



IMPACT EVALUATION OF NANO ENTERPRISE FINANCING FUND (NEFF)



14th June 2025



Prof. Vivek Pandey (Principal Investigator)
Prof. Satyendra Pandey (Co- Principal Investigator)
Debanjan Das

TABLE OF CONTENTS

TABLE OF CONTENTS	1
LIST OF FIGURES	3
LIST OF TABLES	3
STUDY CONTEXT AND MANDATE	4
EXECUTIVE SUMMARY	8
CHAPTER 1- INTRODUCTION	14
1.1 Introduction	14
1.2 Literature Review	17
CHAPTER 2 -TNRTP: INSTITUTIONAL BACKGROUND, DESIGN, OBEJCTIVE	29
2.1 Background:	29
2.2 What is TNRTP and Why is it important?	31
2.3 Project Development Objectives	32
2.4 Institutional Background	34
2.5 Project Evaluation Timeline	37
CHAPTER 3- NEFF: INSTITUTIONAL BACKGROUND, DESIGN, AND THEORY OF CHANGE	38
3.1 Nano Enterprise Financing Fund (NEFF): Design	38
3.2 Theory of Change	42
CHAPTER 4- EVALUATION DESIGN: SAMPLING FRAMEWORK, IDENTIFICATION STRATEGY, STUDY SAMPLE, POWER CALCULATION, AND SURVEYS	45
4.1 Sampling Framework	45
4.2 Identification Strategy and Impact Estimates	49
4.3 Village Sample	54
4.4 Enterprise Sample	55
4.5 Power Calculation: Minimum Detectable Effect (MDE)	55
4.6 Survey Design	58
CHAPTER 5- ANALYSIS PLAN	61
5.1 Intent-to-Treat (ITT)	61
5.2 Treatment Effect on Treated (TOT)	62
5.3 Difference-in-Differences (DiD)	64
CHAPTER 6: IMPACT OF NEFF INTERVENTION ON ENTERPRISE PERFORMANCE AND BUSINESS PRACTICES	67

6.2 Impacts on Firm Growth	72
6.3 Impact of NEFF Program on Investment Behavior	75
6.4 Impact on business practices:	81
6.5 Impact of NEFF on Supplier Relations	85
6.5 Impact of NEFF on loans and indebtedness	87
7. CONCLUSION	91
8. REFERENCE	97
APPENDIX A	99
A1: Balance Table of all four groups	99
A2: Kernal Density Plots for Village-Level Baseline Covariate of all four groups	101

LIST OF FIGURES

Figure 1: Project Timeline	37
Figure 2: Theory of Change.....	44
Figure 3: Village distribution across the Groups	48
Figure 4: Kernel Density of Baseline Characteristics in NEFF and non-NEFF enterprises	53
Figure 5: Sampling Framework.....	55
Figure 6: Power Calculation of Enterprise Profits	56
Figure 7: Power Calculation of Enterprise Cost	58
Figure 8 : Event study on enterprise performance	71
Figure 9: Event study on enterprise finance	80

LIST OF TABLES

Table 1: Balance Table (Comparing NEFF and non-NEFF villages within 95-99% CAP repayment status).....	51
Table 2: Impact of NEFF Program on Enterprise Performance	67
Table 3: Impact on last month's Sales and Profits by Survey Round	73
Table 4: Impact of NEFF Program on Investment Behavior	76
Table 5: Short-term and Long-term Impact of NEFF Program on Business Practices	82
Table 6: Impact of NEFF Program on Suppliers Relation.....	86
Table 7: Impact of NEFF on loans and indebtedness.....	88

STUDY CONTEXT AND MANDATE

Background

This study constitutes a comprehensive impact evaluation of the Nano Enterprise Financing Fund (NEFF) intervention implemented under the Tamil Nadu Rural Transformation Project (TNRTP). The evaluation leverages a natural experimental design that emerged from quasi-random program allocation to provide rigorous causal evidence on NEFF's effectiveness in promoting rural enterprise development. Conducted as part of TNRTP's commitment to evidence-based policy making, this evaluation addresses critical knowledge gaps regarding the impact of targeted credit interventions on nano enterprises in rural India.

The study builds upon the foundation established by the COVID Assistance Package (CAP), which provided emergency support to SHG-linked enterprises during the pandemic. NEFF represents the next phase of this intervention sequence, transitioning from crisis response to sustainable enterprise development through structured access to formal credit. This evaluation is particularly timely given India's policy emphasis on promoting rural entrepreneurship through initiatives like Atma Nirbhar Bharat Abhiyan and the government's substantial budget allocations to the MSME sector.

Evaluation Mandate

This impact evaluation specifically focuses on four critical dimensions of NEFF's implementation and outcomes:

1. **Measuring Enterprise Performance Impacts:** Assessing changes in revenue, profits, costs, and overall business growth trajectories among NEFF-supported enterprises compared to control groups.

2. **Analysing Investment and Capital Allocation:** Evaluating how access to NEFF credit affects enterprise investment patterns, including working capital utilization, asset creation, and debt management strategies.
3. **Examining Business Practice Development:** Measuring improvements in record-keeping, marketing practices, digital payment adoption, and overall business management capabilities.
4. **Assessing Financial Inclusion Outcomes:** Analysing NEFF's contribution to formal financial system integration, including changes in borrowing patterns, interest rate exposure, and credit market access.

Scope of the Study

This evaluation encompasses a comprehensive assessment across 208 villages in TNRTP implementation areas, utilizing a natural experimental design that exploits quasi-random allocation of NEFF intervention. The study sample comprises 117 NEFF panchayats serving as the treatment group and 91 non-NEFF panchayats as the control group, with both groups selected from villages achieving 95-99% CAP repayment rates to ensure comparability.

The enterprise sample includes 2,576 nano enterprises, with 1,205 enterprises receiving NEFF treatment and 1,371 control enterprises. This sample size provides adequate statistical power to detect meaningful treatment effects while ensuring representation across diverse enterprise types and demographic characteristics. The evaluation employs a panel data structure with baseline and follow-up surveys, enabling difference-in-differences estimation to control for time-invariant unobserved heterogeneity and common temporal shocks.

The study examines enterprise development across three interconnected dimensions. Enterprise Performance Analysis focuses on financial outcomes including revenue generation, profit

margins, cost structure optimization, and investment behavior patterns. The evaluation tracks both absolute performance measures and standardized indicators to ensure robust comparison across enterprises of varying scales. Financial Inclusion Assessment examines enterprises' integration into formal financial systems, analysing changes in credit access patterns, borrowing costs, debt portfolio management, and adoption of digital financial services. Business Development Evaluation investigates improvements in entrepreneurial capabilities, including record-keeping practices, marketing strategies, customer relationship management, and overall business formalization.

The temporal scope covers the initial 18 months of NEFF implementation, with particular attention to the evolution of treatment effects over time. This timeframe allows examination of both immediate responses to credit access and medium-term adjustments as enterprises optimize their use of additional capital. The evaluation design recognizes that credit interventions require gestation periods to materialize into measurable performance improvements, making the temporal dimension crucial for accurate impact assessment.

Key Research Questions

This evaluation is guided by five core research questions that align with NEFF's theoretical framework and policy objectives:

Enterprise Performance and Growth: How does access to NEFF credit affect enterprise revenue, profitability, and overall business expansion? What are the mechanisms through which credit access translates into improved enterprise performance?

Investment Behavior and Capital Allocation: In what ways does NEFF influence enterprise investment patterns, including the allocation between working capital, asset creation, and debt

reduction? How do enterprises optimize their capital structure following improved credit access?

Business Practice Development: How does NEFF exposure affect entrepreneurial capabilities, including record-keeping practices, marketing strategies, and overall business management sophistication? What role does formal credit access play in promoting business formalization?

Financial Market Integration: To what extent does NEFF facilitate enterprises' integration into formal financial systems, including changes in borrowing patterns, interest rate exposure, and relationships with financial institutions?

These research questions collectively address both the direct financial impacts of NEFF and its broader developmental outcomes, providing evidence on the intervention's effectiveness in promoting sustainable rural enterprise growth. The evaluation framework recognizes that nano enterprises operate within complex socio-economic environments where credit access interacts with various constraints and opportunities to determine ultimate outcomes.

EXECUTIVE SUMMARY

The Nano Enterprise Financing Fund (NEFF) Impact Evaluation provides a rigorous assessment of the program's effectiveness in promoting rural enterprise development through improved access to formal credit. This comprehensive analysis utilizes a natural experimental design and difference-in-differences methodology to examine NEFF's impact across multiple dimensions of enterprise performance. The findings demonstrate substantial positive effects on enterprise performance, strategic investment behavior, and business formalization, while revealing important insights about the temporal evolution of credit intervention impacts.

Identification and Study Design

Natural Experiment Framework: The evaluation leverages a unique natural experiment arising from NEFF's implementation design. While the program was intended for villages achieving 100% COVID Assistance Package (CAP) repayment, administrative data revealed significant variation in NEFF allocation among villages with 95-99% repayment rates. This quasi-random allocation within a narrow repayment bandwidth creates ideal conditions for causal identification.

Robust Methodology: The study uses panel fixed effects and difference-in-differences estimation with enterprise fixed effects, and it relies on panel data from 2022 to 2024. This method manages unobserved factors that don't change over time and common shocks while pinpointing NEFF's causal impact. Extensive balance tests confirm that treatment and control villages have no significant differences in their characteristics before the intervention.

Study Sample: The analysis encompasses 208 villages (117 NEFF and 91 non-NEFF villages) with 2,576 enterprises (1,205 treated and 1,371 control). The sample provides adequate

statistical power to detect meaningful treatment effects while ensuring representation across diverse enterprise types and demographic characteristics.

Key Findings

1. Enterprise Performance: Substantial and Sustainable Gains

Revenue Growth: NEFF demonstrates significant positive impacts on enterprise revenue generation, with treated enterprises achieving 0.117 standard deviations higher revenue growth ($p < 0.10$) compared to control enterprises. This represents meaningful sales expansion, indicating that additional capital enabled enterprises to pursue previously inaccessible growth opportunities.

Profit Enhancement: The program generates a 0.149 standard deviation improvement in enterprise profits ($p < 0.05$), representing substantial welfare gains for participating entrepreneurs. The 95% confidence interval (0.008 to 0.290) confirms economically meaningful impact scales comparable to successful microenterprise interventions in the development literature.

Cost Efficiency: Notably, profit improvements are achieved without proportional cost increases (-0.025 standard deviations, not significant), suggesting that NEFF enables enterprises to achieve economies of scale or access higher-margin opportunities rather than simple operational expansion.

2. Investment Behavior: Strategic Capital Allocation

Total Investment Growth: Total investment increased by 0.298 standard deviations ($p < 0.001$). This substantial effect indicates that investment is a primary channel through which NEFF influences enterprise performance.

Capital Allocation Efficiency: While total investment amounts increase dramatically, the count of investment activities decreases by 0.169 ($p < 0.001$), revealing that NEFF enables enterprises to make fewer but larger-scale investments rather than spreading resources across many small activities. This concentration suggests improved capital allocation efficiency.

Working Capital Focus: The program shows a strong positive impact on working capital investment (0.156 standard deviations increase, $p < 0.001$), indicating that liquidity constraints were the most binding constraint for many enterprises. This finding aligns with theoretical models emphasizing working capital's importance for firm growth in developing countries.

Strategic Diversification: Asset creation activities show increased frequency (0.071 standard deviations, $p < 0.001$) while debt reduction investments also rise (0.044 standard deviations, $p < 0.05$), indicating financially sophisticated behavior among recipients who balance growth investments with financial sustainability.

3. Business Practices: Complex Rebalancing of Entrepreneurial Activities

Record-Keeping Transformation: NEFF demonstrates the most dramatic impact on record-keeping practices, with improvements of 2.511 standard deviations in Round 1 and 2.471 standard deviations in Round 2 (both $p < 0.001$). These represent among the largest treatment effects observed, indicating that access to external financing fundamentally transforms business documentation and financial planning capabilities.

Marketing Practice Shifts: Marketing practice scores decreased (-1.492 standard deviations in Round 1, -1.354 standard deviations in Round 2, both $p < 0.001$). Rather than indicating deteriorating business acumen, this pattern likely reflects strategic shifts away from intensive

competitor monitoring and promotional activities as improved operational capacity reduces reliance on aggressive marketing efforts.

Credit Management Reduction: Credit management practices show substantial negative effects (-2.421 standard deviations in Round 1, -2.225 standard deviations in Round 2, both $p < 0.001$), suggesting that NEFF recipients systematically reduce their reliance on extending customer credit as improved liquidity enables preference for immediate cash payments over credit sales risks.

