



# The Impact of Cluster Development Initiatives on Non-Financial Performance of SMEs: Evidence from a Quasi-Experimental Study in Tanzania

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**Abstract:** *Small and Medium Enterprises (SMEs) are vital to Tanzania's economy, yet they face persistent growth constraints including limited technological adoption, weak collaboration, and fragmented institutional linkages. Cluster Development Initiatives (CDIs) have been promoted as a mechanism to enhance SME competitiveness through agglomeration and resource sharing. However, empirical evidence on their impact on non-financial performance remains underexplored, particularly in sub-Saharan Africa. This study addresses a critical gap in the literature by investigating whether and how CDIs influence the non-financial dimensions of SME performance, specifically technology use, intra-cluster collaboration, and external linkages, amidst significant regional disparities in Tanzania. Using a quasi-experimental design, we collected primary data from 308 SMEs across three regions (Singida, Mbeya, Morogoro). A Difference-in-Differences (DID) model was employed to compare SMEs within CDIs (treatment) with those outside (control). Mixed methods, including surveys, interviews, and focus groups, were integrated to capture both quantitative and qualitative insights. CDIs significantly improved non-financial performance, though effects varied regionally. Morogoro showed the strongest gains in technology (DID=2.666,  $p<0.01$ ) and collaboration (DID=10.58,  $p<0.01$ ). In contrast, Singida and Mbeya exhibited limited technological progress (DID=1.281 and 0.352, respectively). Linkages improved significantly in Morogoro (DID=6.035,  $p<0.01$ ) and Singida (DID=5.501,  $p<0.01$ ), but not in Mbeya's sunflower oil cluster. The findings highlight that CDIs can foster SME upgrading, but their effectiveness is moderated by regional infrastructure, institutional engagement, and cluster governance. Where physical proximity, shared facilities, and stakeholder coordination were present, as in Morogoro, performance improved markedly. Elsewhere, structural and logistical barriers diluted CDI impact. CDIs positively affect non-financial SME performance, yet outcomes are uneven and context dependent. Success hinges not only on cluster formation but on enabling ecosystems that address local constraints.*

**Keywords:** *Cluster Development Initiatives (CDIs); SME performance; Non-financial outcomes; Technology adoption; Inter-firm collaboration; Tanzania*

## 1. Background Information

Small and Medium Enterprises (SMEs) constitute the backbone of the Tanzanian economy, accounting for approximately 95% of all registered businesses and contributing roughly 35% to the nation's Gross Domestic Product (Kazimoto, 2023; Maziku & Fungo, 2024). Beyond their macroeconomic significance, SMEs are critical engines of employment, innovation, and poverty alleviation, providing livelihoods for an estimated four million people and serving as a primary driver of the informal sector, which generated nearly 73% of new jobs between 2002 and 2012 (Erick *et al.*, 2024; Hazudin *et al.*, 2021; Msuya & Mataba, 2021). Despite this pivotal role, SMEs in Tanzania operate within a constrained ecosystem characterized by chronic challenges. These include severe limitations in accessing formal finance due to stringent collateral requirements and prohibitive interest rates (Magembe, 2017; Woldie *et al.*,

2012), pervasive bureaucratic inefficiencies, inadequate physical infrastructure, and restricted market entry (Kira & He, 2012; Mwamba, 2024). Consequently, while SMEs are numerically dominant, their growth trajectory, sustainability, and capacity for value addition remain severely inhibited (Kazimoto, 2023; Nkwabi & Mboya, 2019).

In response to these systemic constraints, Cluster Development Initiatives (CDIs) have emerged as a prominent industrial policy tool aimed at enhancing the collective efficiency and competitiveness of geographically concentrated SMEs. Rooted in Michael Porter's (2008) theory of competitive advantage, the cluster model posits that geographic proximity fosters specialized ecosystems where firms can achieve synergies through shared resources, collaborative learning, and enhanced market linkages (Sharma & Kohli, 2020). In the Tanzanian context, CDIs,



often facilitated by entities like the Small Industries Development Organization (SIDO), have been implemented across various regions and sectors, notably in agriculture and agro-processing, with the objective of boosting productivity, facilitating technology adoption, and improving market access (John, 2024; Msuya, 2021). Preliminary evidence suggests that such initiatives can lead to tangible benefits, including economies of scale, improved knowledge spillovers, and stronger backward and forward linkages (Francis *et al.*, 2022; Lackson & Muba, 2021).

However, the prevailing scholarly and evaluative focus on CDIs has been disproportionately skewed towards assessing financial performance metrics, such as sales growth, profitability, and revenue (John, 2024; Sharma & Kohli, 2020). This creates a significant empirical and conceptual gap. While financial indicators are undeniably important, they offer an incomplete picture of firm development and resilience. A firm's long-term sustainability and competitive advantage are equally, if not more, dependent on non-financial capabilities, including its technological sophistication, the depth and quality of its collaborative networks, and the strength of its institutional linkages (Fundeanu, 2015; Nkwabi & Mboya, 2019). These intangible assets are critical for innovation, operational efficiency, quality enhancement, and adaptive capacity in dynamic markets. Yet, the mechanisms through which CDIs influence these non-financial dimensions remain poorly understood and under-researched, particularly in sub-Saharan African settings like Tanzania.

