the workforce is engaged in informal activities, spanning both agricultural and non-agricultural domains. In rural and semi-urban areas, informal enterprises often serve as primary sources of livelihood, particularly for individuals with limited access to formal employment opportunities. These micro and small enterprises, although constrained in scale and resources, contribute meaningfully to GDP and employment. According to Annual Survey of Unincorporated Sector Enterprises (ASUSE) 2023–24, the informal non-agricultural sector has approximately experienced annual growth rates of 10% in employment and 16% in Gross Value Added (GVA) during the period October, 2023- September, 2024 as compared to October 2022- September, 2023, indicating a degree of dynamism within this segment of the economy.

Nevertheless, several structural challenges persist. Limited access to capital, small operational scale, and low levels of technological adoption are among the key factors that inhibit productivity growth in informal enterprises. In response, the Government of India has introduced various policy initiatives aimed at enhancing financial inclusion and supporting entrepreneurship. Programs such as Rashtriya Mahila Kosh, MUDRA Yojana, PM SVANidhi, and the National Livelihood Missions offer credit facilities, skill development, and institutional support. While these schemes are intended to improve productivity and sustainability, their outcomes have varied, and comprehensive evaluations remain limited.

One of the important factors in driving productivity has been deemed to be capital investment. The relationship between capital investment and productivity has been widely studied in the context of formal enterprises, though findings are not always consistent. For instance, Moradi and Durabi (2012) reported a weak or negligible correlation between capital investment and productivity in manufacturing firms, whereas Funk and Strauss (2000) identified a stronger causal link from productivity to investment. In the Indian context, Dhawan (2002) have highlighted that smaller firms often have higher profit rates but face challenges like lower survival probabilities and limited access to capital markets. Studies by Goldar (2024), Basu and Sasidharan (2024), Rijesh (2023), Kathuria (2018), Rath (2018), and Chaudhuri, Koudal, and Seshadri (2010) have provided empirical insights into how capital investment influences productivity across various sectors of India's organized economy. However, the informal sector has received comparatively less attention in this regard.

The India KLEMS database provides a robust framework for analysing productivity trends across 27 industries, utilizing National Account Statistics (NAS), multiple rounds of the National Sample Survey (NSS), and Input-Output (I-O) tables (Reserve Bank of India, 2024).

It includes detailed measures of output, capital, labour, and intermediate inputs such as energy, materials, and services, classified according to internationally harmonized industrial standards. However, despite its comprehensive coverage, the database does not fully focus on the productivity dynamics of the unorganized sector, which remains underrepresented due to data constraints.

This gap in the literature is both empirical and conceptual. Informal enterprises operate under distinct conditions, including limited access to formal financing (Beck & Hoseini, 2014), minimal regulatory oversight (FICCI and Konrad- Adenauer- Stiftung, 2020), and informal labour arrangements (WIEGO, 2020). Investigating the impact of capital investment on productivity within this context is important for informed policy design and resource allocation. Additionally, other variables—such as the use of information and communication technologies (ICT), access to financial assistance, and investment in labour—may also influence productivity outcomes and merit examination.

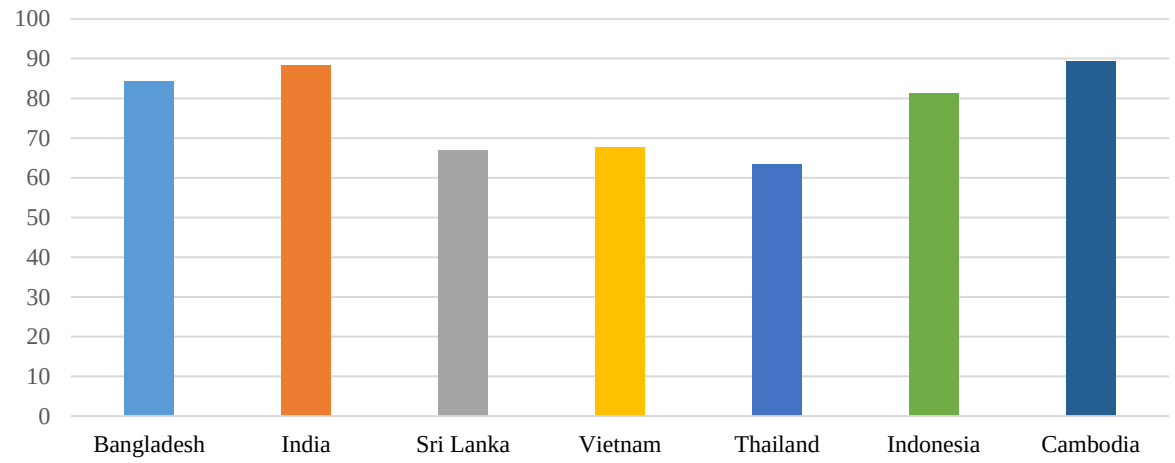
This study seeks to analyze the relationship between capital investment and productivity in India's informal sector, while also considering the roles of ICT adoption, access to credit, and labor investment. By addressing this research gap, the study aims to contribute to a more nuanced understanding of productivity determinants in informal enterprises and to offer insights that may inform future policy interventions. The subsequent sections provide an overview of the informal economy, outline the methodological framework, present empirical findings, and discuss implications for policy and further research.