Overall Business Practices: The composite business practices score shows modest positive effects (0.130-0.150 standard deviations, $p < 0.001$), reflecting the offsetting influence of record-keeping improvements against marketing and credit management declines. This indicates NEFF operates through complex rebalancing of entrepreneurial activities rather than uniform improvements.

4. Supplier Relations: Strengthened Business Networks

Comprehensive Improvement: NEFF generates substantial improvements in supplier relationship quality, with scores increasing by 6.428 points in Round 1 and 6.880 points in Round 2 (both $p < 0.001$) against control baseline means of 3.796. This nearly doubles supplier relation scores for treated enterprises.

5. Financial Market Integration: Strategic Credit Management

Limited Loan Access Effects: NEFF shows minimal impacts on loan access probability or borrowing frequency, with small negative coefficients that are not statistically significant. This suggests the program operates as a complement to rather than a substitute for existing credit sources.

Indebtedness Dynamics: Indebtedness levels show interesting temporal patterns, with positive effects in Round 1 (INR 33,736, marginally significant) declining substantially by Round 2 (INR 4,668, not significant). This pattern indicates financially prudent behavior where enterprises initially increase borrowing when NEFF becomes available but subsequently optimize their capital structures.

Interest Rate Stability: Limited effects on borrowing costs suggest that NEFF's benefits operate primarily through access rather than pricing mechanisms, indicating that recipients continue facing similar borrowing terms in broader credit markets.

Economic Interpretation and Mechanisms

The findings reveal a coherent economic pattern illuminating how NEFF addresses credit constraints in rural nano-enterprises. The combination of significant profit gains, positive revenue effects, and neutral cost impacts suggests that the program enables enterprises to move along their production possibility frontier toward more efficient input-output combinations. Prior to NEFF, enterprises appeared to be operating below their optimal scale due to insufficient capital, inability to purchase optimal input quantities, or constraints on inventory investment.

The strong working capital effects indicate that liquidity constraints were the primary binding constraint, consistent with theoretical models of credit-constrained entrepreneurship. The temporal evolution of impacts, concentrated emergence of effects in Round 2, and strategic investment patterns demonstrate that credit interventions require time for enterprises to identify optimal opportunities and deploy capital effectively.

Conclusion

The NEFF impact evaluation provides compelling evidence that well-designed credit interventions can effectively address binding constraints facing rural nano-enterprises in developing countries. The substantial improvements in enterprise performance (0.149 SD profit increase), strategic investment patterns (0.298 SD investment increase), and business formalization (2.5 SD record-keeping improvement) demonstrate significant development potential of targeted financial inclusion programs.

However, the temporal evolution of impacts, mixed business practice effects, and limited market-level changes underscore the complexity of entrepreneurship development and importance of comprehensive, patient approaches to rural enterprise promotion. The findings provide valuable guidance for maximizing program impact while highlighting areas where complementary investments may enhance effectiveness.

The success of NEFF in generating meaningful improvements through relatively modest credit provision supports arguments for financial inclusion as a development priority, while the nuanced results reinforce the importance of integrated approaches combining financial services with capacity building and institutional strengthening for comprehensive rural enterprise development.

CHAPTER 1- Introduction

1.1 Introduction

India ranks among the fastest-growing global economies, with GDP growth estimates ranging from 6.0 to 6.8 percent for fiscal year 2023-24. Yet beneath these impressive macroeconomic indicators lies a critical challenge: the estimated 63 million nano enterprises that form the backbone of India's rural economy remain largely excluded from formal financial systems. These hyperlocal businesses, typically operated by women from Self-Help Group (SHG) households with annual turnovers below ₹25 lakhs, employ over 110 million people and contribute significantly to rural livelihoods. However, their lack of formal registration, limited credit history, and minimal collateral systematically exclude them from institutional support, leaving them vulnerable to external shocks and trapped in cycles of low productivity.

The COVID-19 pandemic exposed these vulnerabilities with devastating clarity. Nationwide lockdowns disrupted supply chains, collapsed consumer demand, and forced many nano enterprises to exhaust their limited savings or cease operations entirely. While larger firms could access institutional relief measures, nano enterprises—despite their critical role in community resilience—were largely excluded from formal pandemic support due to their informality. This exclusion not only exacerbated immediate suffering but also highlighted fundamental gaps in India's rural enterprise support ecosystem.

Against this backdrop, the Tamil Nadu Rural Transformation Project (TNRTP) introduced an innovative financial intervention sequence designed to address both crisis response and long-term enterprise development. The project first implemented the COVID Assistance Package (CAP) to provide emergency working capital support to SHG-linked enterprises during the pandemic. Building on CAP's foundation, the Nano Enterprise Financing Fund (NEFF) was

subsequently launched to transition enterprises from survival mode toward sustainable growth by providing access to formal credit ranging from ₹30,000 to ₹70,000 per enterprise.

This study examines a fundamental question in development economics: How does structured access to formal credit affect nano enterprise performance, investment behavior, and business practices in rural India? NEFF represents a particularly compelling case because it builds upon existing community-based institutions (Panchayat Level Federations) and leverages prior repayment performance as an allocation criterion, creating conditions for credible causal identification.

Our empirical strategy exploits a natural experiment arising from NEFF's implementation design. While the program was intended to support enterprises in villages achieving 100% CAP repayment, administrative data reveals significant variation in NEFF allocation among villages with 95-99% repayment rates. This quasi-random allocation within a narrow repayment bandwidth enables us to compare enterprises in NEFF-receiving villages to those in non-NEFF villages with nearly identical repayment performance, addressing common selection concerns in program evaluation.

Using primary data from 2,576 enterprises across 208 villages collected through comprehensive baseline and follow-up surveys, we employ difference-in-differences estimation to identify causal impacts. Our analysis reveals that NEFF exposure generates substantial improvements in enterprise performance. Treated enterprises experience profit increases of 0.149 standard deviations and revenue growth of 0.117 standard deviations relative to control enterprises, achieved without proportional cost increases. Investment behavior shifts dramatically, with total investment rising by 0.298 standard deviations, concentrated in fewer but larger-scale activities that suggest improved capital allocation efficiency. Working capital

investment increases by 0.156 standard deviations, indicating that liquidity constraints were the primary binding constraint for most enterprises.

The temporal evolution of effects provides crucial insights into the mechanisms underlying credit interventions. While impacts are minimal in the first survey round, substantial improvements emerge by the second round, suggesting that enterprise development requires gestation periods for optimal capital deployment. Business practices show mixed patterns: record-keeping capabilities improve dramatically (2.5 standard deviations), indicating enhanced formalization, while marketing practices decline, possibly reflecting strategic shifts away from intensive promotional activities as improved operational capacity reduces reliance on aggressive customer acquisition.

These findings contribute to three distinct literatures. First, we advance research on financial constraints facing micro and nano enterprises by demonstrating how community-based credit interventions can effectively address binding liquidity constraints while promoting business formalization. Second, we extend the post-crisis recovery literature by showing how sequenced financial support—from emergency assistance to growth capital—can help informal enterprises transition sustainably from survival to expansion modes. Third, we contribute to understanding optimal design features for rural enterprise interventions, particularly the importance of building upon existing social capital through established community institutions.

Our study advances beyond previous work in several dimensions. Unlike traditional microfinance evaluations that examine credit access in isolation, we analyze an intervention sequence that bridges crisis response and development objectives. Our natural experimental design provides credible causal identification while the comprehensive outcome measurement spanning financial performance, investment patterns, and business practices offers unusually

detailed insights into intervention mechanisms. Additionally, the post-COVID context allows examination of how formal credit access affects enterprise resilience and recovery trajectories.

The remainder of this study proceeds as follows: Section 2 provides institutional background on TNRTP and develops our theoretical framework. Section 3 details the evaluation design, sampling strategy, and data collection procedures. Section 4 outlines our empirical methodology and identification strategy. Section 5 presents results on enterprise performance, investment behavior, and business practices. Section 6 concludes with implications for rural development policy and future research directions.

1.2 Literature Review

1.2.1 Micro, Small, and Medium Enterprises (MSMEs) and Nano Enterprises: Definition and Classification

Micro, Small, and Medium Enterprises (MSMEs) play a pivotal role in the economic development of many countries, particularly in developing economies, by contributing significantly to employment, innovation, and GDP. In India, MSMEs are classified based on their investment in plant and machinery or equipment and annual turnover: micro enterprises are defined as those with an investment not exceeding INR 1 crore and annual turnover up to INR 5 crore; small enterprises have investment limits of INR 10 crore and turnover up to INR 50 crore; medium enterprises are characterized by investments up to INR 50 crore and turnover not exceeding INR 250 crore (MoMSME., 2020). More than 99 percent of MSMEs in India belong to the ‘micro’ category (MoMSME 2023b). The regulatory framework for MSMEs in India has undergone significant evolution, particularly through changes in classification criteria. The MSMED Act of 2006 initially categorized enterprises based solely on investment in plant and machinery/equipment, with distinct thresholds for manufacturing and service sectors. The revised classification system introduced composite criteria incorporating both

investment and turnover thresholds, while also expanding coverage to include retail and wholesale trade. Notably, the new framework excludes export turnover from classification limits, providing flexibility to export-oriented enterprises (MoMSME, 2023b). This regulatory shift acknowledges the heterogeneity within the MSME sector and aligns policy support more closely with operational scale rather than just capital investment.

A large majority (96%) of India's microenterprises operate with annual turnover below INR one crore (Omidyar Network and BCG, 2018). These enterprises constitute a heterogeneous group at varying stages of business growth, with over 90% operating informally. They are owner-managed firms, most of which operate with less than five workers. This high degree of informality and limited operational scale creates distinct challenges for policy intervention and support programs.

Nano enterprises represent a distinct subset within the broader Micro, Small, and Medium Enterprises (MSME) category, defined by their hyperlocal focus and scale of operations. Typically, these enterprises are characterized by an annual turnover of less than INR one crore and include small retail outlets such as Kirana stores, local businesses, and small-scale manufacturing units often run by households or individuals. Although the term "nano enterprise" is not yet widely recognized in academic or policy discussions, emerging literature and reports advocate for its adoption to differentiate these enterprises from larger MSMEs (Buteau et al., 2023; Sharma et al., 2023). For instance, recent analyses suggest that nano enterprises generally operate with annual turnovers between INR 10 lakhs (~USD 13.33K) and INR one crore (~USD 120K), highlighting their economic significance and unique challenges within the MSME ecosystem.

Unlike larger MSMEs, which often engage with broader markets and supply chains, nano enterprises primarily cater to hyperlocal demands. This localized approach allows them to effectively serve their communities and contribute to community cohesion and resilience. However, the same characteristics that define their importance—small scale, hyperlocal reach, and informality—also serve as barriers to growth and development. These enterprises are often excluded from formal policy support, access to structured financing, and the broader opportunities available to MSMEs.

The government's policy interventions, including support packages for MSMEs, have consistently overlooked nano enterprises, primarily because these businesses are often informal and unregistered. The Covid-19 pandemic widened this gap, as government relief packages were targeted at registered MSMEs, leaving nano enterprises without access to much-needed support. Despite employing over 110 million people, with approximately 20% being women-owned and home-based, the informal nature of nano enterprises leaves them vulnerable to economic shocks. The pandemic led to widespread disruptions like market closures, loss of raw materials, and collapsing demand which disproportionately affected nano entrepreneurs such as artisans, weavers, and livestock producers. Many were forced to exhaust their savings or fold entirely due to lacking institutional support.

1.2.2 Informality of MSMEs: Reasons and Challenges

The available literature and reports on the formalization of the MSME sector explore the reasons for informality and self-exclusion by small businesses. Key barriers include high direct and indirect registration costs, such as compliance with tax regulations and labour laws, which deter small businesses from formalizing (ILO, 2015). In India, the seasonal and transient nature of many small businesses further discourages formal registration, as they perceive limited value in complying with bureaucratic processes (Buteau et al., 2022). Many nano enterprises lack

awareness of the specific advantages of formalization, including access to finance and markets, which further limits their motivation to register. The operational constraints of nano enterprises compound the challenge. With minimal manpower, owners find it difficult to balance the administrative burden of formalization alongside running their businesses. Recent data highlights the vulnerability of the MSME sector. Between July 1, 2020, and December 8, 2023, 32,298 MSMEs cancelled their Udyam registration due to business closures. This reflects the fragile nature of many enterprises in the post-pandemic economy.

The informality of nano enterprises prevents them from accessing key benefits associated with formalization, such as easier access to finance and broader markets. Service sector nano enterprises face additional challenges, including low productivity, intense competition due to low barriers to entry, and limited working capital, making them especially vulnerable during economic downturns. The closure of such enterprises can have severe consequences, often leading to household financial distress due to the overlap between personal and business finances, as well as job losses for semi-skilled, unskilled, and migrant workers. To address the risks and challenges posed by informality, registration and licensing are essential first steps toward formalization. This process involves registering with government agencies, obtaining necessary licenses and permits, and adhering to tax regulations and reporting requirements (Gaarder and Doorn, 2021). However, many nano enterprises face significant barriers to registration, such as a lack of formal documents needed for the process. In recent years, digital adoption has emerged as a potential pathway for formalization. By creating a digital trail through transaction records, MSMEs can gain visibility and access to benefits associated with formalization. As digitalization expands, it offers a promising avenue for integrating nano enterprises into formal financial and market systems.