This study, therefore, seeks to address this critical lacuna. Its primary objective is to empirically investigate the impact of Cluster Development Initiatives on the non-financial performance of SMEs in Tanzania. It specifically examines three core dimensions: (1) the level of technology adoption and utilization, (2) the extent and nature of inter-firm collaboration within clusters, and (3) the formation and strength of external linkages with supporting institutions such as universities, government agencies, and large industries. As such, by adopting a quasi-experimental research design and employing the Difference-in-Differences (DID) methodology to compare SME clusters in the regions of Singida, Mbeya, and Morogoro, this research moves beyond anecdotal evidence to provide a rigorous, causal analysis of CDI impacts.

The significance of this inquiry is threefold. First, it contributes to academic discourse by shifting the evaluative focus from purely financial outcomes to the foundational capabilities that enable such outcomes. Second, it provides much-needed, context-specific evidence from Tanzania, a nation where SME policy is actively evolving. Third, and most importantly, by uncovering pronounced regional disparities in CDI effectiveness, the study offers actionable

insights for policymakers. It argues that the success of CDIs is not automatic but contingent upon tailored, region-sensitive interventions that address localized barriers related to infrastructure, institutional coordination, and inclusive cluster governance. In doing so, this research aims to inform the design of more effective, equitable, and sustainable industrial policies for SME development in Tanzania and similar economies.

## 2. Literature Review

### 2.1 Theoretical Framework: *The Cluster*

#### *Advantage*

The conceptual foundation of this study is anchored in Michael Porter's (1990, 2008) seminal theory of competitive advantage, which posits that geographic clusters, concentrations of interconnected companies, specialized suppliers, service providers, and associated institutions in a particular field, foster sustained regional competitiveness. According to Porter, clusters enhance productivity through three primary mechanisms: 1) improved access to specialized inputs and human capital, 2) ease of information flow and knowledge spillovers, and 3) the creation of synergies and complementarities among firms and institutions (Porter, 1998). This theoretical perspective moves beyond viewing firms as isolated entities and instead frames them as participants in a localized ecosystem where collective efficiency surpasses individual capability.

In the context of developing economies like Tanzania, the cluster model has been adapted as a strategic policy instrument, Cluster Development Initiatives (CDIs), to address systemic market failures that inhibit SME growth. The core theoretical proposition is that by reducing transaction costs, facilitating collective learning, and enabling access to shared resources and services, CDIs can catalyze the transition of SMEs from informal, subsistence operations to formal, competitive enterprises (Sharma & Kohli, 2020; Fundeanu, 2015). This study draws upon this theoretical framework to hypothesize that CDI participation will positively influence key non-financial performance dimensions: technological capability, collaborative intensity, and institutional linkage strength.

### 2.2 CDIs and SME Performance: From *Financial to Non-Financial Metrics*

Extant literature on CDIs in Africa, and Tanzania specifically, has predominantly focused on evaluating financial outcomes. Studies by John (2024) and Msuya (2021) provide evidence that SMEs within clusters experience increased sales, profitability, and market share, primarily attributed to economies of scale in procurement and collective marketing. Similarly, research in the Mbeya rice cluster and Morogoro agro-processing sectors highlights how CDIs improve access to finance and buyer networks, directly impacting revenue (Magembe, 2017; Nkwabi &



Mboya, 2019). While these financial metrics are crucial for assessing business viability, they represent lagging indicators that may not capture the foundational capacities enabling long-term resilience and innovation.

A growing strand of literature, however, suggests that the most transformative impacts of clustering may be non-financial. Fundeanu (2015) argues that clusters primarily drive productivity through “soft” factors like knowledge exchange and cooperative learning. Similarly, Nkwabi and Mboya (2019) and Woldie *et al.* (2012) posit that networking and trust-building within clusters are critical yet under-measured outcomes. This study identifies and investigates three critical non-financial dimensions where CDIs are theorized to have significant impact, yet empirical evidence remains fragmented and regionally specific.

## **2.3 The Three Pillars of Non-Financial Performance: A Review**

### **2.3.1 Technology Adoption and Utilization**

Technology adoption is a critical determinant of SME productivity and product quality. Theoretically, clusters are seen as conduits for technology diffusion due to proximity, which lowers the cost of information acquisition and enables learning by observation (Lackson & Muba, 2021). Empirical studies in Tanzania show mixed results. Successful cases, such as the Mbeya Rice Cluster, demonstrate how CDIs facilitated the adoption of modern parboiling and milling technologies, significantly reducing post-harvest losses and improving marketability (Hazudin *et al.*, 2021; John, 2024).

However, significant barriers persist. Kira and He (2012) and Mwamba (2024) identify poor rural infrastructure, high capital costs, and limited technical skills as major impediments, particularly for SMEs outside major urban centers. Furthermore, Ndesaulwa *et al.* (2017) note a disconnect between available technologies and SME needs, suggesting that CDIs must do more than provide access; they must facilitate contextualized adaptation. This study contributes by examining not just whether technology adoption occurs, but how its level and effectiveness vary across different regional and sectoral clusters.

### **2.3.2 Inter-Firm Collaboration**

Collaboration, encompassing joint procurement, shared marketing, resource pooling, and knowledge exchange, is a hypothesized core benefit of clustering (Francis *et al.*, 2022). Strong collaborative networks can lead to risk-sharing, cost reduction, and enhanced bargaining power with suppliers and buyers (Kazimoto, 2023). In Tanzania, evidence suggests collaboration is strongest when facilitated by formal structures, such as common facility centers and producer associations, as seen in some Morogoro food processing clusters (Erick *et al.*, 2024).