2. Overview of the informal sector in India

Informality has no universally accepted single definition; it is generally conceived as something which maintains no legal records or cannot be found in any legal framework. The National Statistics Office (NSO) of India, measures absorption of workforce in the informal sector through PLFS which demarks the proprietary and partnership establishments as informal sector aligning with the definition of informal sector as put forward in the 15th International Conference on Labour Statisticians (ICLS) of the International Labour Organization (ILO).

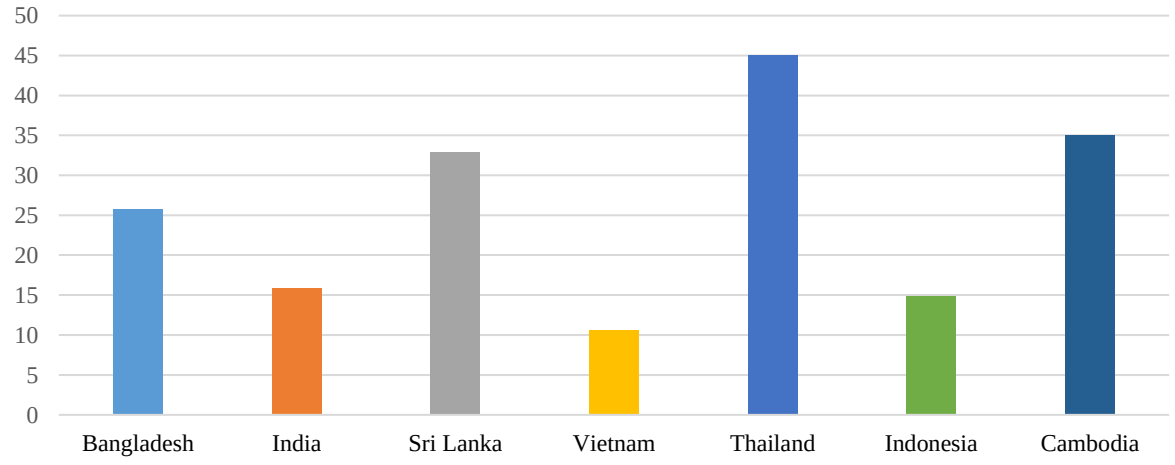
Informal sector plays a pivotal role in the developing countries as a sector that absorbs significant amount of labour from varied background. It is a space where the accumulation of women and unskilled workers is especially prevalent, driven by limited access to formal employment, education, and social protections (Cling et al. 2014; Shaikh, R, 2023). Here is a snapshot in Figure 1 which illustrates the percentage contribution of workers in the informal sector for various developing economies.

Figure 1: Share of Informal Employment (Percentage)
Source: ILOSTAT



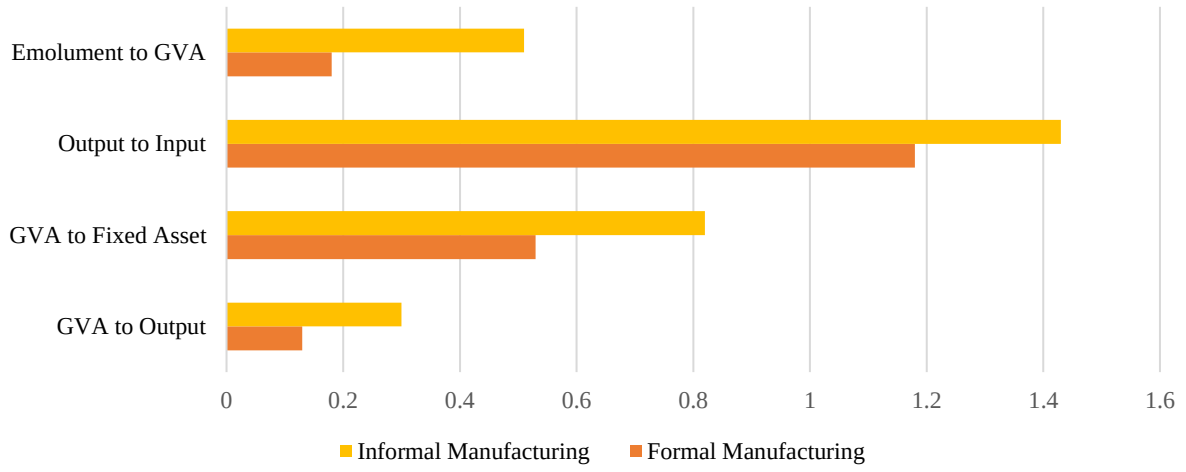
However, the contribution of the Gross Domestic Product (GDP) generated from the informal economy is not as pronounced as has been observed in the case of employment generation which is illustrated in *Figure* 2. Yet, the sector holds immense importance in the supply value chain and shows great potential in driving the nation forward.

Figure 2: Share of Informal GDP (Percentage)
Source: World Bank



The manufacturing sector is widely regarded as a cornerstone of economic development. Within this domain, formal and informal manufacturing segments often coexist in a symbiotic relationship. However, key disparities remain, particularly in terms of infrastructure and capital access, where informal manufacturing tends to lag behind its formal counterpart.