1.2.3 Constraints

These small enterprises often operate with limited resources and in volatile environments. They face significant constraints that hinder their operations and growth. Constraints include limited access to formal credit, inadequate infrastructure, lack of market information, insufficient business skills, and exposure to economic shocks. According to the International Finance Corporation (IFC), micro and small enterprises account for approximately 95% of the credit gap, highlighting the untapped potential for formal financial institutions to address these needs (IFC, 2018). The constraints they face can be broadly categorized into supply-side and demand-side limitations that hinder their capacity to thrive.

1.2.3.1 Demand-side Constraints

Microenterprises face significant demand-side barriers in accessing formal finance, with collateral requirements among the most critical challenges. Lack of collateral inhibits small businesses from securing cheaper loans (Kumar, 2017). In the Indian context, cultural and social norms place immense importance on land ownership, often discouraging individuals from using land as collateral for loans (Krishnan et al., 2017). Even when property is pledged, issues such as unclear land titles and ambiguous property rights reduce perceived creditworthiness in the eyes of formal lenders, creating inefficiencies in the credit market. For smaller businesses, the only viable collateral is often their enterprise assets, which are typically of lower value and insufficient to meet formal lending requirements (Rahman et al., 2017). This challenge is more pronounced in service-oriented firms, which predominantly possess intangible assets like brand equity, unlike manufacturing firms that hold securitizable tangible assets (Rao et al., 2019). Consequently, smaller businesses often face a paradox: they cannot secure credit without sufficient assets, and they cannot create assets without access to credit.

Another significant barrier is the lack of financial records, which are critical for demonstrating financial health to formal lenders. Many microenterprises do not maintain proper bookkeeping

practices, which limits their ability to access affordable credit (Nikaido et al., 2015). The blending of personal and business finances further complicates this issue, particularly for micro-retail businesses that often use business funds for household expenses (de Mel et al., 2009). This lack of financial separation hinders the ability of small firms to present themselves as credible borrowers.

Many researchers argue that managerial capital is also a first-order impediment to firm growth. Managerial capital is a critical demand-side constraint that limits the growth potential of small firms, especially in developing contexts. It represents the skills, knowledge, and experience required for efficient business operations, including financial management, strategic planning, marketing, and resource allocation competencies. For many small enterprises, inadequate managerial skills translate into ineffective business decisions, poor financial management, and an inability to adapt to changing market demands. Weak managerial capacity prevents small firms from maintaining proper financial records and developing growth strategies, all of which are crucial for enhancing productivity and ensuring competitiveness. Moreover, these constraints often exclude small firms from formal credit channels and growth opportunities, as they lack the credibility and operational sophistication that financial institutions require. Therefore, strengthening managerial capacity is key to improving business outcomes and enhancing the ability of small enterprises to grow sustainably and remain resilient in the face of economic challenges.

Risk aversion also plays a critical role in discouraging microenterprise owners from seeking formal credit. Many fear the consequences of defaulting, including the potential loss of pledged assets, especially when business survival is uncertain. Firm-level characteristics such as size and age also impact credit access. Larger and older firms are generally seen as less risky and more creditworthy, while younger and smaller firms, despite their potential for higher growth,

still struggle to secure financing (Kumar, 2017). Additionally, inadequate loan sizes fail to meet the growth capital needs of these businesses, particularly for younger firms that lack equity reserves. Delays in accessing timely credit further exacerbate these challenges, reducing the profitability and growth potential of microenterprises (Otoo et al., 2011).

A lack of publicly available information on microenterprises makes them "opaque" to lenders compared to larger firms, further discouraging formal lending (Abraham & Schmukler, 2017). To address this opacity, lenders often impose stringent collateral requirements, which increases the credit gap. Stiglitz and Weiss (1981) argued that such information asymmetry leads to adverse selection, where lenders charge higher interest rates to mitigate perceived risks. However, this practice disproportionately affects creditworthy borrowers, leaving a riskier pool of applicants. High collateral requirements can also create moral hazard, incentivizing borrowers to invest in riskier ventures, ultimately increasing the lender's exposure to default risk.

Modern finance has typically tried to overcome this problem of information asymmetry, which lies at the heart of financial intermediation and is inherent in dealing with informal or semi-formal microenterprises. One of the innovative ways to overcome this has been the birth of the microfinance movement which uses a high touch model as well as social collateral to provide small ticket size loans with high frequency repayment schedules. Morduch (1999) highlights the relevance of the group-lending model, which has been one of the predominant approaches in microfinance. This concept rests on the promise of social assurances to physical contribution (Besley and Coate, 1995). However, while microfinance caters to the daily cash flow needs of microenterprises, the small loan size does not address the long-term growth capital needs of this sector.

1.2.3.2 Supply-side Constraints

Supply-side constraints significantly hinder the ability of micro and small enterprises (MSEs) to access formal finance. Financial institutions, particularly banks, are often reluctant to lend to MSEs due to the perceived risk of default and the potential for loans to turn into non-performing assets (NPAs) (Singh, 2016). While private sector banks experience higher NPAs for larger-ticket loans to corporate borrowers compared to the MSE segment, public sector banks demonstrate the opposite trend, with MSME loans accounting for a substantial share of their NPAs (Sumanjeet and Minakshi, 2017). For instance, in the June 2019 quarter, 16% of all MSME loans disbursed by public sector banks were classified as NPAs, nearly three times the rates observed in private banks and non-banking financial companies (NBFCs) (Memos et al., 2020). In this scenario, credit guarantees play a pivotal role in aiding private sector lending to MSME players. Challenges such as adverse selection problems and high default rates consequently increase the transaction costs for lending organisations and results in aversions towards lending to this sector (Jena, 2021).

High transaction costs further discourage lending to MSEs. These costs arise from administrative expenses related to processing loans, underwriting, and provisioning for potential defaults. MSE lending involves significant costs due to weak capital bases, limited financial records, and poor transparency of business performance, which make the underwriting process more complex and expensive (Moses and Adebisi, 2013). In addition, post-loan monitoring costs are elevated for MSEs due to the lack of continuous visibility into their financial health. These factors collectively increase the costs of structuring, administering, and monitoring loans for traditional financial institutions, leading to constrained and delayed credit access for MSEs (“New Approaches to SME and Entrepreneurship Financing,” 2015).

Relationship banking emerges as a potential alternative to address the challenges of obtaining quantifiable transaction data from microenterprises. Evidence suggests the existence of relationship-based lending in India, as opposed to traditional transaction lending approaches like asset-based lending, factoring, and leasing (Thampy, 2010). While this approach benefits both banks and smaller firms (Baas and Schrooten, 2006), agency concerns within large banking organizations, such as delegating authority to loan officers, make relationship-based lending costly in terms of transaction and supervision (Berge et al., 2011).

Commercial banks in developing countries typically restrict their MSME lending to short-tenure loans that are either fully secured or of small ticket sizes (Kumar, 2017), limiting microenterprises' access to more specialized financial products like trade financing or leasing. Credit bureaus have become increasingly important in addressing this limitation by enabling the development of varied financial products based on risk profiles (OECD, 2015). Credit bureaus have expanded the geographical reach of bank lending by providing credit scores that overcome proximity constraints (Petersen and Rajan, 2002).

1.3.3 The Covid-19 Pandemic as a Covariate Shock

The Covid-19 pandemic served as a significant covariate shock, affecting entire communities and economies simultaneously, with devastating consequences for nano enterprises in particular. Unlike idiosyncratic shocks, which may affect individual firms due to firm-specific circumstances, a covariate shock like Covid-19 impacts entire sectors, regions, and population groups indiscriminately. The pandemic's abrupt onset and subsequent lockdowns disproportionately impacted nano enterprises, which were already vulnerable due to their informal operations, limited financial reserves, and fragile market connections.

The pandemic led to widespread market closures, supply chain disruptions, and a collapse in consumer demand, all of which severely affected small, informal businesses. For nano entrepreneurs, the lockdown meant losing access to their already limited customer base and being cut off from raw materials and necessary inputs. The economic impact was further compounded by the lack of formal support structures for nano enterprises during the crisis. Government relief efforts largely targeted registered MSMEs, while nano enterprises, being predominantly informal and unregistered, were excluded from the formal relief ecosystem. Despite employing over 110 million people and significantly contributing to local economies, these enterprises were left out of the financial aid provided through government channels, highlighting the gaps in the relief framework for the informal sector.

As a covariate shock, COVID-19 not only threatened the immediate livelihoods of nano entrepreneurs but also highlighted structural weaknesses that prevent these businesses from achieving sustainable growth. For instance, during the pandemic, the Government of India announced a generous support package for MSMEs, yet the majority of nano enterprises, which provide livelihoods to millions within the informal sector, remained off the radar simply because they were not formally registered. The inability of nano enterprises to access emergency relief measures exacerbated their vulnerability to the effects of the pandemic.

For many nano enterprises, the lockdown led to a loss of fixed and working capital, severely limiting their ability to finance operations, restock inventory, or maintain equipment. The economic fallout was not limited to immediate revenue loss but extended to a long-term reduction in productivity due to the depletion of working capital and assets. This has led to a vicious cycle of reduced competitiveness and increased fragility for nano enterprises, hindering their ability to recover and grow. The COVID-19 pandemic revealed the inadequacy of current support structures for nano enterprises and highlighted the urgent need for targeted

interventions specifically designed to support the recovery and growth of these businesses in the aftermath of such shocks.

1.3.5 Interventions: Addressing the Needs of Nano Enterprises

The interventions under NEFF are designed to restore lost capital, build skills, enhance digital access, and provide comprehensive business support to nano enterprises, thereby addressing both immediate and long-term challenges these enterprises face.

1. **Restoring Capital:** One of the major setbacks for nano enterprises during the pandemic was the depletion of working capital, which is essential for daily operations. NEFF addresses this by channeling funds from CAP repayments to provide new loans ranging from INR 30,000 to INR 70,000 per enterprise. These loans are designed not just to restore lost capital but to transition enterprises from a focus on survival to one on growth. The loans are provided at a maximum interest rate of 12% per annum, based on well-prepared business plans, ensuring that the support is targeted towards viable and growth-oriented enterprises.
2. **Reskilling and Training:** NEFF incorporates crucial non-financial interventions through a robust support ecosystem. The program emphasizes the role of Enterprise Community Professionals (ECPs) who provide critical business development support, including assistance in business plan preparation and regular monitoring. ECPs must visit enterprises at least twice monthly, ensuring continuous guidance and support. Regular interaction helps identify and address operational challenges early while also facilitating proper fund utilization and timely loan repayment.

NEFF's intervention design notably includes strong monitoring and evaluation components, with multiple institutional layers (from village to district level) overseeing implementation. This multi-tier monitoring system, involving PLF book keepers, ECPs, and various project

executives, helps ensure the effectiveness of interventions while maintaining program accountability. The requirement for 100% asset verification within 30 days of disbursement further strengthens the program's implementation integrity.

CHAPTER 2 -TNRTP: INSTITUTIONAL BACKGROUND, DESIGN, OBJECTIVE

2.1 Background:

India currently ranks among the fastest-growing global economies, with GDP growth estimates ranging from 6.0 to 6.8 percent for the fiscal year 2023-24, contingent upon the evolving landscape of global economic and political dynamics. The Economic Survey for the fiscal year 2022-23 sets the stage with a foundational projection of a 6.5 percent real GDP growth rate in FY24 (Economic Survey 2022). Simultaneously, the proportion of the population engaged in agriculture has exhibited a declining trend in recent years, reaching a significant low of 41% in 2019 (World Bank Group). However, there was a notable uptick to 44% in 2021, plausibly attributed to the onset of the Covid-19 pandemic. In response to this shift, the government has implemented a comprehensive array of measures designed to reduce dependency on agriculture. A prominent manifestation of this shift is evident in the increased allocation of budgetary resources to the Micro, Small, and Medium Enterprises (MSME) sector. It is noteworthy that there has been a substantial expansion of credit allocation to the MSME sector. For the fiscal year 2023-24, the government has significantly augmented budget allocations for the Ministry of Micro, Small, and Medium Enterprises, allocating 22137.95 crores. This represents a substantial 41.6% increase from the previous year's revised estimates (Union Budget 2023).