Yet, collaboration is not automatic. Research by Goodluck *et al.* (2020) and Fundeanu (2015) reveals that power asymmetries, lack of trust, and competition among member firms can inhibit cooperative behavior. Smaller SMEs may be excluded from collaborative benefits or lack the capacity to participate effectively (Sharma & Kohli, 2020). This study investigates the conditions under which CDIs successfully foster collaboration and the factors that lead to collaborative failure.

### **2.3.3 External Linkages with Institutions**

Linkages beyond the cluster, with universities, research institutes, financial institutions, and large anchor firms, are vital for accessing advanced knowledge, credit, and new markets. Porter's (1998) diamond model emphasizes the role of supporting institutions in cluster development. In practice, studies show that CDIs often act as a bridge, connecting SMEs to technical training from institutions like the Tanzania Industrial Research and Development Organization (TIRDO) or market opportunities through trade fairs (Msuya, 2021; Nkwabi & Mboya, 2019).

However, the formation of these linkages is often uneven. As noted by Fundeanu (2015), linkage development depends heavily on the proactive engagement of cluster facilitators and the alignment of institutional incentives. Mwamila and Temu (2020) observe that linkages are often weaker in remote regions and for clusters in less prioritized sectors. This study analyzes the strength and impact of these external linkages, exploring why some clusters develop robust networks while others remain insular.

## **2.4 Regional Disparities and Contextual Factors**

A significant and persistent gap in the existing literature is the absence of systematic, comparative analysis examining how Cluster Development Initiative (CDI) outcomes vary across distinct regions within Tanzania. Prevailing research tends toward isolated case studies focused on single locales, such as John's (2024) examination of Mbeya or Erick *et al.*'s (2024) work in Morogoro. This fragmented approach overlooks the profound moderating influence of regional context, a composite of variables including infrastructural development, the efficacy of local governance structures, inherent agricultural or industrial potential, and the density of pre-existing business networks. Scholars like Sharma and Kohli (2020) posit that the failure of generic, blueprint cluster models is often attributable to a disregard for these localized constraints and enabling conditions. By design, this study directly confronts this empirical shortcoming. Its purposeful multi-regional comparative framework, encompassing Singida, Mbeya, and Morogoro, facilitates a rigorous investigation into how specific contextual factors actively shape and differentiate the impact of CDIs on critical non-financial performance dimensions, thereby moving the discourse beyond universal claims to contextually grounded insights.



## 2.5 Conceptual Synthesis and Research Positioning

As synthesized in Table 1, while the theoretical benefits of clustering are well-established and some empirical evidence exists for each non-financial dimension in Tanzania, the literature suffers from three key limitations: 1) a fragmented focus that treats technology, collaboration, and linkages in isolation rather than as an integrated performance system; 2) a scarcity of comparative studies that explain regional variations in outcomes; and 3) a methodological predominance of descriptive case studies, with few employing rigorous causal inference designs to isolate the impact of CDIs from other factors.

This study is positioned to address these gaps. By simultaneously investigating the three non-financial pillars within a unified quasi-experimental framework across three distinct regions, it seeks to provide a holistic, comparative, and causally robust analysis of how, and under what regional conditions, Cluster Development Initiatives shape the foundational capabilities of Tanzanian SMEs.

and common temporal trends affecting treatment and control groups (Angrist & Pischke, 2009; Gertler *et al.*, 2016).

The DID model compares the change in outcomes over time for SMEs that participated in CDIs (the treatment group) to the change over the same period for SMEs that did not participate (the control group). The key identifying assumption, the parallel trends assumption, posits that in the absence of the intervention, the treatment and control groups would have followed similar performance trajectories. This assumption was empirically tested and validated, as detailed in Section 3.5.

## 3.2 Study Context and Sampling Strategy

The study was conducted in three purposively selected regions of Tanzania: Singida, Mbeya, and Morogoro. These regions were selected based on two key criteria: (1) the presence of formal, operational CDIs facilitated by the Small Industries Development Organization (SIDO), and (2) representation of diverse agro-ecological and economic contexts, allowing for cross-regional comparative analysis.

**Table 1: Theoretical Constructs and Empirical Gaps**

Non-Financial Dimension	Theoretical Mechanism (Porter, 1998)	Empirical Support in Tanzanian Context	Identified Gaps/Limitations
<i>Technology Adoption</i>	Knowledge spillovers; Access to specialized inputs	Positive evidence in agro-processing (e.g., Mbeya Rice); Technology transfer programs exist.	Uneven adoption; Barriers in rural areas; Lack of studies on <i>level</i> and <i>effectiveness</i> of use.
<i>Inter-Firm Collaboration</i>	Synergies and complementarities; Reduced transaction costs	Observed in shared marketing and procurement (Morogoro); Strengthened by common facilities.	Not automatic; Power imbalances exclude small firms; Limited depth of collaboration in many clusters.
<i>External Linkages</i>	Role of supporting institutions; Systemic innovation	Links to SIDO, TIRDO, trade fairs documented.	Linkages often ad-hoc and weak; Dependent on facilitator effort; Regional disparities not studied.
<i>Overall CDI Impact</i>	Enhanced collective efficiency & competitiveness	Financial improvements documented (sales, profit).	Overwhelming focus on financial metrics; Lack of integrated analysis of non-financial pillars; Absence of comparative regional analysis.