Figure 3: Ratio Estimates for Formal and Informal Manufacturing
Source: Annual Survey of Industries (for formal) & ASUSE (for informal)



As illustrated in *Figure 3*, structural and operational differences between the two segments are evident. Notably, the ratio of Gross Value Added (GVA) to Fixed Assets—an indicator of asset utilization efficiency—is higher in informal manufacturing. Similarly, the GVA-to-Output ratio suggests greater production efficiency among informal enterprises. These trends imply that informal manufacturers may be generating relatively more value from their limited asset base.

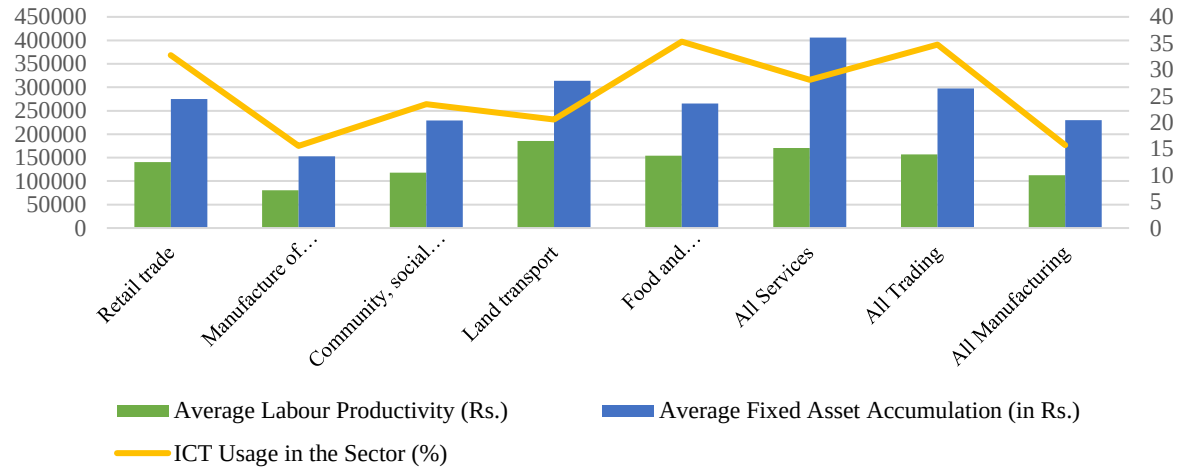
Conversely, when considering labour compensation, the emoluments-to-GVA ratio is significantly higher in informal manufacturing. Approximately 50% of GVA in this segment is directed toward employee remuneration—substantially more than in formal enterprises. This underscores the centrality of labour input in informal sector productivity and suggests a wage-centric operational model.

These distinctions underscore the importance of examining informal manufacturing through a dedicated lens. Applying insights from the formal sector without adjustment may lead to misinterpretation, as the underlying drivers of productivity, investment efficiency, and workforce dynamics differ meaningfully between the two segments.

Moving deeper into the unincorporated non-agricultural sector, *Figure 4* reveals wide variation in labour productivity and asset accumulation across major segments—Manufacturing, Trading, and Services—as well as among sub-sectors.

Notably, ICT adoption for business purposes is more prevalent in services and trading than in manufacturing. This disparity signals that sector-specific analysis is vital when examining how fixed asset accumulation correlates with labour productivity, and that a one-size-fits-all approach could lead to misleading conclusions.

Figure 4: Key Characteristics of Important Industries in Informal Sector
Source: ASUSE 2023-24



3. Data Description and Methodological Approach

Data Description:

The empirical analysis is based on unit-level data from the Annual Survey of Unincorporated Sector Enterprises (ASUSE) for the period 2023–24. ASUSE provides comprehensive information on operational and financial characteristics of unorganized enterprises in India, categorized into Own Account Enterprises (OAE) and establishments with Hired Workers (HWE). It covers those businesses which are not registered under Companies Act and thus includes in its coverage some establishments which are registered with other authorities (like ESIC, GSTN etc.) and also a very small proportion of establishments maintaining audited books of accounts. However, around 99% of the business covered in this survey are proprietary and partnership establishments which are mostly unregulated and self-employed, thus, emphasizing that it is great source of information for the assumed informal sector.

This study specifically utilizes data from **ASUSE 2023–24**, which was conducted during the period **October 2023 to September 2024**, covering **4,98,024 establishments** across rural and urban regions and encompassing three broad industrial categories: **manufacturing, trade, and other services**. Given the unorganized and informal nature of the sector, approximately **99% of the sampled establishments** provided **oral estimates** based on the reference period of the last **30 days**, while the remaining enterprises, typically larger or more formalized units, reported **audited annual financial data**.

Sample Size:

For the sake of model building, we used only those establishments which were operational during the canvassing period, which were market establishment, i.e., those establishments whose intention of running business was for generating profit and those establishments which either had a hired worker or were run by proprietor(s). Imposing such criteria, we ended up with a total of 497688 the breakdown of which is given below.