Furthermore, the Indian government has embarked on initiatives to nurture entrepreneurial acumen among the nation's youth. A noteworthy endeavour in this regard is the Atma Nirbhar Bharat Abhiyan, initiated by the Indian government in 2020. This strategic endeavour signifies a pivotal opportunity for Indian startups to assume leadership roles in guiding the development of innovations that have traditionally relied on global supply chains. The primary objective of this initiative is to position India as a globally competitive, self-reliant

entity by strengthening domestic manufacturing, fortifying local supply chains, and elevating indigenous products to the status of globally recognized brands.

The government is making attempts to promote entrepreneurship and gender inclusivity in the rural sector as well. The government is initiating programs aimed at creating a women entrepreneur ecosystem, fostering connections, collaboration, and innovation to scale up businesses and empower a robust female workforce. Jammu and Kashmir Rural Livelihood Mission (JKRLM) has established the UMEED to create a platform for approximately 500,000 rural SHG members to showcase their products, establish direct connections with consumers and potential buyers, and exhibit their skills. This initiative, known as UMEED Women's Haat, is part of JKRLM's efforts to empower rural women SHG members by providing them with opportunities to display their products and connect with potential market participants. Under a similar initiative called SAATH, women entrepreneurs from SHGs would be provided with easy access to capital and would be equipped with the necessary skill set such as training and mentorship that would enable them to reach new markets. As part of this program, the selected women entrepreneurs would be trained on channels of production, branding, packaging, and distribution.

These initiatives would facilitate the establishment of strong connections between these businesses and the marketplace, simultaneously nurturing the entrepreneurial drive among women. These Indian enterprises possess the potential to introduce world-class yet cost-effective products and services to the market. It is anticipated that sectors such as automation, fintech, supply chain management, logistics, and healthcare will serve as the vanguard in advancing the objectives of this mission. Drawing inspiration from similar initiatives in other countries, we find examples such as Indonesia's Kredit Usaha Rakyat (KUR), a government-funded subsidy scheme supporting small entrepreneur enterprises (such as street vendors).

Financing provided through KUR is sourced from banking funds or financial institutions designated as KUR Distributors. The funds provided include working capital and investment funds disbursed to individual MSME operators, business entities, and/or groups engaged in productive and viable enterprises that may lack additional collateral or are feasible but not yet bankable. Mexico has implemented a comparable program known as the National Program of Financing for Microentrepreneurs (PRONAFIM). The program tries to encourage gender equality and empower women microentrepreneurs by facilitating their access to microfinance services. Meeting microcredit demands are achieved through strategic credit lines provided to accredited MFIs, thereby enhancing conditions. Efforts also focus on bolstering the financial and entrepreneurial capabilities of microentrepreneurs through training and productive activities incubation. The program also focuses on expanding the geographic area under its cover, prioritizing underserved areas, to improve access to microfinance services. These initiatives highlight the global trend of fostering skill development and entrepreneurship to enhance economic resilience and self-reliance. In this context, the Tamil Nadu Rural Transformation Project (TNRTP) serves as an exemplary model for advancing the realization of “Atma Nirbhar” goals in India.

2.2 What is TNRTP and Why is it important?

The Vazhndhu Kattuvom Project (VKP), also known as the Tamil Nadu Rural Transformation Project (TNRTP), represents a pioneering initiative supported by the World Bank. Its overarching objective is to foster rural transformation in specific blocks of Tamil Nadu. Rather than solely focusing on poverty reduction, this project adopts a comprehensive approach aimed at enhancing the sustainability and affluence of rural communities. This multifaceted strategy encompasses the promotion of rural enterprises, the facilitation of access to financial resources, and the creation of employment prospects.

One of the major challenges in sustainably integrating rural households into higher-level income opportunities for wealth creation is the presence of human resource and capacity gaps within existing promotional agencies and implementing departments. These gaps hinder the effective coordination and facilitation of business promotion and development services. Additionally, there is a notable scarcity of start-up capital and reliable business service support, which impacts overall access to finance for these rural households. Weak management capacity is another significant issue within producer groups (PGs) and businesses led by individual entrepreneurs and enterprises. Furthermore, asymmetry in prices and business information poses a significant hurdle. Lastly, the lack of coordinated planning and resource mobilization for the promotion of farm or off-farm producer-linked business enterprises, individual entrepreneurship, and value chain development exacerbates the challenges. Therefore, the Tamil Nadu Rural Transformation Project (TNRTP) serves as a valuable model to address these multifaceted challenges effectively.

2.3 Project Development Objectives

The Project Development Objective (PDO) of TNRTP is ‘To promote rural enterprises, access to finance and employment opportunities in targeted areas of Tamil Nadu.’. To accomplish these PDOs the project envisages different components including:

i) Rural Enterprises Ecosystem Development (REED) This component can be further divided into three subcomponents: Inclusive Strategic Investment Analytics and Planning, Enterprise/Business Development Support Services and Enterprise Promotion, Value Chain Strengthening and Partnerships. REED comprises three integral components. Firstly, it employs a systematic approach involving District Diagnostic Studies (DDS) and value chain analyses to identify and prioritize commodities or subsectors for targeted investments. Subsequently, it formulates Participatory Growth Plans to facilitate inclusive investment

strategies for the identified sectors. Secondly, the program establishes mechanisms for delivering comprehensive business development support services, primarily through community professionals and One Stop Facilities. Lastly, it focuses on promoting prioritized commodities and subsectors, assisting individual and collective enterprises with technical expertise, financial resources, and market access, benefiting Enterprise Groups, Producer Groups, and Producer Collectives.

ii) Enterprise Business Plans Financing This component aims to establish institutions and mechanisms for delivering business development support services, primarily driven by community professionals operating at the village level. The One Stop Facility (OSF) serves as an institution providing these services to rural entrepreneurs. The overarching objective is to enhance access to financing for both individual and group enterprise business plans, achieved through the Matching Grant Program (MGP). This financing mechanism would not only promote improved loan repayment discipline among borrowers but also widen the prospects for enterprise sustainability. Additionally, it encourages active participation from mainstream financial institutions, fostering timely credit support for rural businesses.

iii) Skills and Job Opportunities: The Skills and Jobs Opportunities component focuses on creating sustainable wage and self-employment opportunities by promoting relevant skills for higher-value agriculture, allied activities, and non-farm sectors. It also aims to enable entrepreneurship through market-responsive skills and entrepreneurship development. To achieve this, the project utilizes community-based skilling to train service providers, entrepreneurs, and producer households in targeted value chains. Additionally, it seeks to improve access to skills training in rural areas by establishing Community Schools.

iv) Project Management: This component is providing support services, developing management and monitoring systems, creating delivery processes and enhancing staff capacity for effective and efficient implementation of the project activities.

2.4 Institutional Background

In this section, we provide the institutional background of the TNRTP project perspective.

2.4.1 Nature of support

- Target beneficiaries are SHG members in TNRTP blocks.
- Loan amounts range from Rs.30,000/- to Rs.70,000/- per enterprise.
- Loans are based on the business plan and given at a maximum interest rate of 12% per annum.
- Entrepreneurs accessing NEFF can avail of necessary business development services from One Stop Facility (OSF) if required.

2.4.2 Eligibility for Individual Entrepreneurs

- Entrepreneur from project implementation village panchayat.
- Both existing and new Enterprises.
- Entrepreneur must be a SHG member.
- SHG should be affiliated to PLF.
- Eligible enterprises run by differently abled, vulnerable, SC and ST households.
- Enterprises should not be categorized in the negative list under the Environment Social and Management Framework (ESMF).
- Entrepreneurs should have good track record of SHG/PLF loan repayment.

2.4.3 Role of Enterprise Community Professionals (ECPs)

Enterprise Community Professionals (ECPs) play a crucial role in supporting and facilitating the success of entrepreneurs within the program. These professionals are tasked with multiple responsibilities that span the entire process of business development and loan management. Initially, ECPs assist entrepreneurs in preparing comprehensive Business or Activity plans, a critical step that precedes the submission of loan applications. This support ensures that entrepreneurs present well-thought-out and viable business proposals. Beyond the planning stage, ECPs act as key liaisons, connecting enterprises with necessary resources. If entrepreneurs require additional training or specific services to enhance their business capabilities, ECPs facilitate their access to One Stop Facility (OSFs), ensuring that entrepreneurs receive the support they need to succeed. Furthermore, ECPs take on a significant oversight role post-loan disbursement. They are responsible for conducting thorough asset verification, ensuring that 100% of assets are verified within 30 days of the loan being disbursed. This verification process is crucial for maintaining the integrity of the program and ensuring that funds are utilized as intended. Additionally, ECPs play an active role in the financial health of the program by following up on repayments and initiating recovery processes for overdue amounts. This comprehensive involvement of ECPs throughout the entrepreneurial journey highlights their importance in fostering successful businesses and maintaining the sustainability of the financial support program.

2.4.4 Role of BPMU

The Block Project Management Unit (BPMU) plays a critical role in overseeing and managing the loan program, likely associated with the Nano-Enterprise Financing Fund (NEFF). The BPMU project team, along with various Project Executives (PEs), is responsible for a comprehensive monitoring and management system. PE (A&A) and the BPMU team conduct regular inspections of Panchayat Level Federation (PLF) activities both before and after loan

disbursement. Similarly, PE (ED) focuses on monitoring enterprises throughout the loan cycle, including their business activities. A key responsibility of PE(A&A) is to ensure that all loan disbursement and repayment information is entered into the NEFF Portal in real-time. This simultaneous entry of data eliminates the need for a separate reporting format to the District Project Management Unit (DPMU). The team also ensures prompt repayment by monitoring and updating the NEFF repayment ICT module, as well as overseeing the maintenance of accurate bookkeeping records for all disbursements and repayments. In cases where repayments are overdue by more than 30 days, the Block Team Leader (BTL) and PE (ED) are tasked with taking necessary steps to regularize the account. This multi-faceted approach demonstrates a thorough system of checks and balances, ensuring the effective management and sustainability of the loan program while supporting the success of the enterprises it funds.

2.4.5 Role of DPMU

The District Project Management Unit (DPMU) plays a crucial role in overseeing and managing the loan program, likely associated with the Nano-Enterprise Financing Fund (NEFF). The DPMU project team, particularly the Executive Officers (EOs), are responsible for a comprehensive monitoring and management system. EO (A&A) and the DPMU team conduct regular inspections of Panchayat Level Federation (PLF) activities both before and after loan disbursement. EO (ED) focuses on monitoring enterprises throughout the loan cycle, including their business activities. A key responsibility of EO(A&A) is to collect and consolidate loan disbursement and repayment status reports from the PLF, which are then submitted to the DPMU in a specified format. This team also ensures prompt repayment by monitoring and updating the NEFF repayment ICT module, as well as overseeing the maintenance of accurate bookkeeping records for all disbursements and repayments. In cases where repayments are overdue by more than 60 days, the DPMU is tasked with taking necessary steps to regularize the account. This multi-faceted approach demonstrates a thorough

system of checks and balances at the district level, ensuring the effective management and sustainability of the loan program while supporting the success of the enterprises it funds.

2.5 Project Evaluation Timeline

To evaluate the causal impact of NEFF intervention data were collected in two phases. Phase 1 baseline survey commenced on February 14th and concluded on June 16th. Phase 2 secondary data collection began on April 15th and ended on June 1st. To ensure data quality, high-frequency checks and audio audits were conducted throughout both survey phases. This rigorous dual-phase process helps verify the accuracy and reliability of the collected data, addressing any discrepancies or errors in real time while allowing for comprehensive data validation.

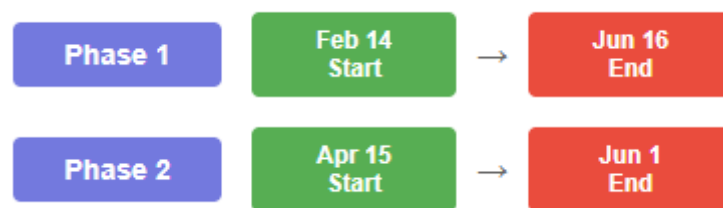


Figure 1: Project Timeline

Chapter 3- NEFF: Institutional Background, Design, and Theory of change

3.1 Nano Enterprise Financing Fund (NEFF): Design

NEFF is a component that supports nano-enterprises managed through community-based institutions such as Panchayat Level Federation (PLF). The loan given to individual enterprises under CAP initiative is being repaid and this fund will be channelized as a Nano Enterprise Financing Fund (NEFF). Nano Enterprising Fund will support 15,000 loans to the existing/new enterprises in the respective Village Panchayats.

The PLFs will be provided capacity building through Project at the Block level and continuous handholding will be done by the ECPs on the process to revolve repayment received from the CAP funds. Under NEFF, both the existing and new entrepreneurs from SHG/SHG households are eligible to avail loans for Nano enterprise activity. The PLF will receive loan application from the beneficiaries and evaluate the activity plan based on the detailed NEFF guidelines and disburse loan through PLF at the rate of Rs. 30,000 to Rs. 70,000 per beneficiary. The Nano enterprises assisted through NEFF funds will be monitored through ECPs and PE (ED).