## 3. Methods

### 3.1 Research Design and Causal Inference Framework

This study employed a quasi-experimental design to estimate the causal impact of Cluster Development Initiatives (CDIs) on the non-financial performance of SMEs in Tanzania. Given the ethical and practical constraints of randomly assigning SMEs to cluster programs, a quasi-experimental approach represents the most robust method for establishing causality in a real-world policy context (Shadish *et al.*, 2002). The specific methodology adopted was the Difference-in-Differences (DID) estimator, which is widely used in applied economics and program evaluation to control for both time-invariant unobservable characteristics

A multi-stage, purposive sampling strategy was implemented. First, all active SIDO-supported clusters in the three regions were identified, constituting the sampling frame for the treatment group. Second, for each treatment cluster, a comparable set of non-clustered SMEs (control group) was identified from the same geographical zone, matched on key sector and size characteristics (micro vs. small-medium) to minimize selection bias. The final sample comprised 308 SMEs: 150 within CDIs (treatment) and 158 outside CDIs (control). The distribution across regions and clusters is summarized in Table 2.



**Table 2: Sample Distribution by Region and Cluster Status**

Region	Treatment Group (Inside CDI)	Control Group (Outside CDI)	Total	Key CDI Clusters (Treatment) Sampled
Singida	46	54	100	SIMUSOP (Soap Making), Mtinko Sunflower Oil Processing
Mbeya	44	44	88	Mbeya Rice Group, Mbeya Sunflower Oil Processing
Morogoro	60	60	120	Morogoro Engineering, Morogoro Food Processing, Morogoro Grain Milling
<b>TOTAL</b>	<b>150</b>	<b>158</b>	<b>308</b>	

### 3.3 Data Collection and Variable Construction

A mixed-methods approach was used to collect both quantitative and qualitative data between June and August 2019. This triangulation enhances the validity and depth of the findings (Creswell & Plano Clark, 2017).

**Quantitative Data:** A structured questionnaire was administered to SME owners/managers. Core dependent variables; *Level of Technology*, *Level of Collaboration*, and *Level of Linkages*; were measured using multi-item, five-point Likert scales (1=Very Low, 5=Very High). For example, “Level of Technology” was assessed through items on the use of modern machines, technological skills, and product quality. Scale reliability was confirmed via Cronbach’s Alpha (see Table 3). Total scores for each construct were summed and standardized to create continuous outcome variables. The key independent variable was a binary indicator for CDI participation (1=Inside cluster, 0=Outside). A time dummy captured pre-(2014) and post-intervention (2018) periods.

**Qualitative Data:** To contextualize and explain the quantitative results, 24 Key Informant Interviews (KIIs) were conducted with SIDO officials, cluster leaders, and local government authorities. Furthermore, 12 Focus Group Discussions (FGDs) were held with SME owners within the clusters. All interviews and FGDs were audio-recorded, transcribed, and thematically analyzed using NVivo 12 software.

**Table 3: Measurement of Non-Financial Performance Constructs**

Construct	Definition	Sample Indicator Items	No. of Items	Cronbach’s Alpha ( $\alpha$ )
<i>Level of Technology (Tech)</i>	Adoption and effective use of modern tools, machines, and processes.	Use of current machines; Modern processing skills; Product quality standards.	5	0.959
<i>Level of Collaboration (Collab)</i>	Intensity of inter-firm cooperation in operations, marketing, and resource sharing.	Joint marketing; Machinery lending; Sharing sales networks; Business information exchange.	7	0.894
<i>Level of Linkages (Link)</i>	Strength of formal connections with external institutions (research, govt., large firms).	Collaboration with universities; Support from LGAs; Subcontracting by large industries.	5	0.869

### 3.4 Empirical Model and Estimation

The impact of CDIs was estimated using the following two-way fixed effects Difference-in-Differences (DID) specification, adapted from Gertler *et al.* (2016):

$$DID = [(Y1 | D = 1) - (Y0 | D = 1)] - [(Y1 | D = 0) - (Y0 | D = 0)]$$

Where:

DID = Difference in Differences estimation

Y = Outcome variable

D = Differences in outcomes in a given time (0 = Control group: 1 = Treatment group)

Outcome variable (Y) is given as:

$$Y_{it} = \beta_0 + \beta_1(C_i) + \beta_2(D_t) + \delta(C_i \times D_t) + \epsilon_{it}$$

Where:

- $Y_{it}$  = Non-financial performance outcome (Tech, Collab, Link) for SME  $i$  at time  $t$ .
- $C_i$  = Cluster dummy (1 if SME is inside a CDI, 0 if outside).
- $D_t$  = Time dummy (1 for post-intervention period 2018, 0 for pre-intervention period 2014).
- $C_i \times D_t$  = Interaction term (the DID estimator).
- $\delta$  = Coefficient of interest, capturing the average treatment effect on the treated (ATT). It represents the differential change in performance attributable to CDI participation.
- $\epsilon_{it}$  = Error term.

The model was estimated separately for each region and for specific clusters to investigate heterogeneous effects. Robust standard errors were clustered at the SME level to account for potential serial correlation.

### 3.5 Validity Tests and Data Analysis

Parallel Trends Test: A critical prerequisite for DID validity is that the treatment and control groups exhibit similar pre-



intervention trends. Following Bertrand *et al.* (2004), we tested this by comparing the mean outcomes for both groups in the pre-CDI period (2013-2014). A t-test of differences showed no statistically significant differences ( $p > 0.10$ ) for any of the three outcome variables, supporting the parallel trends assumption.