Table 1: Sample Size used in the Analysis

Industry	OAE	HWE
Manufacturing	96,258	30,911
Trade	92,182	31,298
Other Services	1,75,794	50,155

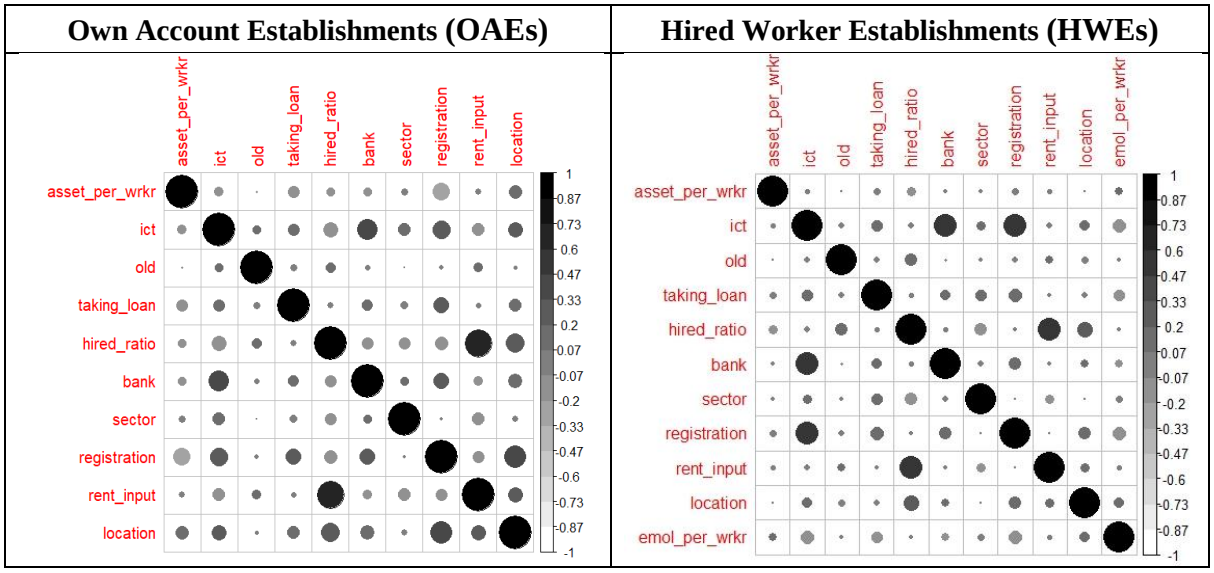
Variable Selection and Diagnostic Analysis:

The primary objective of this research is to examine the relationship between enterprise-level productivity, measured as output per worker, and capital investment in fixed assets measured through the value of owned fixed assets, with a secondary focus on evaluating the impact of ICT adoption, captured through a binary indicator for computer and/or internet usage. In addition, several control variables were incorporated into the analysis, selected based on existing literature and empirical evidence of their relevance to firm-level productivity. The initial set of explanatory variables thus comprises asset per worker, ICT usage (Yes/No), age of establishment (Younger than 3 years/Older than 3 years), loan availability (Yes/No) as indicator for financial assistance, hired asset ratio, as another indicator for capital investment but in terms of hiring, bank account ownership (Yes/No) as indicator for financial inclusion, urban location (Yes/No) an indicator for sectoral influence, legal registration status (Yes/No) an indicator for formalisation of the business, rental expenditure ratio, an indicator for recurring expenditure on capital investment, and household-based location (Yes/No). For establishments employing hired workers (HWEs), emolument per worker is additionally incorporated to capture human capital investment.

Given the list of independent variables outlined above, it is anticipated that certain variables may exhibit significant statistical inter-correlations, potentially resulting in multi-collinearity, which could distort coefficient estimates and undermine the validity of inference. To mitigate this issue, a diagnostic multi-collinearity analysis was conducted separately for Own Account Enterprises (OAEs) and Establishments with Hired Workers (HWEs) by evaluating the magnitude of linear association among explanatory variables. Correlogram plots for OAEs & HWEs are presented in Figure 5.

The analysis revealed stronger correlations, notably between ICT usage and bank account ownership, hired asset ratio and rental expenditure, and registration status and location. Subsequently, Variance Inflation Factors (VIFs) were computed, and variables with VIF values exceeding the threshold of 5 were dropped to mitigate from multi-collinearity. The final set of retained variables includes asset per worker, ICT usage, age of establishment, loan availability, hired asset ratio, urban location, and household-based location for OAEs while the same set along with emolument per worker for HWEs.

Figure 5: Correlogram Plot for detection of Multicollinearity



Model:

Our aim for this paper is to conduct an econometric analysis to assess the relationship between productivity and the variables of interest. We estimate a standard production function extended to include several establishment characteristics, denoted by X, using establishment level data:

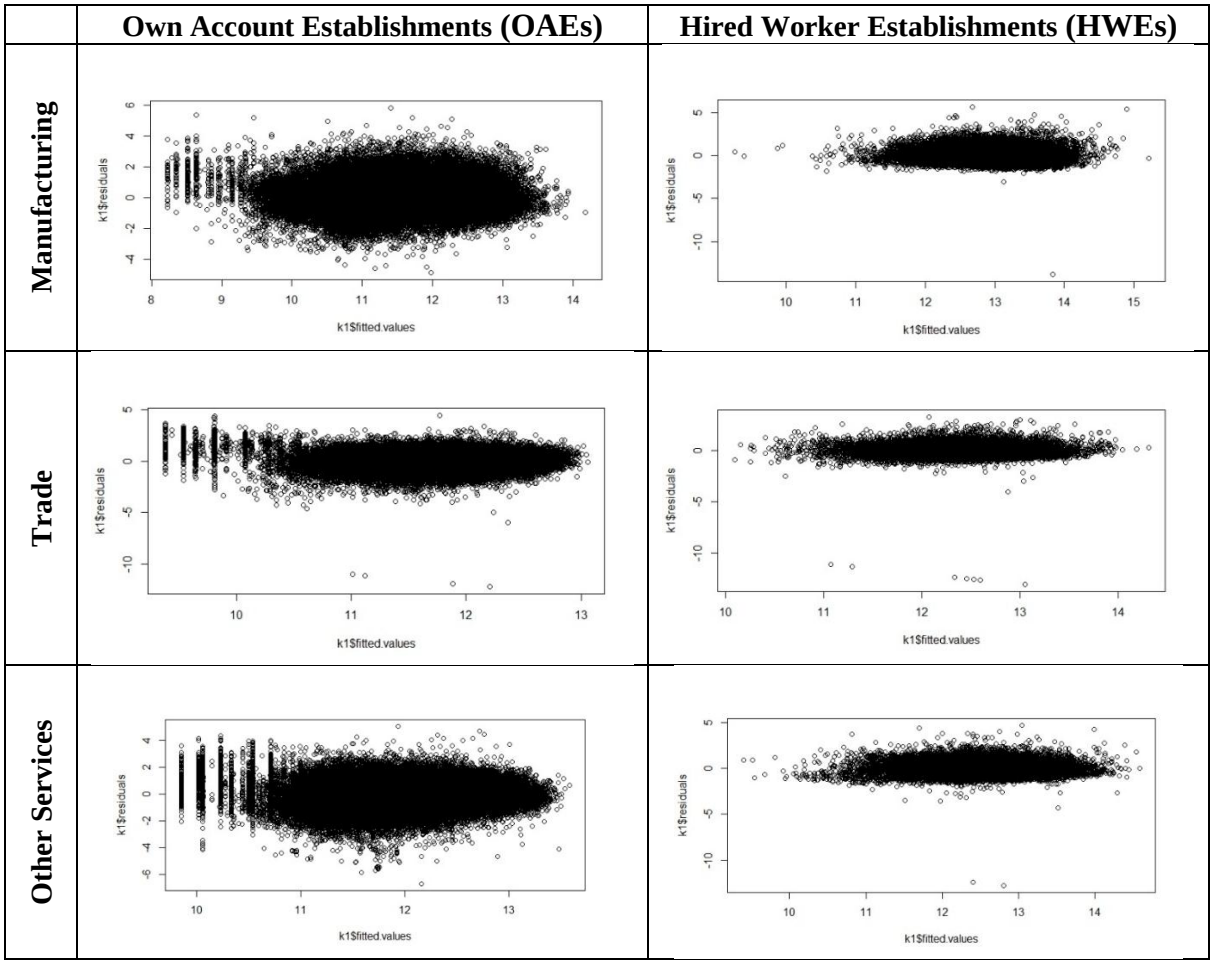
$$\ln(y_i) = \alpha + \sum \beta_j \ln X_{ij} + \sum \gamma_k W_{ik} + e_i \qquad (*)$$

where, i denotes the i-th establishment

In the above equation, α represents the log of the baseline total factor productivity (TFP), conditioned on the set of control variables. It is important to note that this is distinct from the unobserved TFP in the baseline model without control variables, as our model considers establishment characteristics that may contribute to variations in labour productivity. β is the coefficient of the continuous variables denoted by X and γ is the coefficient of binary variables used in the model denoted by W and e denotes the random factor which is unexplained by the control variables. The logarithmic transformation was chosen because residual plot analysis indicated that, when regressing on transformed data, the residuals (e_i) were normally distributed.

We have estimated 6 versions of equation (*); three models for Own Account Establishments (OAEs) for three broad sectors (manufacturing, trading and other services) and similarly for the Hired Worker establishments (HWEs). Each of the six models derived from Equation (*) was examined for the presence of heteroscedasticity. Diagnostic plots of residuals versus fitted values are presented below. In all cases, the residuals appear randomly dispersed around the zero-reference line across the range of fitted values, indicating no visible pattern suggestive of heteroscedasticity. Furthermore, the Breusch-Pagan test conducted on each model yielded statistically insignificant p-values, thereby confirming the absence of heteroscedasticity in all fitted models.

Figure 6: Plot of Residuals versus Fitted Response



4. Results

Descriptive Statistics:

Table 2 gives a snapshot of the summary of the variables used in model specifications in the form of aggregate values. It highlights that HWE businesses significantly outperform OAE in productivity, with 4-5 times higher annual output per worker and substantially higher fixed assets per worker. Also, it highlights that HWE establishments are more technology-oriented (46-64% use ICT vs 12-29% for OAE), more likely to be urban-based, and rely more heavily on hired assets, while OAE businesses predominantly operate from households with minimal external financing. This clearly suggests a prominent scale and productivity divide between businesses with employees versus informal single-operator establishments across all three sectors. In addition, sectoral variation has also been observed among all the variables used in our study.