The strategy to promote individual entrepreneurs (both existing and new) to set up enterprises around the prioritized commodity and subsector will be to (a) identify a set of aspiring entrepreneurs through a rigorous methodology; (b) provide technical and business development services through the OSF, along with convergence (line department) and partnership (private sector) to develop business plans; and (c) link to financial institutions for business plan financing and other financial services. While selecting entrepreneurs, proactive measures would be taken to motivate and mobilize women to lead the initiatives. Moreover, the possibility for greening the enterprises would be explored during the business planning process. The nano enterprises, especially, would require intensive hand-holding support in

terms of business advisory and business development services. The OSF, project staff, and ECPs would be extending all support, including focused training and capacity-building inputs, besides regular ongoing counselling and facilitation support.

Key challenges for sustainably integrating rural households into higher-level income opportunities for wealth creation are: (a) human resource and capacity gaps in existing promotional agencies and implementing departments to coordinate and facilitate business promotion and development services; (b) lack of start-up capital and predictable business service support and overall access to finance; (c) weak management capacity within existing producer groups (PGs) and businesses promoted by individual entrepreneurs and enterprises; (d) asymmetry in prices and business information; and (e) lack of coordinated planning and resource mobilization for promotion of farm or off-farm producer linked business enterprises, individual entrepreneurship, and value chain development. The other important impediments are the lack of responsiveness and sustained engagement of buyers or private players with producers, because of lack of compliance with requirements demanded by markets, small volumes, and low production efficiency, leading to high transaction costs. In addition, private players do not have proficiency to engage with the dispersed individual producers, PCs, and downstream enterprises that lack market orientation.

Furthermore, support to women entrepreneurs and women-led enterprises under the proposed project builds on TNEPRP and global experience, which shows that women face significant constraints in starting enterprises or advancing the nano/micro units into small/medium enterprises. Key challenges include: (a) social and cultural barriers to take up economic enterprise beyond individual-level livelihoods; (b) poor access to capital and lack of knowledge about available finance options, advantages and disadvantages of available options, costs of various options, and benefits of borrowing; (c) lack of knowledge and access to

productive resources and technology which limits women enterprises to agriculture and services sectors; (d) limited skills related to relevant technology, leadership, market, and financial aspects which are critical for running successful and profitable enterprises; (e) poor knowledge and access to markets beyond the local areas with no/limited reach to regional, state, national, and international markets because of limited understanding of branding, marketing channels, and newer platforms including e-marketing; (f) largely informal businesses with no registration, which limits outreach; and (g) poor knowledge and access to professional networks and associations critical for business expansion, knowledge sharing, and potential tie-ups and partnerships.

The project will focus on households represented by women as the unit of planning. The project will target households that possess a basic level of assets, resources, and skills that can be invested in to enable income increase from value-added economic opportunities. The project will also build on the institutional platforms created and nurtured under the NRLP and the TNEPRP in the form of SHGs, Panchayat-Level Federations (PLFs) at the block and district levels. In this context, all project beneficiary households will have SHG membership (self or family member). Capable and willing SHG members who can leverage the business ecosystem created by the project will benefit from support for individual enterprises, membership of PCs, and/or skills for self or wage employment. The key aspect of the program includes relaxing financial constraints and mobilizing the social capital of these enterprises, thereby bridging the gap for capital and technical requirements of rural enterprises.

3.1.1 Covid Assistance Package (CAP) and NEFF

The Covid Assistance Package (CAP) was designed to support Self-Help Group (SHG) women-led enterprises in maintaining their operations during the pandemic. During this period, small businesses were particularly hard hit, grappling with challenges such as decreasing

consumer demand, interruptions in supply chains, and financial instability. These enterprises were compelled to rapidly adapt to an evolving market landscape to maintain their viability (Engidaw, A. E., 2022). Regardless of their economic status, use a range of strategies to manage shocks, including drawing on savings, seeking remittances, taking loans, selling assets, and participating in government welfare programs. Conversely, the poorest households, which often lack external support and access to informal credit, experience more severe outcomes. These households sometimes resort to extreme measures like starvation when faced with shocks (Pradhan and Mukherjee, 2018).

Entrepreneur from mature Self-Help Groups (SHGs), those existing for more than 12 months, encountered similar difficulties. The mature SHGs are typically more integrated within financial networks, having access to Revolving Funds (RF), Community Investment Funds (CIF), and established bank connections. Despite these advantages, which often provide a buffer against financial instability, these groups were not insulated from the widespread economic disruptions caused by the pandemic. One inherent challenge in this setup was the difficulty in segregating household budgets from enterprise budgets. This overlap can lead to scenarios where loans intended for business use are redirected towards personal consumption, especially during times of economic stress. Such a situation becomes more likely when external shocks like the pandemic significantly impact household income, compelling entrepreneurs to prioritize immediate family needs over business expenditures.

3.1.2 Eligibility for NEFF

The Nano-Enterprise Financing Fund (NEFF) is provided to enterprise owners located in villages where that have met the condition of full CAP repayment and the repayment status in SHGs. Therefore, the intervention in the form of NEFF support inherently posits that successful

repayment is an indicator of business stability and financial discipline. This prerequisite not only ensures that beneficiaries have demonstrated financial discipline following the pandemic period but also shows that availability of credit is a catalyst for unlocking entrepreneurial capabilities and performance. These elements of NEFF design makes it an intervention that goes beyond the idea of second bank connect for SHGs. Instead, the intervention deepens the bank connect by providing access to formal credit, which helps entrepreneurs by potentially relax their borrowings constraints.

The Financial Slack Theory suggests that the additional capital from NEFF creates a buffer, allowing firms to pursue growth opportunities and innovation. NEFF enables firms to acquire valuable resources, enhancing their competitive advantage. NEFF may lead to optimal financing choices, potentially altering firms' capital structure decisions. NEFF's structure may reduce information asymmetries, leading to more efficient capital allocation. These factors collectively contribute to NEFF's potential to enhance firm performance.

Moreover, the nature of investments facilitated by NEFF is likely to shift towards asset creation or debt reduction, moving away from the working capital-based investments typically supported by CAP. While CAP provided crucial support for day-to-day operations during the pandemic, NEFF allows firms to strategize their investments for long-term growth. This transition from operational focus to asset creation can lead to increased productivity, expanded capacity, and improved long-term financial health. By enabling enterprises to invest in assets or reduce existing debt, NEFF paves the way for sustainable growth and increased resilience, marking a significant evolution in the financial support structure for SHG enterprises.

3.2 Theory of Change

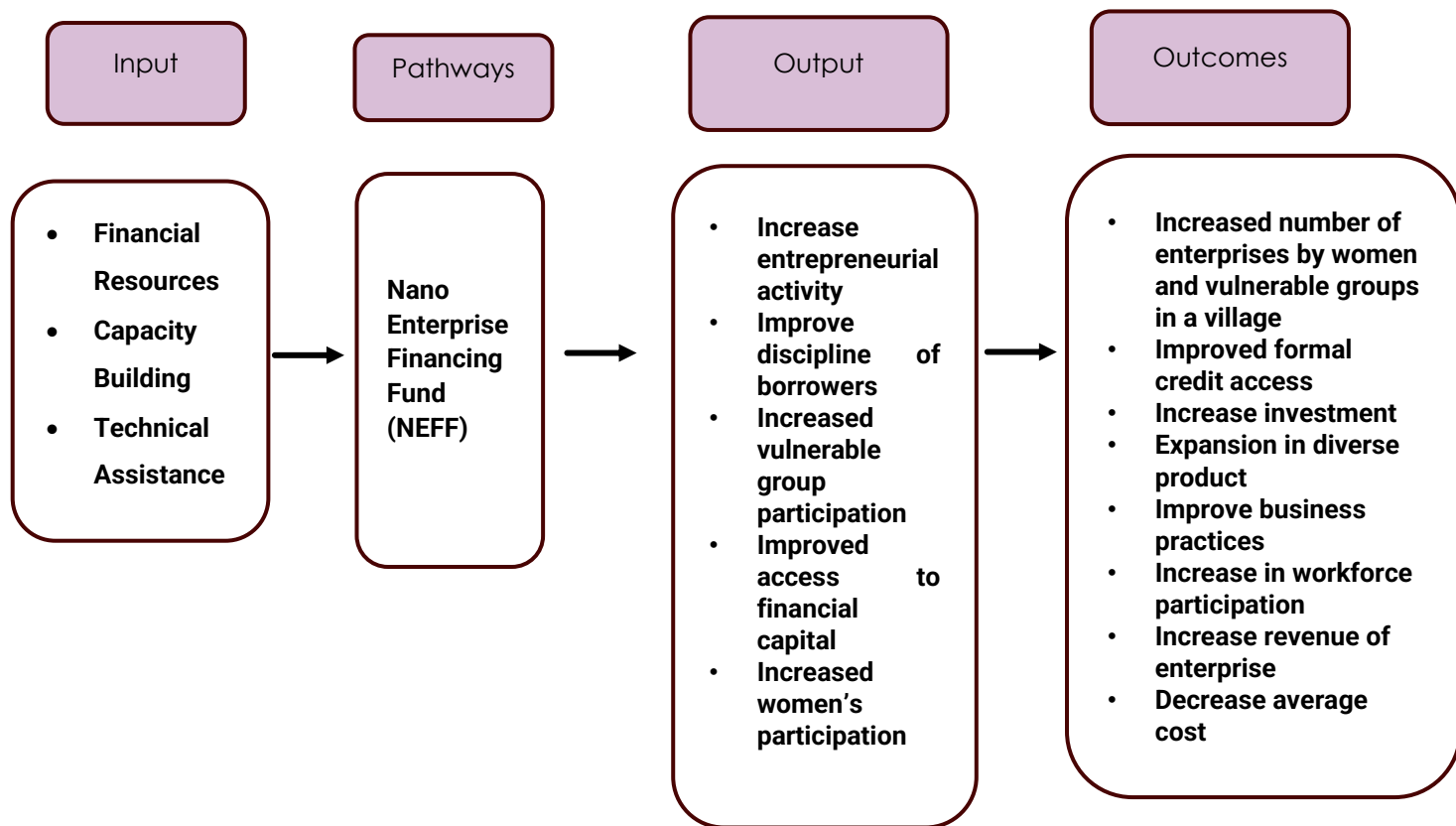
In this section, we present the Theory of Change of NEFF. Theory of Change (ToC) is a model that explains the change process by mapping out the logical sequence of events or conditions that lead to

the expected results. It provides a conceptual framework that outlines the causal pathways through which an organization or initiative expects to achieve its goals and create intended outcomes. It provides a roadmap for how activities and resources will contribute to achieving desired outcomes. We have constructed ToC of NEFF as it served pathways through which financial services are extended to enterprises. The activities conducted within these pathways represent the channels through which enterprises will access these services.

The project has successfully implemented the Covid-19 Assistance Package (CAP), providing loan assistance to enterprises totalling through VPRCs and PLFs. The loans given to individual enterprises under CAP are being repaid, and these funds will be redirected to establish a Nano Enterprise Financing Fund (NEFF). NEFF aims to foster an inclusive business environment by supporting new and existing enterprises operated by SHG members, SHG households. This fund will operate based on the lending principles employed by existing Community Based Organizations (CBOs) like PLFs encompassing entrepreneur selection, assessment, documentation, and fund disbursement. This activity addresses the challenges of providing financial support to enterprises affected by the Covid-19 pandemic, particularly those operated by vulnerable groups of the society. By repurposing the repayments from CAP loans into NEFF, it helps sustain and expand support for these enterprises, fostering an inclusive business environment and economic recovery.

The Theory of Change (ToC) for the Nano Enterprising Financing Fund (NEFF) demonstrates how financial services are extended to enterprises. It starts with the establishment of NEFF (Pathway), which provides access to financial capital (Channels) through organizations like Panchayat Level Federations (PLFs). This access leads to several outputs: increased entrepreneurial activities, improved borrower discipline, greater participation of vulnerable groups, better access to financial capital, and enhanced women participation. These outputs contribute to desired outcomes: an increase in enterprises run by women and vulnerable groups in villages, expansion in diverse products, and greater workforce participation by these groups, fostering an inclusive business environment and economic recovery.

Figure 2: Theory of Change



Key Challenge:

NEFF addresses the critical challenge of inadequate access to timely, formal credit for rural nano-enterprises, particularly those operated by women and Self-Help Group (SHG) members. This credit constraint, exacerbated by the Covid-19 pandemic, has hindered the growth and sustainability of these small businesses.