**Reliability Analysis:** Internal consistency of the multi-item scales was assessed using Cronbach's Alpha. As shown in Table 3, all values exceeded the recommended threshold of 0.70 (Nunnally & Bernstein, 1994), with a minimum of 0.869, confirming the scales' high reliability.

**Data Analysis:** Quantitative data analysis was performed using STATA 16. The DID regressions provided the primary causal estimates. Qualitative data from KIIs and FGDs were coded inductively and analyzed thematically to provide nuanced explanations for the quantitative results, particularly for understanding regional disparities and implementation challenges.

#### 4. Results and Discussion

This section presents the empirical findings on the impact of Cluster Development Initiatives (CDIs) on SME non-financial performance and provides a contextualized discussion of their implications. The analysis is structured around the three core dimensions: Technology Adoption, Inter-Firm Collaboration, and External Linkages. The findings reveal significant positive impacts but with pronounced regional heterogeneity, underscoring the critical role of contextual factors in mediating CDI effectiveness.

##### 4.1 Technology Adoption and Utilization

The DID estimates reveal a statistically significant positive impact of CDIs on technology adoption, though this impact varies substantially across regions (Table 4). SMEs in the Morogoro clusters demonstrated the most substantial improvement, with a highly significant DID coefficient of 2.666 ( $p < 0.01$ ). In contrast, the effect was moderate and non-significant in Singida (DID = 1.281) and minimal in Mbeya (DID = 0.352).

Disaggregation by specific clusters (Table 5) provides further nuance. High-performing clusters such as Morogoro Food Processing (DID = 3.524,  $p < 0.01$ ) and the Mbeya Rice Group (DID = 2.167,  $p < 0.05$ ) showed strong technological gains. Conversely, clusters like Mtinko Sunflower Oil Processing (DID = 0.581) and SIMUSOP (DID = 2.367, non-significant) exhibited limited progress.

**Table 4: DID Estimates for Technology Adoption Across Regions**

Region	DID Coefficient ( $\delta$ )	Std. Error	P-value	Interpretation
Singida	1.281	(0.948)	0.178	Positive but statistically insignificant effect
Mbeya	0.352	(0.998)	0.724	Negligible and insignificant effect
Morogoro	2.666*	(0.459)	0.000	Large, statistically significant positive effect

Note: SE = Standard Error; ns = not significant; \*\*\*  $p < 0.001$ . DID = Difference-in-Differences estimator.

**Table 5: Technology Adoption Scores Across Selected Clusters**

Cluster	DID Coefficient ( $\delta$ )	Std. Error	P-value	Performance Level
Morogoro Food Processing	3.524*	(1.014)	0.001	High Improvement
Mbeya Rice Group	2.167**	(0.636)	0.001	Significant Improvement
SIMUSOP (Singida)	2.367	(1.205)	0.051	Moderate, Marginally Significant
Mtinko Sunflower Oil	0.581	(0.736)	0.430	Low, Insignificant Improvement

The qualitative data expound the mechanisms behind these disparities. In successful clusters like Morogoro Food Processing, CDIs provided direct access to “modern food processing technologies like solar drying” (**Tech-1**) and specific machinery for rice processing, leading to recognized improvements in efficiency and product quality (**Tech-2**). This aligns with theories of knowledge spillovers and reduced adoption costs within clusters (Porter, 1998; Lackson & Muba, 2021).

However, in underperforming clusters, significant barriers persisted. SMEs in Mtinko and Mbeya sunflower oil clusters reported reliance on manual labor for seed movement and the use of inefficient crushing machines that leave valuable oil in the seed cake (**Tech-3**, **Tech-4**). A critical institutional barrier was also highlighted: *delays in obtaining Tanzania Bureau of Standards (TBS) certification forced production stoppages, negating any potential technological benefits* (**Tech-5**).

These findings confirm that while CDIs can be effective conduits for technology transfer, their success is contingent



upon two critical factors: 1) the appropriateness and accessibility of the technology provided, and 2) the presence of a supportive institutional and regulatory environment. The stark contrast between Morogoro's success and the struggles in Singida and Mbeya's sunflower sectors underscores that a "one-size-fits-all" technological intervention is ineffective. This supports and extends the work of Ndesaulwa *et al.* (2017) and Kira & He (2012), who identified infrastructure and skill gaps as barriers, by highlighting how regulatory hurdles (e.g., certification) can specifically undermine technology initiatives within clusters.

#### 4.2 Inter-Firm Collaboration

CDIs had a transformative impact on collaboration in Morogoro (DID = 10.58,  $p < 0.01$ ) and a significant positive impact in Mbeya (DID = 6.076,  $p < 0.01$ ), but only a negligible effect in Singida (DID = 0.927, non-significant) (Table 6). At the cluster level (Table 7), collaboration scores were exceptionally high in Morogoro Food Processing (DID = 14.69) and the Mbeya Rice Group (DID = 12.74), while clusters like Mtinko Sunflower Oil showed virtually no improvement (DID = 0.0095).