Table 2: Descriptive Table for the Variables used in Analysis

Own Account Establishments (OAEs)			
Indicators	**Manufacturing**	**Trade**	**Other Services**
Average Annual Output per Worker (in Rs.)	1,48,852	1,69,436	2,51,290
Average Owned Fixed Asset per Worker (in Rs.)	19,412	27,865	92,278
Establishments using ICT (in %)	12	29	26
Establishments older than three years (in %)	80	79	80
Establishments having outstanding loan (in %)	3	11	7
Average Ratio of Hired Asset to Total Asset	9	22	14
Establishments located in Urban Sector (in %)	36	45	47
Establishments Operating within Household (in %)	80	27	25
Hired Worker Establishments (HWEs)			
Indicators	**Manufacturing**	**Trade**	**Other Services**
Average Annual Output per Worker (in Rs.)	7,07,639	2,95,113	3,86,574
Average Owned Fixed Asset per Worker (in Rs.)	72,536	44,697	1,01,911
Establishments using ICT (In %)	46	64	63
Establishments older than three years (in %)	82	82	79
Establishments having outstanding loan (in %)	16	18	12
Average Ratio of Hired Asset to Total Asset	38	47	39
Establishments located in Urban Sector (in %)	71	77	69
Establishments Operating within Household (in %)	13	6	10
Average Annual Emolument per Hired Worker (in Rs.)	84,539	69,902	77,708

Regression Results:

Across all three sectors, the log of Asset Owned per worker shows a highly significant positive correlation with log of output per worker ($p<0.001$), suggesting that higher capital intensity is indeed associated with greater productivity in own-account establishments (Table 3). The coefficient has been observed to be highest in Manufacturing (0.273), followed by Services (0.170) and Trading (0.188), suggesting that the productivity benefits of capital may be more pronounced in manufacturing.

Our second point of interest, ICT usage, has also been observed to be positively and significantly associated with output per worker in all three sectors ($p<0.001$). Using ICT is associated with an approximate increase in log output per worker of 25.2% in Manufacturing, 13.8% in Trading, and 21.6% in Services.

Table 3: Regression results for Own Account Establishments (OAE)

	Manufacturing		Trading		Services	
Variables	Coefficient	p-value (Standard Error)	Coefficient	p-value (Standard Error)	Coefficient	p-value (Standard Error)
Asset Owned per worker (log)	0.273	0.000	0.188	0.000	0.15	0.000
		(0.002)		(0.001)		(0.001)
ICT use	0.252	0.000	0.138	0.000	0.216	0.000
		(0.009)		(0.005)		(0.004)
Age of the Establishment	0.291	0.000	0.163	0.000	0.21	0.000
		(0.007)		(0.006)		(0.005)
Loan Availability	0.281	0.000	0.06	0.000	0.296	0.000
		(0.016)		(0.007)		(0.007)
Ratio of Hired Asset to Total Asset	0.005	0.000	0.005	0.000	0.005	0.000
		(0.000)		(0.000)		(0.000)
Sector (Urban)	0.123	0.000	0.263	0.000	0.169	0.000
		(0.006)		(0.005)		(0.004)
Location (within Household)	-0.819	0.000	-0.27	0.000	-0.482	0.000
		(0.008)		(0.005)		(0.004)
R^2	0.4636		0.3561		0.3932	
F-statistic (p-value)	11,886 (<0.001)		7,281 (<0.001)		16,271 (<0.001)	

We shall now briefly deliberate upon the control variables used in the model. It was observed that age of an establishments plays a significant role in driving productivity of a business. Findings from the analysis suggests that, holding other factors constant, own-account establishments older than 3 years have significantly higher log output per worker (approximately 29.1% higher in Manufacturing, 26.3% higher in Trading, and 21.0% higher in Services) compared to establishments that have been in operation for less than three years.

Loan availability is consistently and significantly positively associated with output per worker across all sectors ($p<0.001$). It has been observed to be associated with an approximate increase in output per worker of 28.0% for Manufacturing, 6.1% for Trading, and 39.6% for Services. This underscores the importance of access to finance for own-account enterprises to invest, expand, and improve their productivity.

This coefficient of *Ratio of Hired Asset to Total Asset* shows a significant positive relationship with output per worker in all three own-account sectors, though the coefficients are relatively low (0.003 for Manufacturing, 0.005 for Trading, and 0.005 for Services) and $p<0.001$. This indicates that even for own-account establishments, a higher proportion of hired assets can contribute to productivity, possibly by allowing access to specialized equipment without large capital outlays.

Being located in an urban sector, too, has an influence over productivity ($p<0.001$). Establishments located in urban areas have been observed to have significantly higher log output per worker compared to those in rural areas. The coefficients of 0.123 for Manufacturing, 0.263 for Trading, and 0.169 for Services suggest urban establishments have

approximately 12.3%, 26.3%, and 16.9% higher log output per worker, respectively. This implies that urban locations provide advantages such as better infrastructure, larger markets, and easier access to resources, leading to higher productivity.

Operating from within a household registered a significant negative relationship with productivity in Manufacturing (-0.119), Trading (-0.270), and Services (-0.482), all with $p<0.001$. This implies that, establishments operating within household have significantly lower log output per worker compared to those operating from dedicated commercial spaces (approximately 11.9% lower in Manufacturing, 27.0% lower in Trading, and 48.2% lower in Services).