Chapter 4- Evaluation Design: sampling framework, identification strategy, Study Sample, power calculation, and surveys

This chapter outlines the comprehensive evaluation design that was developed to identify the short-run impacts for NEFF intervention, a key initiative under the VKP program. For NEFF intervention, TNRTP classified enterprises with an annual turnover of a maximum ₹25 lakhs and investment of ₹5 lakhs. Throughout the remaining part of this report, we interchangeably use the terms “enterprise” and “nano-enterprise,” which cater to the same nano-enterprise definition/classification we employ for the study. Nano enterprises in rural areas, especially those run by women, faced difficulties owing to un-timely credit, working capital deficit, and changing the business environment. These would be small enterprises, mostly operating at a household level, which cannot be supported through a loan from an SHG or other MFIs. This gap widens further due to the unintended COVID-19 pandemic and nationwide lockdown, which has affected rural enterprises significantly. The NEFF intervention is uniquely structured around the COVID Assistance Program (CAP) repayment status, ensuring that support is tailored to the needs and repayment capacities of nano-enterprises run by households of Self-Help Group (SHG) members. This chapter details the systematic approach taken to sample selection, survey design, and methodological rigor employed to assess the impact of NEFF. By elucidating the sampling framework, survey design, and analytical strategies, this chapter provides a robust foundation for understanding the intervention's short-term impact.

4.1 Sampling Framework

The enterprise sampling frame is distributed over 29 districts and 1552 villages, thereby providing a robust and comprehensive sample to evaluate the impact of the Nano Enterprise Financial Fund (NEFF) intervention in the short run. NEFF is mounted over and above the

CAP loan program and is built on the repayment behaviour of Community-Based Organizations (CBOs), thereby ensuring that the financial practices and commitments of such groups are incentivized appropriately. In the first phase, the NEFF is available to enterprises situated in villages that have shown resilience following the pandemic. As a result, NEFF is theoretically available to enterprises operating in villages that were successful in full repayment of their CAP loans. The CAP was provided to enterprise owners who were either members of SHGs or belonged to the household of a SHG member.

Therefore, our first task was to identify CAP and NEFF Panchayats, ensuring that we accurately distinguished between those supported under each intervention.

4.1.1 Identification of CAP and NEFF Panchayats

We started with the administrative (MIS) data that comprised exclusively of NEFF enterprises. In order to identify the NEFF Panchayats, we collapsed the NEFF enterprise data at the panchayat level. Then we utilized the MIS-CAP database to identify enterprises that had received the CAP support. The database also had details on the enterprise-level CAP loan repayment status and the proportion of the loan repaid. The enterprise-level CAP loan repayment status dataset was collapsed at the panchayat level and we are able to generate the list of CAP panchayats. The CAP Panchayats were further classified into seven categories based on their CAP loan repayment status:

- Category 0- The panchayat has fully repaid the CAP loan amount.
- Category 1-The panchayat has repaid between 95% to 99.9% of the CAP loan amount.
- Category 2-The panchayat has repaid between 90% to 94.9% of the CAP loan amount.

- Category 3-The panchayat has repaid between 85% to 89.9% of the CAP loan amount.
- Category 4-The panchayat has repaid between 80% to 84.9% of the CAP loan amount.
- Category 5-The panchayat has repaid between 75% to 79.9% of the CAP loan amount.
- Category 6-The panchayat has repaid less than 75% of the CAP loan amount.

4.1.1.1 Compliance with the NEFF Placement Rule

Following the categorization of CAP Panchayats, we merged CAP and NEFF panchayats, and this exercise helped us to identify ‘only CAP’ panchayats. While analysing the merged dataset, we observed that compliance with NEFF eligibility was partial. We focused our examination of NEFF compliance to a much smaller repayment bandwidth of 95%-99.99%. Even within this limited bandwidth, we could observe significant variation in compliance statistics. The findings from analysing the 95-99.9% CAP repayment bandwidth are presented in the figure below. Based on CAP loan repayment status and allocation of NEFF, four groups of Panchayats were found: (a) Group G1 includes villages that received NEFF loans with CAP repayment rates of 95-99.99%, (b) Group G2 comprises those that received NEFF loans and achieved 100% CAP repayment. (c) Group G3 consists of villages that did not receive NEFF loans despite having CAP repayment rates between 95-99.99%, and (d) Group G4 includes villages that fully repaid their CAP loans but did not receive NEFF loans. The four groups gave us a combined sampling framework of 1552 villages.

The sampling framework was drawn from Groups G1 and G3. In other words, the loan repayment status of sampled enterprises will vary between 95% to 99.9%. The sampling frame

resulted in the identification of 564 panchayats, divided into 253 NEFF panchayats (Group G1) and 311 only CAP panchayats (Group G3).

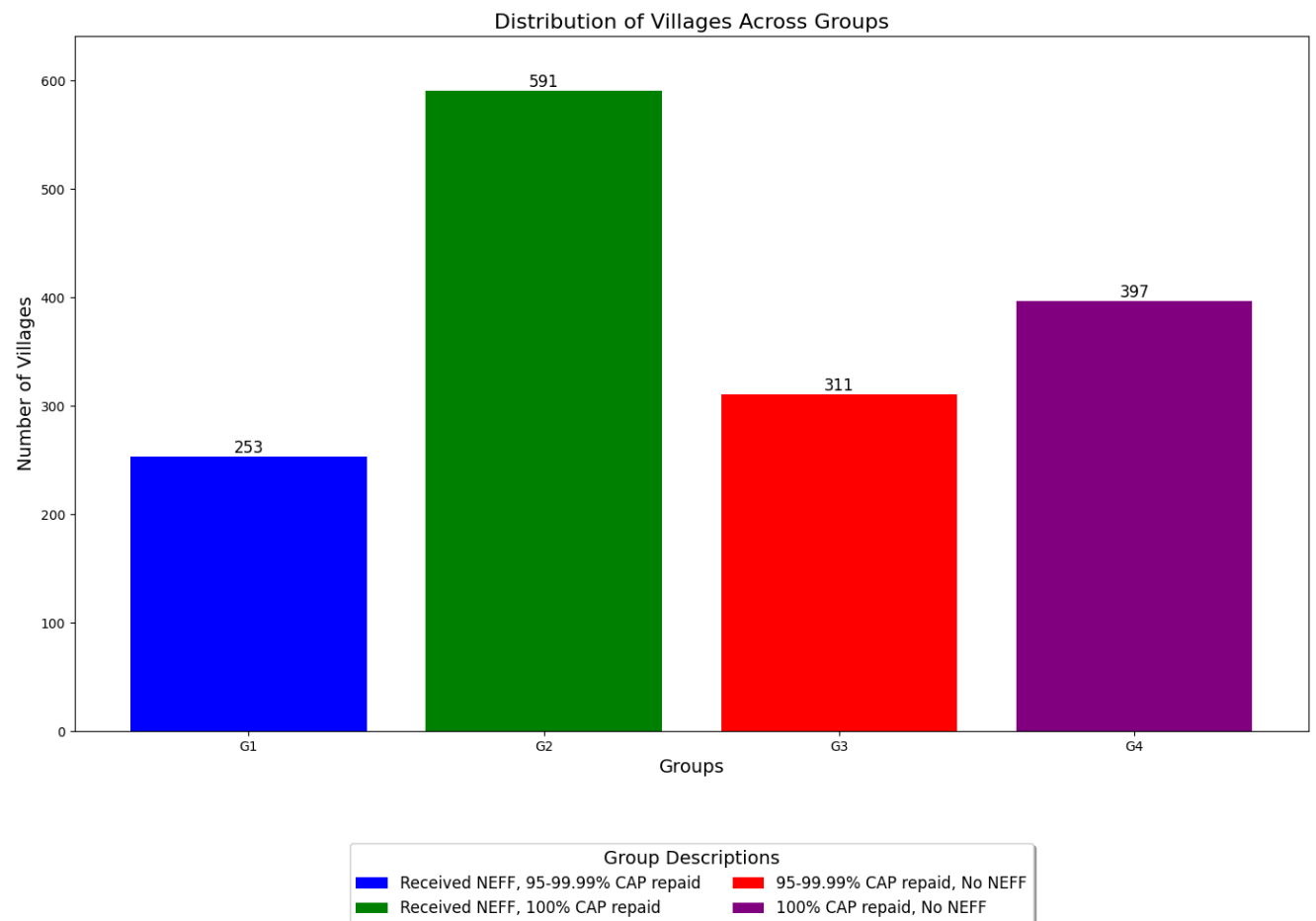


Figure 3: Village distribution across the Groups

4.2 Identification Strategy and Impact Estimates

In this sub-section, we first discuss a few elements of programme design and its implementation, and then develop a strategy that has been used to establish the causal nature of the impact estimates.

4.2.1 Village-level rollout of NEFF and Limited Randomized Allocation

We leverage specific aspects of programme implementation that rendered naturally occurring randomness to the village-level allocation of NEFF. As discussed earlier, the Nano-Enterprise Financing Fund was mounted over an existing albeit phased-out Covid Assistance Package (CAP). The CAP support was provided during pandemic in order to enable rural enterprises to continue their operations in the phase of economic downturn once the pandemic ended further boost was required to strengthen the performance and business activities of CAP enterprises. The CAP was provided as loan to enterprise owner over either members of the village level SHG or one of the household members participated in such groups. The next level of assistance in the form of NEFF loan is available to all the enterprises located in the CAP villages under the condition that CAP repayment was 100% at the village level.

Given the design of NEFF, the sampling framework of the NEFF supported enterprises has a perfect overlap with the CAP villages because NEFF as of now, is available only in CAP villages. While the programme was to be rolled out only in the villages with cent percent CAP repayment status, the MIS data showed that quite a few CAP villages who did not repay the full CAP loan also received the NEFF loan.

Within this group of less than full CAP repayment villages, a subset of villages had almost repaid the entire CAP loan (but not the full amount), i.e., 95-99% repayment was achieved. Given the implementation rule, all the villages in this subgroup are ineligible to receive the NEFF loan. However, the MIS data showed that few villages from this sub-group

received the NEFF assistance, while remaining did not. The unintended variation in NEFF allocation among villages that nearly completed their CAP loan repayments (95-99%) presents a unique opportunity for a natural experiment. We, therefore, posit that the allocation of NEFF program within this subgroup is almost entirely random. This assertion implies that, based on their NEFF treatment status, there are no systematic differences among the enterprises within the 95-99% CAP repayment group, that is:

$$E[X_{k1}|NEFF = 1]_{95-99\%} = E[X_{k2}|NEFF = 0]_{95-99\%} = E[X_{k3}|NEFF = 1]_{100\%} = E[X_{k4}|NEFF = 0]_{100\%}$$

, where X_{k1} , X_{k2} , X_{k3} and, X_{k4} are a set of pre-baseline covariates (for example, count of CAP enterprises, age of the entrepreneur, disbursement, marketing cost, machinery cost, working capital, input purchase cost, total cost, enterprise diversity index, etc.). These were used to check the balance across the four groups of villages. The subscripts 95 – 99% and 100% represent the CAP loan repayment status at the village level. *NEFF* is a binary variable that takes the value 1 if at least one enterprise from a CAP village has received the *NEFF* loan, and 0 otherwise.

We statistically tested our assumption by analysing the observed enterprise characteristics from both the sets of villages and the findings suggest support for limited randomization in the 95-99% CAP loan repayment interval. We specifically compare enterprises in group G1 with those in G3. All the enterprises in G1 and G3 had nearly repaid CAP loans (95-99%), thus simulating a randomized allocation of NEFF.

4.2.2 Testing for Randomized Balance

As discussed above, the baseline data was used to ascertain whether the distribution of observed attributes was symmetric in treatment and control groups. We have presented the results from the balancing test in the table below. The findings suggest that there were no significant

differences between the NEFF and non-NEFF villages in the 95-99% CAP repayment pool with respect to the age of the entrepreneur, enterprise age, enterprise diversity index, and various cost components. The balance observed between Group G1 and Group G3, which shows no systematic differences in enterprise characteristics and financial metrics at the village level, supports the assumption that the NEFF allocation was effectively random among villages with 95-99% CAP repayment. The findings from the balancing tests also strengthen our claim from that the outcomes in the post-intervention period can be attributed to the NEFF intervention.

Table 1: Balance Table (Comparing NEFF and non-NEFF villages within 95-99% CAP repayment status)

Village level Variable	¹ NEFF Villages		Non-NEFF Villages		Difference	
	N	Mean	N	Mean	N	(1)-(2)
Age	253	43.477 (0.233)	311	43.711 (0.195)	564	-0.234
Enterprise Age	253	15.644 (1.399)	311	17.960 (1.531)	564	-2.316
Enterprise Diversity Index	253	0.389 (0.012)	311	0.376 (0.013)	564	0.013
Disbursement amount	253	33913.923 (494.953)	311	33370.976 (449.485)	564	542.947
No. of CAP enterprises	253	12.474 (0.202)	311	12.659 (0.195)	564	-0.185
Count of Loan in quarter-1	253	0.111	311	0.132	564	-0.021

Enterprise Diversity Index (EDI): A measure of the variety of business types within a village, ranging from 0 (low diversity) to 1 (high diversity). The EDI is calculated using the Simpson's Diversity Index formula: $EDI = 1 - \sum (n/N)^2$ Where: n = the number of enterprises of a particular type, N = the total number of enterprises in the village. A higher EDI indicates a more diverse mix of enterprise types in the village, while a lower EDI suggests a concentration in fewer types of businesses. For example, an EDI of 0 would mean all enterprises in the village are of the same type, while an EDI approaching 1 indicates a high variety of different enterprise types.