**Table 6: DID Estimates for Collaboration Across Regions**

Region	DID Coefficient ( $\delta$ )	Std. Error	P-value	Interpretation
Singida	0.927	(0.949)	0.330	Minimal, insignificant effect
Mbeya	6.076*	(1.052)	0.000	Strong positive effect
Morogoro	10.58*	(0.622)	0.000	Very strong positive effect

**Table 7: Collaboration Scores Across Selected Clusters**

Cluster	DID Coefficient ( $\delta$ )	Std. Error	P-value	Performance Level
Morogoro Food Processing	14.69*	(1.219)	0.000	Very High Improvement
Mbeya Rice Group	12.74*	(1.193)	0.000	Very High Improvement
Morogoro Grain Millers	7.827*	(1.021)	0.000	High Improvement
Mtinko Sunflower Oil	0.00952	(1.185)	0.994	No Improvement

The qualitative data reveal the enabling conditions for successful collaboration. In Morogoro, the establishment of a common facility at Kihonda was pivotal. It created a "teamwork spirit and eagerness to learn from one another"

(*Collab-3*) and made joint activities like fortification and packaging training inherently collaborative (*Collab-4*). Proximity fostered daily interaction and trust. SME owners acknowledged that CDIs "created an environment which enhanced collaboration... allowing us to share resources and expertise" (*Collab-1*).

In contrast, in clusters with weak collaboration, SMEs operated in physical isolation. As one interviewee noted, owners "work independently at their own working premises," which breeds fear of competition and severely limits information sharing (*Collab-5*). The lack of a common brand or unified marketing strategy further reduced incentives for cooperative action.

These results strongly support the theoretical premise that geographic proximity and shared infrastructure are fundamental for reducing transaction costs and building the trust necessary for collaboration (Porter, 1998; Francis *et al.*, 2022). The success in Morogoro demonstrates that CDIs which invest in shared physical capital (common facilities) and social capital (repeated interaction) can unlock significant collaborative gains. The failure in clusters like Mtinko illustrates that mere geographical grouping without mechanisms to foster integration is insufficient. This finding critically extends the work of Goodluck *et al.* (2020) by demonstrating that the physical design of the cluster initiative, whether it includes a shared space, is a decisive factor in overcoming the trust deficits and competitive fears that inhibit SME cooperation.

#### 4.3 External Linkages

The impact on external linkages was positive and significant in Singida (DID = 5.501,  $p < 0.01$ ) and Morogoro (DID = 6.035,  $p < 0.01$ ), but weaker and only marginally significant in Mbeya (DID = 2.010,  $p < 0.05$ ) (Table 8). Cluster-level analysis (Table 9) shows strong performance in Morogoro Engineering (DID = 7.585) and Mtinko Sunflower Oil (DID = 6.457), but a near-zero effect in Mbeya Sunflower Oil Processing (DID = 0.101).

**Table 8: DID Estimates for External Linkages Across Regions**

Region	DID Coefficient ( $\delta$ )	Std. Error	P-value	Interpretation
Singida	5.501*	(0.607)	0.000	Strong positive effect
Mbeya	2.010*	(0.704)	0.005	Moderate positive effect
Morogoro	6.035*	(0.428)	0.000	Strong positive effect



**Table 9: External Linkage Scores Across Selected Clusters**

Cluster	DID Coefficient ( $\delta$ )	Std. Error	P-value	Performance Level
Morogoro Engineering	7.585*	(0.573)	0.000	Very High Improvement
Mtinko Sunflower Oil	6.457*	(0.673)	0.000	High Improvement
Mbeya Rice Group	6.274*	(0.863)	0.000	High Improvement
Mbeya Sunflower Oil	0.101	(0.802)	0.900	No Improvement

Linkages were forged through organized channels. SMEs were connected to customers via “*SIDO, Nanenane and Sabasaba exhibitions*” (**Link-1**) and to knowledge providers like “*various academic and research institutions*” (**Link-2**). However, the qualitative data expose a critical issue of selective intervention. Officials noted that business development organizations favoured clusters in Singida, where sunflower production was more established, over those in Mbeya (**Link-3**). This created a “*Matthew Effect*,” where better-endowed regions received more linkage support, amplifying existing disparities.

Furthermore, the absence of physical proximity in some clusters was cited as a barrier to forming organic linkages, as it limited “*sharing of various business experiences and apprenticeship*” (**Link-4**). Stakeholders emphasized that “*coordination of interventions... is crucial to ensure equitable levels of linkages*” (**Link-5**).

The findings confirm that CDIs can successfully act as bridging institutions, connecting SMEs to markets and knowledge sources (Nkwabi & Mboya, 2019). However, they also reveal a significant governance failure in the implementation. The unequal distribution of linkage opportunities, driven by donor or implementer preference for “*higher potential*” areas, contradicts the equity goals of many development initiatives. This supports Fundeanu’s (2015) observation that linkage effectiveness depends on stakeholder interests, but it provides concrete evidence of how this manifests as regional bias. For CDIs to be truly inclusive, linkage-building activities must be consciously designed to counteract, rather than reinforce, pre-existing geographic inequalities. The stark disparity between the two sunflower oil clusters in Singida (high linkages) and Mbeya (low linkages) is a direct result of this implementer bias, not a difference in SME capability or need.

#### 4.4 Synthesis and Theoretical Implications

The integrated analysis of quantitative and qualitative findings reveals a central, overarching conclusion: Cluster Development Initiatives (CDIs) are not uniformly effective

policy instruments but are highly context-dependent interventions. Their success in enhancing the non-financial performance of SMEs is not guaranteed by the mere act of geographic agglomeration but is critically mediated by a triad of interdependent factors that operate at the intersection of policy design, local capacity, and facilitative agency. This triad can be conceptualized as the “*CDI Effectiveness Framework*.”