Similar to own-account establishments, the log of Asset Owned per worker is a highly significant positive determinant of productivity ($p<0.001$). The coefficients are 0.123 for Manufacturing, 0.098 for Trading, and 0.095 for Services, indicating that capital investment tends to yield more substantial productivity improvements in manufacturing sectors (Table 4).

Table 4: Regression results for Hired Worker Establishments (HWE)

	Manufacturing		**Trading**		**Services**	
Variables	Coefficient	p-value (Standard Error)	Coefficient	p-value (Standard Error)	Coefficient	p-value (Standard Error)
Asset Owned per worker (log)	0.123	0.000 (0.003)	0.098	0.000 (0.002)	0.095	0.000 (0.002)
ICT use	0.149	0.000 (0.009)	0.048	0.000 (0.005)	0.009	0.108 (0.006)
Age of the Establishment	0.053	0.000 (0.011)	-0.009	0.155 (0.007)	-0.03	0.000 (0.006)
Loan Availability	0.278	0.000 (0.011)	0.081	0.000 (0.007)	0.198	0.000 (0.008)
Ratio of Hired Asset to Total Asset	0.000	0.287 (0.000)	0.002	0.000 (0.000)	0.003	0.287 (0.000)
Sector (Urban)	-0.046	0.000 (0.009)	0.068	0.000 (0.006)	0.138	0.000 (0.006)
Location (within Household)	-0.091	0.000 (0.013)	0.033	0.000 (0.011)	-0.074	0.000 (0.009)
Emolument per worker (log)	0.601	0.000 (0.007)	0.604	0.000 (0.004)	0.617	0.000 (0.004)
R^2	0.3100		0.4851		0.4527	
F-statistic (p-value)	1735 (<0.001)		3685 (<0.001)		5185 (<0.001)	

ICT usage is significantly and positively associated with productivity in Manufacturing (0.143, $p<0.001$) and Trading (0.048, $p<0.001$). For Services, while positive (0.009), it is not

statistically significant at conventional levels (p=0.108). This suggests that, holding other factors constant, hired worker establishments using ICT have significantly higher log output per worker in Manufacturing (approx. 14.3% higher) and Trading (approx. 4.8% higher) compared to those not using ICT. Its impact might vary across different hired worker sectors, potentially being more impactful in manufacturing and trading processes.

Findings from the control variable, age, suggests that, holding other factors constant, hired worker manufacturing establishments older than 3 years have approximately 5.3% higher output per worker. In contrast, hired worker service establishments older than 3 years have approximately 3.0% lower output per worker. The negative relationship in services is notable and contrasts with own-account establishments and hired worker manufacturing. It could indicate that newer service establishments, perhaps those adopting newer technologies or business models, are more productive, or that older service establishments face diminishing returns or are less adaptable.

Loan availability has also been observed to be a significant positive predictor of productivity in all sectors ($p<0.001$). Establishments with loan availability have registered significantly higher productivity compared to those without. Specifically, loan availability is associated with an approximate increase in log output per worker of 27.8% for Manufacturing, 8.1% for Trading, and 19.8% for Services, emphasizing the critical role of financial access for productivity in these businesses.

This *Ratio of Hired Asset to Total Asset* variable shows a significant positive association with output per worker in Trading (0.002, $p<0.001$) and Services (0.003, $p<0.001$), but the coefficient is negligible for Manufacturing with $p<0.001$. This suggests that for hired worker establishments, leveraging hired assets can marginally contribute to productivity in trading and services, but its effect is negligible in manufacturing.

Operating in an urban sector is consistently and significantly positively associated with higher productivity ($p<0.001$). The coefficients of 0.046 for Manufacturing, 0.068 for Trading, and 0.138 for Services suggest that hired worker establishments in urban areas have approximately 4.6%, 6.8%, and 13.8% higher log output per worker, respectively, compared to their rural counterparts.

Similar to own-account establishments, operating from within a household shows a significant negative relationship with output per worker in Manufacturing (-0.091, $p<0.001$) and Services (-0.074, $p<0.001$). However, for Trading, the coefficient is positive (0.033, $p<0.001$), suggesting that hired worker trading establishments operating within a household actually have approximately 3.3% higher output per worker. This positive relationship in hired worker trading establishments operating within a household is an interesting anomaly, possibly indicating that certain trading activities with hired workers might benefit from a home-based setup (e.g., lower overheads, direct supervision, etc.).

Investment in labour capital shows a very strong and highly significant positive relationship with productivity across all sectors ($p<0.001$). The coefficients are substantial (0.601 for Manufacturing, 0.604 for Trading, and 0.617 for Services). The findings suggest that better

compensated workers are more productive, or that higher productivity allows for higher compensation.

5. Discussion

The findings of this study provide a robust empirical basis for understanding productivity determinants within India's unincorporated sector, revealing both universal drivers and sector-specific nuances. The results are largely consistent with established economic literature and offer critical insights for policy formulation.