Count of Loan: The average number of all loans taken by enterprises in the village during each quarter.

Marketing cost, machinery cost, working capital cost, Input purchase Cost, Others Proposed cost: Average requested cost from the applicants.

		(0.063)		(0.062)		
Count of Loan in quarter-2	253	5.004	311	5.174	564	-0.170
		(0.295)		(0.270)		
Count of Loan in quarter-3	253	7.277	311	7.277	564	0.000
		(0.315)		(0.291)		
Count of Loan in quarter-4	253	0.083	311	0.077	564	0.006
		(0.062)		(0.045)		
Marketing Cost	238	8860.386	298	10818.970	536	-1958.584
		(748.078)		(996.660)		
Machinery Cost	238	9008.624	298	10877.405	536	-1868.782*
		(691.492)		(775.343)		
Working capital Cost	238	23036.776	298	21400.999	536	1635.777
		(970.523)		(829.266)		
Input purchase Cost	238	11349.002	298	11906.370	536	-557.368
		(681.995)		(753.484)		
Others Proposed cost	238	4778.357	298	4176.642	536	601.715
		(487.020)		(367.587)		
Significance: ***=.01, **=.05, *=.1						

We utilized the predicted covariate data from the balancing test specification to prepare the kernel density plots. The kernel plots are a more useful way of representing the full distribution of baseline covariates in addition to the point estimates shown in the balancing table 1.

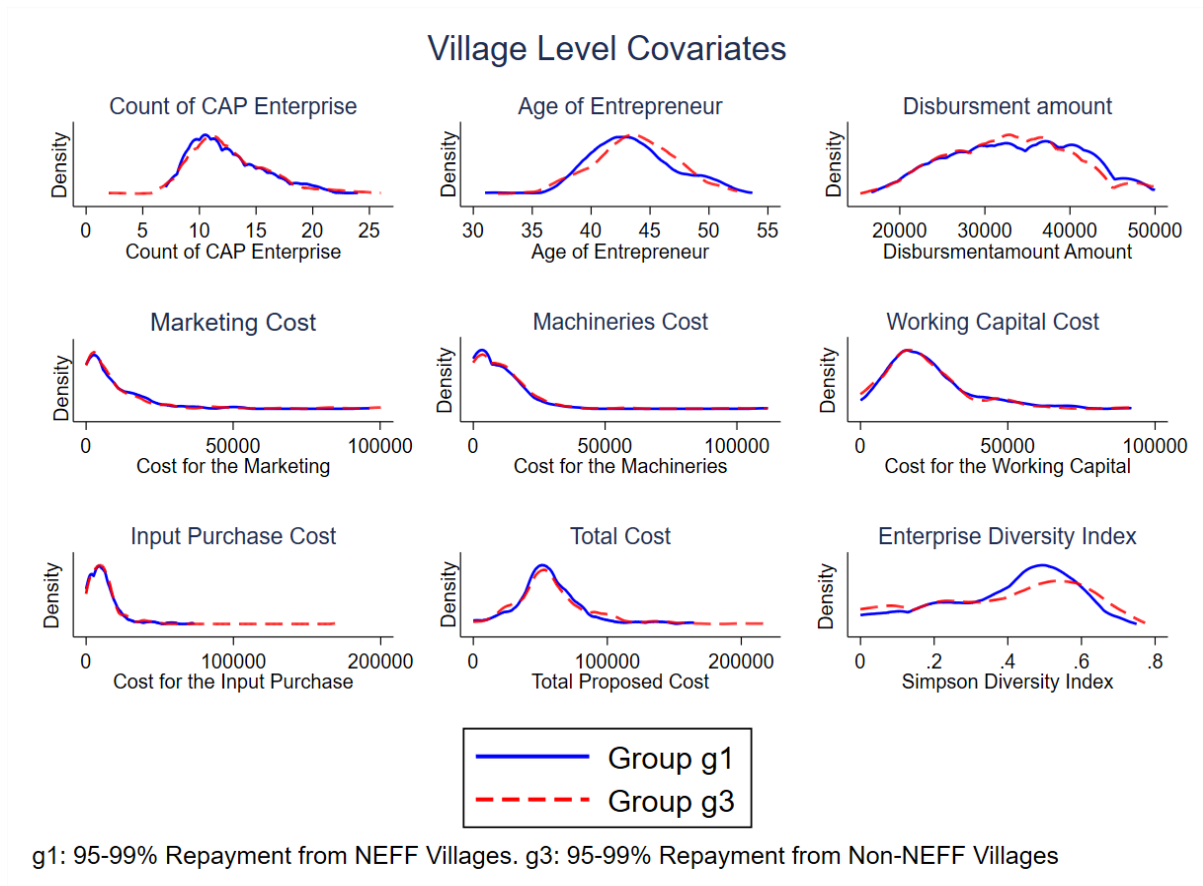


Figure 4: Kernel Density of Baseline Characteristics in NEFF and non-NEFF enterprises

Findings from the kernel plots are consistent with the balancing results as we can observe that the distribution of baseline covariates in the NEFF and non-NEFF villages almost overlap each other. The set of covariates includes number of CAP enterprises, age average age of the entrepreneur, enterprise diversity, enterprise cost, etc. Thus, the kernel density findings also support the claim that the initial conditions across both groups are comparable. The baseline equivalence is crucial for the validity of natural experiment design for estimation of the short-run impact of NEFF intervention. In addition, we conducted balancing tests across all the four groups outlined in figure 3 and the findings demonstrate balance across all the groups. (Refer appendix A1 and A2).

4.3 Village Sample

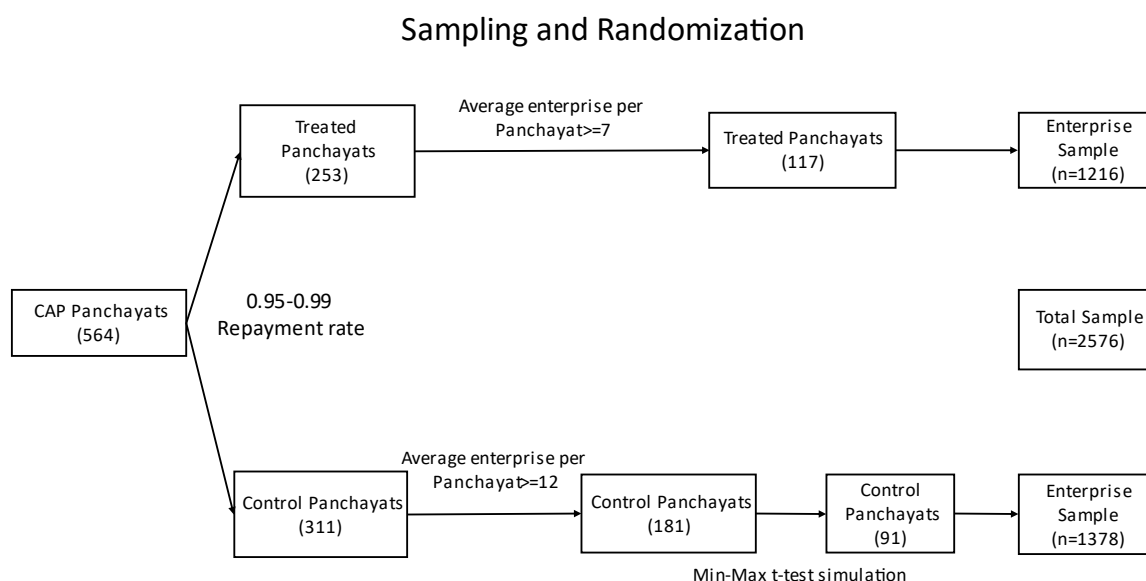
In conducting our analysis, it was crucial to establish that the pre-baseline covariates of the villages across different groups did not systematically differ. This ensures that any observed effects can be attributed to the NEFF intervention rather than underlying differences in the village's profiles. This suggestive evidence indicates that the village-level allocation of NEFF was randomized at the margins of the CAP repayment status. Therefore, we have taken Group G1 and Group G3 as our treatment and control groups. The 117 NEFF panchayats have a total of 1216 enterprises. Given the limited number of enterprises in the NEFF panchayats, we included all enterprises from these 117 panchayats in the study. There are 181 'only CAP' panchayats with a large pool of 2672 enterprises.

We further refined the selection of villages from the potential control group with the help of the min-max t-statistic approach. The method is designed to minimize the maximum difference in averages of observable characteristics between treated and control groups across multiple iterations. The min-max t-statistic method involves comparing multiple potential samples of control panchayats against the treatment group, evaluating each set based on baseline covariates. The iteration that yielded the smallest maximum t-statistic indicates the most balanced and comparable treatment and control groups. This iteration therefore provided the final control sample of 91 Panchayat villages. We conducted 500 iterations to select the most balanced sample of 91 panchayats out of the 181 CAP panchayats (from Group G3). The balancing was attained on several panchayat-level variables including the enterprise diversity index (Simpson index), mean age of entrepreneur, age of the enterprise, average size of the CAP loan, timing of receipt of CAP loan, and average size of requested CAP loan amount, and operational costs including machinery, marketing, inputs, and working capital. The min-max t-statistic led us to the final sample of 117 NEFF villages and 91 non-NEFF (or only CAP) villages.

4.4 Enterprise Sample

All the 1216 enterprises from 117 NEFF panchayats were included in the final enterprise sample. We ensured that not more than one enterprise was selected from the same household. From the 91 non-NEFF panchayats, we randomly selected 10 enterprises from each village, resulting in a total of 910 enterprises. Additionally, we randomly sampled 4 non-NEFF enterprises from each NEFF village, to estimate the exposure effect of NEFF intervention. In the final stage of the sampling process, we excluded 17 enterprises on account of duplicate phone numbers originating from the same village. This was done to ensure a unique number of enterprises in the sample. The final sample consisted of 2576 enterprises, 1205 were categorized as treated and 1371 non-NEFF enterprises.

Figure 5: Sampling Framework



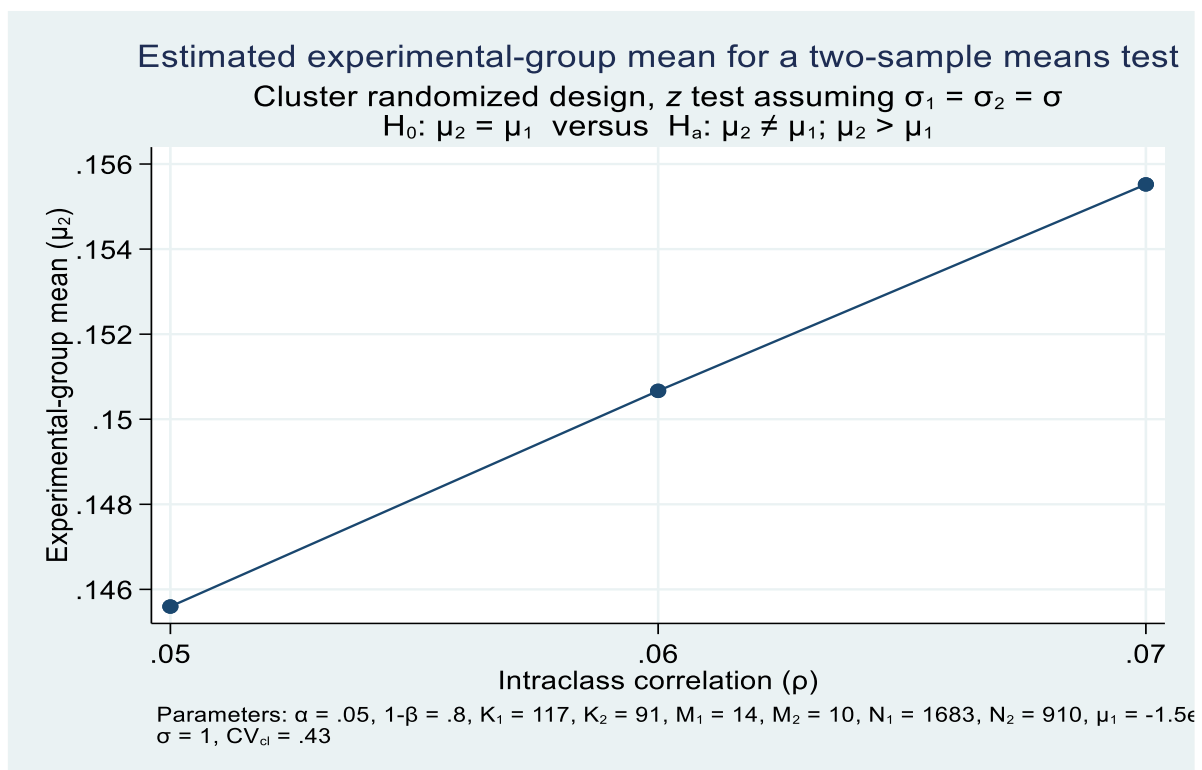
4.5 Power Calculation: Minimum Detectable Effect (MDE)

Power calculation was used to determine the minimum detectable effect (MDE) based on certain programmatic parameters and anticipated strength of sub-components. MDE is the

minimum effect that has a $(1-\beta)$ % chance of producing an estimate that is statistically significant at $\alpha\%$, and β is the probability of committing a type-II error (or false negative), and α is the probability of committing a type-I error or false positive.