First, *Localized Resource Appropriateness* is paramount, particularly for technology adoption. The stark contrast between Morogoro’s success and the struggles in the sunflower oil clusters demonstrates that technology transfer fails when it is not congruent with local operational realities, skill levels, and regulatory landscapes. Providing advanced machinery is insufficient if SMEs lack the foundational infrastructure (e.g., reliable power, transport), the technical skill to maintain it, or if its benefits are nullified by protracted certification processes. This finding extends technological diffusion theory within clusters by emphasizing that appropriateness and absorptive capacity, the ability to recognize, assimilate, and apply new knowledge, are locally constructed and must be proactively nurtured alongside the technology itself.

Second, is the successful *Inter-Firm Collaboration* is fundamentally underpinned by Investment in Collective Infrastructure. The theory posits that proximity reduces transaction costs and fosters trust. Our results specify that this is only activated through dedicated, shared physical and social infrastructure. The common facility in Morogoro acted as a crucible for collaboration, transforming passive proximity into active cooperation by creating a neutral space for repeated interaction, joint problem-solving, and collective learning. In its absence, as seen in Singida’s fragmented clusters, geographic concentration can simply breed isolated coexistence or even rivalry. Thus, the study refines Porter’s model by arguing that the collaborative advantage of a cluster is not an inherent property of co-location but a constructed outcome that requires intentional investment in the “*connective tissue*” of the cluster.

Third, the development of External Linkages is contingent upon Equitable and Proactive Facilitation. While clusters are theorized to strengthen institutional connections, our evidence shows these connections are not organic but are forged by deliberate, often biased, facilitator action. The disparity in linkage strength between similar sunflower clusters in Singida and Mbeya exposes a critical implementation flaw: the tendency of facilitating agencies to pursue “*low-hanging fruit*” or align with donor preferences, thereby reinforcing existing geographic inequalities rather than mitigating them. Effective linkage-building, therefore, requires a conscious governance commitment to equity and a



facilitator role that actively brokers connections for all cluster members, especially the less visible or resource-poor. Collectively, these insights necessitate a significant theoretical advancement. This study moves the discourse beyond a generic endorsement of agglomeration towards a contingency model of cluster efficacy. It specifies that the canonical benefits of clusters, knowledge spillovers, collaborative synergies, and institutional support, are not automatic deliverables of spatial concentration. Instead, they are *potentialities* that are activated or stifled by specific design and implementation choices. The pronounced regional heterogeneity observed is not statistical noise to be controlled for; it is the core empirical revelation. This heterogeneity directly illuminates the critical moderating roles of implementation quality, facilitator agency, and strategic alignment between interventions and localized socio-economic constraints and opportunities. Consequently, the theoretical contribution of this research lies in shifting the unit of analysis from the *cluster as a form* to the cluster as a process, where outcomes are dynamically shaped by the interplay of designed interventions and contextual realities. This paradigm shift calls for future research and policy that is inherently adaptive, diagnostic, and sensitive to the unique ecosystem of each intended beneficiary community.

## 5. Conclusion and Policy Recommendations

### 5.1 Conclusion

This study set out to investigate a critical but underexplored dimension of industrial policy: the impact of Cluster Development Initiatives (CDIs) on the *non-financial performance* of SMEs in Tanzania. Through a rigorous quasi-experimental design applied across three diverse regions, the research provides robust, causal evidence that CDIs can indeed function as powerful catalysts for enhancing technological capability, fostering inter-firm collaboration, and strengthening external institutional linkages. These non-financial advancements are not merely supportive of growth; they constitute the foundational capabilities that underpin long-term SME resilience, innovation, and competitive upgrading.

However, the core contribution of this research lies in its nuanced revelation that these positive outcomes are highly contingent and unevenly distributed. The significant regional and inter-cluster disparities, from the transformative successes in Morogoro's food processing to the constrained progress in Singida and Mbeya's sunflower oil sectors, demonstrate unequivocally that the mere establishment of a geographic cluster is an insufficient condition for development. Instead, the effectiveness of CDIs is mediated by a critical triad of factors: the appropriateness of technological and resource interventions to local contexts, the presence of shared physical and social infrastructure to enable collaboration, and the equity and proactivity of facilitative governance in building external bridges.

Consequently, this research advances the theoretical understanding of clusters by moving from a generic model of agglomeration economies to a contingency framework. It posits that the theoretical benefits of clustering are not automatic but are *activated* through context-sensitive design and high-quality implementation. The regional heterogeneity is not a limitation of the study but its central finding, highlighting that the "how" of cluster facilitation is as important as the "what."

### 5.2 Policy and Practical Recommendations

The empirical evidence from this study provides a clear mandate for a fundamental recalibration of how Cluster Development Initiatives are conceived, implemented, and evaluated. To translate the identified potential into equitable and sustainable impact, stakeholders must move beyond generic support frameworks towards precision interventions that address the specific mediators of success and failure. The following multi-tiered recommendations are directed at national policymakers, implementing agencies, and the research community, aiming to enhance the efficacy, inclusivity, and long-term viability of CDIs in Tanzania and analogous developing economies.

**Strategic Reorientation for National Policymakers & Development Partners:** The foundational role of national institutions like SIDO and the Ministry of Industry is to set the enabling environment and strategic direction. Their actions must shift from facilitating uniform programs to orchestrating context-sensitive ecosystem engineering.