A central and compelling finding is the unequivocal importance of capital investment as key engines of productivity. Our result that a higher capital-labour ratio (as measured by the log of assets per worker) is a primary driver of output is a fundamental tenet of economic theory, aligning with the Solow-Swan model (Solow, 1956) and other neoclassical growth frameworks. This capital accumulation process is intrinsically linked to the significant positive effect of loan availability. Our findings show that enterprises with access to loans have significantly higher productivity, confirming that financial services are a key channel through which unincorporated businesses can acquire the necessary capital for investment and expansion. This also empirically supports concerns raised by the World Bank regarding the need for finance to enable an inclusive economic recovery (World Bank, 2020).

The roles of human capital and technology adoption also emerge as significant factors, albeit with some sector-specific variations. For establishments with hired workers, the strong positive correlation between the emoluments per worker and productivity supports both Human Capital Theory (Becker, 1964) and efficiency wage theory (Stiglitz, 1987). Higher compensation likely attracts and retains more skilled labour, while also increasing worker motivation and effort. The adoption of ICT consistently shows a positive and significant impact on output per worker, particularly in own-account establishments. This finding aligns with literature that confirms the sustained positive impact of digital technologies on enterprise performance, even in informal and resource-constrained environments. Notably, Gupta and Kumar (2018) leveraged data from the National Statistics Office to reveal that even small-scale enterprises—often limited in technological reach—experience notable gains in both firm-level and labor productivity through ICT integration. Further, Aterido et al. (2018) provide cross-country evidence that ICT use significantly boosts productivity and employment outcomes, especially for small and medium enterprises operating in developing economies. Their findings reinforce the argument that digital inclusion is a key lever for economic empowerment and competitiveness in informal sectors.

The analysis of location-specific variables highlights the heterogeneous landscape of the unincorporated sector. The consistently positive and significant coefficients for an urban location provide strong empirical support for agglomeration economies, a concept central to the field of New Economic Geography (Krugman, 1991). Urban areas provide clear productivity advantages through better infrastructure, larger markets, and access to a denser network of labour and knowledge (Glaeser & Resseger, 2010). The urban advantage amplifies

the impact of ICT adoption, creating an ecosystem where technology-driven growth is more feasible and sustainable. (World Bank, 2017).

While many of our findings are consistent with established economic theory, several results are particularly nuanced and even contrast with common expectations in the literature. The most striking of these is the relationship between the age of establishment and productivity. For most sectors, older establishments are more productive, a finding consistent with the concept of "learning-by-doing". However, for hired worker service establishments, being older is associated with a negative and significant coefficient. This finding challenges the conventional view of accumulated experience as a universal source of productivity gains. Instead, it suggests a process of creative destruction, where newer, more agile firms are better equipped to adapt to new technologies and business models, thus outperforming older, less flexible competitors (Schumpeter, 1942). This is further supported by recent studies on firm dynamics that link innovation to growth and highlight that older firms may struggle to innovate (Coad et al., 2016). In line with this, Huergo and Jaumandreu (2004) demonstrate that the probability of innovation tends to decline as firms age—young and mid-life firms show higher innovation activity, while older firms, often constrained by organizational inertia and risk aversion, innovate less. This decline in innovation capacity reinforces the notion that age may hinder not just adaptability, but also the pursuit of productivity-enhancing advancements.

A notable exception to general findings is the positive and significant effect of household location on hired worker trading establishments. This result contrasts with much of the existing literature, which identifies home-based operations as a growth constraint due to limited space and inadequate commercial infrastructure (Henderson, 2002). Yet, findings from Muthusamy and Ibrahim (2016) reveal that home-based workers in India's informal sector remain among the most vulnerable—receiving low wages under piece-rate systems, lacking legal protection, and possessing limited bargaining power. Despite these disadvantages, the present result suggests that for certain trading activities, a home-based business model may confer competitive advantages through reduced overhead costs and streamlined, family-based supervision of hired labour. Such a paradox underscores the need for a more granular, sector-specific understanding of informal economy dynamics.

While this study provides important insights, several limitations should be noted. The cross-sectional nature of the data limits our ability to make causal inferences. Additionally, it would be interesting to perform a detailed analysis for different industries under each broad sectors of the economy. Future research using longitudinal data could provide additional insights into the dynamics of productivity determination.

6. Conclusion

This study highlights the pivotal role of fixed capital and human capital in driving productivity among unincorporated small enterprises, with particularly strong effects observed in the manufacturing sector—a cornerstone of India’s journey toward *Viksit Bharat*. The empirical evidence underscores the need for targeted policy interventions and improved financial

accessibility to support business investment. These mechanisms are essential for strengthening the informal economy, enabling structural transformation, and enhancing productivity within a traditionally underperforming segment. In doing so, they contribute meaningfully to broader developmental goals and sustainable economic growth.

The findings offer a nuanced understanding of the productivity dynamics within India's unincorporated sector. They emphasize the importance of multifaceted policy approaches, especially those that expand access to formal finance, encourage capital investment, foster ICT adoption and digital literacy, and promote regionally balanced development to bridge the urban–rural divide.

Furthermore, the study reveals significant variations in productivity outcomes based on establishment age and household location, illustrating the limitations of uniform policy frameworks. Instead, the evidence advocates for tailored, sector-specific strategies that reflect the diverse realities of informal enterprises—maximizing their productivity potential and aligning with inclusive growth objectives.

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