First, the adoption of a *Differentiated, Region-Specific Cluster Policy* is imperative. The persistent failure of blueprint models is starkly illustrated by the divergence between Morogoro's success and the stagnation in Mbeya's sunflower cluster. A one-size-fits-all approach ignores critical variances in local productive capacities, value chain maturity, infrastructure endowments, and social capital. Consequently, policymakers must mandate and fund comprehensive diagnostic studies prior to intervention. These studies should map regional comparative advantages, identify binding constraints within specific sectors, and assess the absorptive capacity of local SMEs. This diagnostic phase should inform a menu of tailored support options, allowing for flexible adaptation rather than rigid prescription. For instance, a cluster in a region with strong agricultural output but weak processing might prioritize post-harvest technology, while a cluster in an artisanal hub might focus on design innovation and market linkage.

Second, investment must be strategically directed toward building Shared Collective Infrastructure. The study's most compelling finding is that collaboration is structurally dependent on dedicated physical and social spaces. Therefore, funding for Common Facility Centers (CFCs)



should be a non-negotiable, central component of national CDI budgets, not an ancillary afterthought. These centers must be equipped not only with shared processing machinery and quality-testing laboratories but also with spaces designed for interaction, training, and collective decision-making. However, capital investment alone is insufficient. Policymakers must concurrently support the development of sustainable governance and business models for CFC management, such as cooperative ownership or professional management with cost-recovery mechanisms, to ensure their operational longevity beyond initial donor funding cycles.

Third, regulatory harmonization and streamlining must be integrated into the core of cluster support. The finding that technological adoption was crippled by delays in standards certification exposes a critical, often overlooked, barrier. Policymakers should proactively establish “Cluster Fast-Track Desks” within key regulatory bodies, including the Tanzania Bureau of Standards (TBS), the Business Registration and Licensing Agency (BRELA), and sector-specific authorities. These desks would provide consolidated, expedited services for verified cluster members, handling certification, inspections, and licensing through a prioritized pipeline. This transforms regulation from a passive obstacle into an active enabler, reducing a significant non-financial transaction cost that disproportionately burdens small enterprises.

**Operational Imperatives for Cluster Facilitators & Implementing Agencies:** At the operational level, facilitators act as the linchpins of cluster development. Their role must evolve from passive coordinators to proactive brokers and institutional architects. A primary operational imperative is the implementation of *Pro-Active and Equitable Linkage Brokerage*. The research uncovered a detrimental “*Matthew Effect*,” where facilitator attention and linkage opportunities disproportionately flowed to more established regions or larger firms within clusters, thereby exacerbating existing inequalities. To counter this, facilitators must adopt a deliberate, inclusive brokerage strategy. This involves actively mapping and connecting all cluster members, especially marginalized and smaller SMEs, to a curated network of buyers, input suppliers, technical experts from universities and research institutes, and financial institutions. Tactics should include organizing tailored matchmaking events, facilitating technology demonstration contracts with research bodies, and negotiating group purchasing or marketing agreements that bundle the output of smaller producers to meet larger order volumes.

Concurrently, facilitators must focus intensively on building *Strong Cluster Governance and Social Capital*. The study demonstrates that trust is the currency of collaboration. Therefore, facilitators must consciously engineer opportunities for trust-building, moving beyond logistical

administration to fostering a shared identity and purpose. This involves supporting the formation of legitimate, representative cluster associations with clear bylaws and transparent financial management. It requires investing in regular forums for joint business planning, collective visioning exercises, and facilitated workshops on conflict resolution. By nurturing this social fabric, facilitators help construct a resilient governance structure that can sustain the cluster’s activities, advocate for its interests, and manage internal disputes long after external project support has ended.

**Forward Agenda for Research and Monitoring & Evaluation:** To ensure continuous learning and evidence-based adaptation, the frameworks for research and program assessment must also evolve. There is an urgent need to Develop and Utilize Balanced Performance Scorecards in both academic research and program Monitoring & Evaluation (M&E). The historical overemphasis on financial metrics has created a policy blind spot regarding the foundational drivers of SME resilience. Future M&E frameworks must institutionalize the measurement of non-financial indicators, such as indices for technology sophistication, density of collaborative agreements, and diversity of institutional linkages, assigning them weight commensurate with their strategic importance. This “*what gets measured gets managed*” principle will ensure that policymakers and facilitators are held accountable for cultivating the intangible assets that underpin sustainable competitive advantage.

Finally, the research community and funding partners must *Invest in Longitudinal Studies on Cluster Evolution*. The quasi-experimental snapshot provided by this study is powerful for measuring initial impact but cannot capture the dynamic processes of cluster maturation, decline, or transformation. Longitudinal panel studies that track clusters over 5-10 years are essential to understand the lifecycle of these initiatives. Such research could investigate critical questions: *How does cluster governance evolve? What are the tipping points for self-sustainability? How do clusters adapt to external shocks or technological disruptions?* Insights from long-term tracking are invaluable for designing interventions that support not just the launch, but the enduring success of industrial ecosystems.

Henceforth, realizing the substantial promise of CDIs requires a decisive shift in philosophy, from cluster creation to cluster cultivation. This cultivated approach is sophisticated, demanding a deep understanding of local context; it is equitable, consciously designed to bridge rather than widen disparities; and it is patient, focused on nurturing the slow-growing roots of non-financial capabilities. As such, by embracing this paradigm, Tanzanian policymakers and practitioners can steward SME clusters that are not only



productive but also inclusive, resilient, and enduring engines of innovation-led growth across the nation's diverse economic landscape.

### Declaration of Conflict of Interest

I hereby declare that there are no known competing financial interests or personal relationships that could have influenced the research and findings presented in this paper.

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