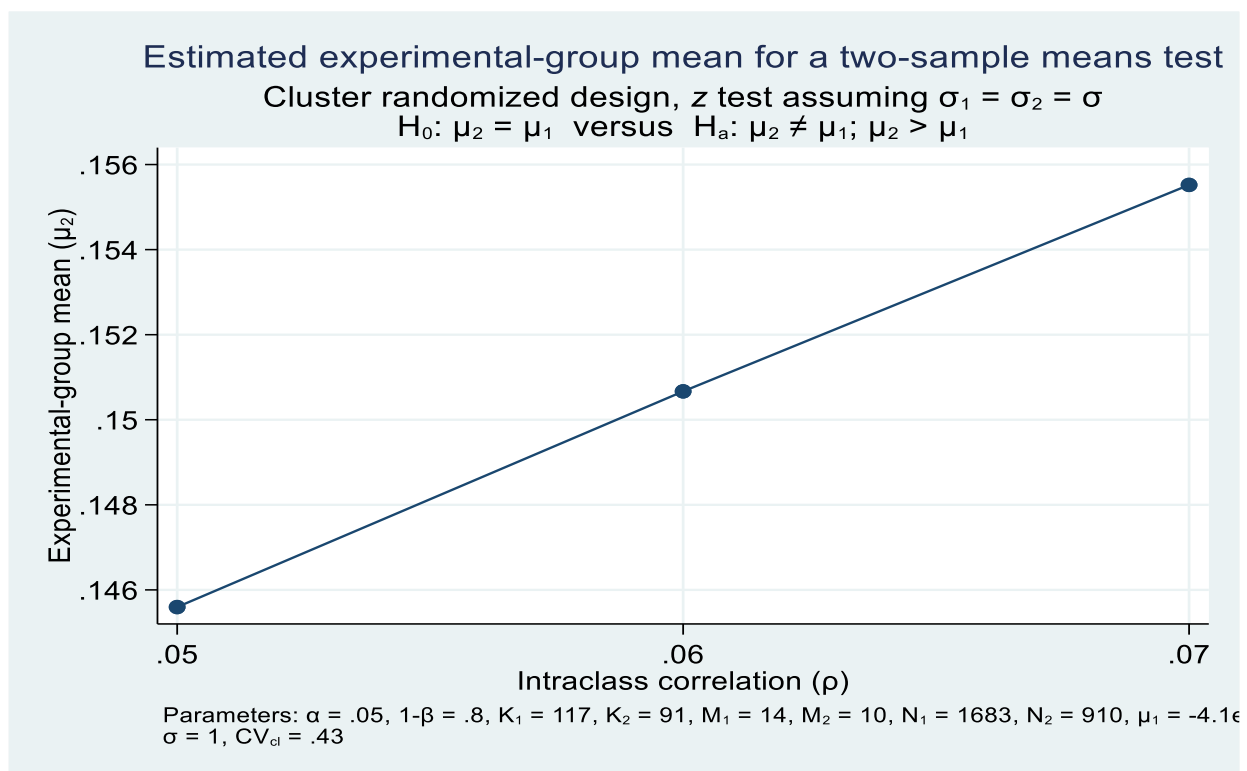
Power calculation was done using SEPRI data for the Tamil Nadu State. Three outcome variables were selected for the computation of MDE: (a) z-score of Revenue, (b) z-score of Cost, and (c) z-score of Profit. The total sample is 208 villages with an average 12 enterprises per village, since the number of enterprises per village varies due to the size and population of the village, we have accounted for the same through design parameters in the power calculations.

Figure 6: Power Calculation of Enterprise Profits



The power calculation results for the "enterprise profit" in a two-sample means test provide key insights into our experimental design's capability to detect differences between the treatment group (117 clusters) and the control group (91 clusters). Set to achieve 80% power ($1-\beta = 0.8$) and a 5% significance level ($\alpha = 0.05$), the analysis confirms the design's robustness. Varying intra-cluster correlation (ICC) values of 0.05, 0.06, and 0.07 demonstrate that higher ICCs require larger detectable effects due to increased similarity within clusters. Specifically, the minimum detectable effects are 0.1456 for an ICC of 0.05, increasing to 0.1507 at 0.06, and reaching 0.1555 at 0.07. This trend underlines that as clustering within the sample intensifies, detecting significant differences between groups necessitates observing larger variations. These findings assure us that our study is adequately powered to detect minimum effects.

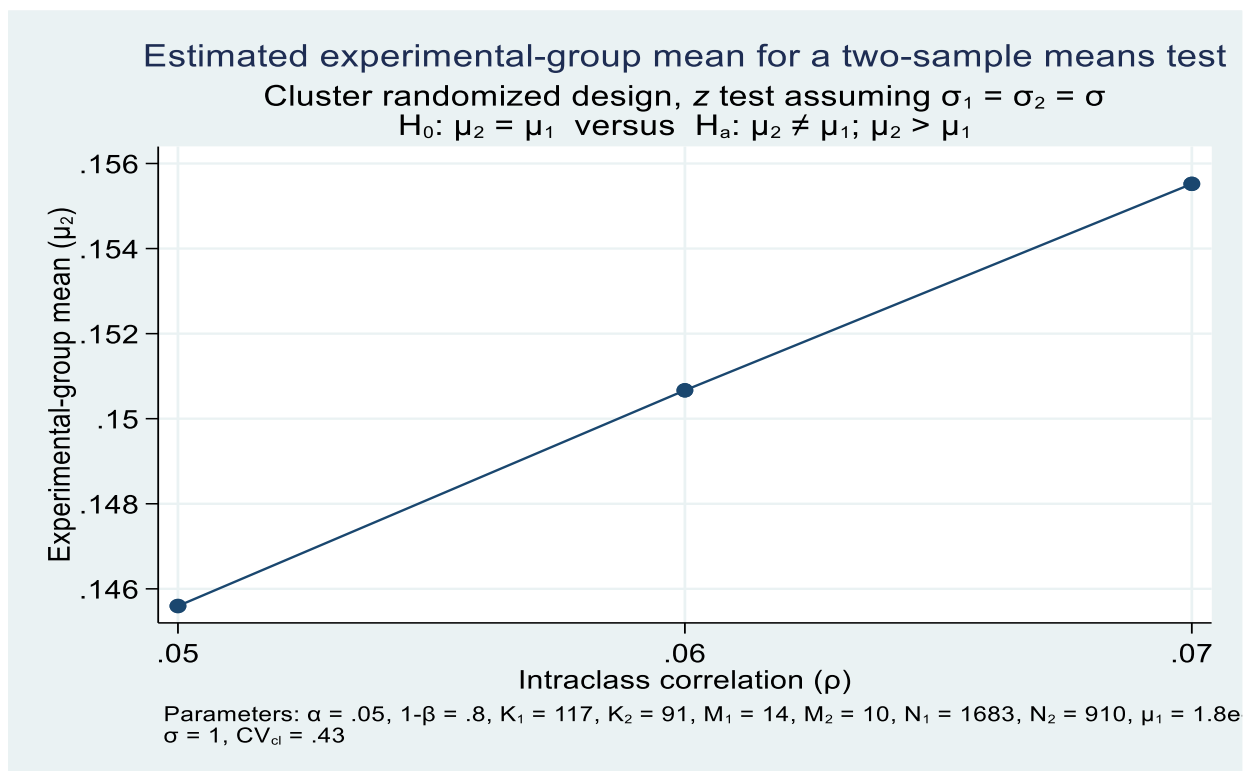
Figure 5: Power Calculation of Enterprise Revenue



The power analysis for "enterprise revenue" demonstrates a gradual increase in the minimum detectable effects (MDE) as the intra-cluster correlation (ICC) rises, indicating that

as cluster effects intensify, larger effects are required for detection. Specifically, the MDE progresses from 0.1456 at an ICC of 0.05 to 0.1507 at 0.06 and reaches 0.1555 at an ICC of 0.07. This trend highlights the importance of accounting for cluster variance when assessing enterprise revenue, ensuring that our sample sizes of 117 NEFF villages and 91 non-NEFF villages are sufficiently powered to detect the true impact of the NEFF intervention reliably.

Figure 7: Power Calculation of Enterprise Cost



For the variable "Z-Cost," with an 80% power and a 5% significance level across three ICC values (0.05, 0.06, 0.07), the minimum detectable effects (MDE) are determined as 0.1456, 0.1507, and 0.1555, respectively.

4.6 Survey Design

Information collected through the enterprise survey includes- (i) fact-based, (ii) observational, and (iii) retrospective. Fact-based data captured are in the form of (a) binary or discrete choice responses and (b) continuous responses based on the variable type. Observational data collected

in the survey pertains to directly observed attributes and behaviours of the enterprises. In the TNRTP project, spanning from December 2017 to November 2024, does not have access to baseline or pre-baseline information. Therefore, in the current study, we propose to construct a retrospective panel dataset on surveyed enterprises for robust estimation of the program impact. This approach allows for comparing conditions before and after the implementation of an intervention or program, as required by the difference-in-difference methodology of impact evaluation.

4.6.1 Enterprise Survey Module

The enterprise survey instrument consists of 19 sections. These include basic demographic details of the entrepreneur, household details, and details of the enterprise in terms of its operations, investment, revenue, various cost components (on labour, operation, raw materials, etc.), asset ownership, loan details, innovation, business practices, suppliers' relation, inventory management, credit bureau score, digital payment, perception of their business performance, and self-efficacy, etc. In an innovative approach to measuring profitability, the survey not only queries about detailed data on revenue and costs but also gathers self-reported profit. This method follows the finding by de (de Mel et al., 2009) that asking for profits directly can yield more accurate measures of firm profits than collecting detailed breakdowns of revenues and expenses, providing a streamlined yet effective assessment of financial performance. The details of each component of the survey instrument can be found in Appendixes A3.

4.6.2 Household Survey Module

The household survey schedule for our project is designed to capture essential demographic and economic data from the participating enterprise's households. We collect basic demographic details of all household members. This includes age, gender, education level, and current occupation. This foundational data provides insight into the household composition and the socio-economic background of each member, which is vital for contextualizing subsequent

economic data. Critical to our study is the detailed collection of financial data from each household. This includes a thorough assessment of household revenue, costs, and overall income. The survey records various revenue streams and associated costs and calculates the total income of the household. This financial data is essential for understanding the economic status of households.

Chapter 5- Analysis plan

Our analysis of the short-term impacts of the NEFF intervention utilizes a natural experiment framework involving 208 villages, categorized into treatment and control groups. In this chapter we have proposed to utilize two types of impacts estimators, viz., (a) exposure and (b) treatment effects. Both the estimates are defined as short-run impacts because at the time of the phase-1 survey, six months of NEFF implementation had taken place. As discussed earlier, the intervention seems to have been randomly allocated within the pool of 95-99% CAP loan repayment villages. However, within the treatment villages, self-selection or systematic program placement cannot be entirely ruled out. As a result, we estimate both intent to treat as well as treatment effect on treated. These estimators and corresponding specifications have been discussed in detail below:

5.1 Intent-to-Treat (ITT)

The exposure effect or Intent-to-Treat (ITT) estimate is associated with our main identification strategy that assumes randomised allocation of the village treatment at the margins of the eligibility condition, that is, full CAP loan repayment. The quasi-experimental results account for the fact that the NEFF intervention is randomized at the village and not household or individual level. This implies that when a village is exposed to NEFF intervention, the enterprises do not receive automatic access to the NEFF loan. Therefore, the causal estimate is provided by ITT which measures the exposure effect of the intervention on entrepreneurial outcomes. The ITT specification is as follows:

$$Y_{ihv} = \beta_0 + \beta_1 NEFF_v + \beta_2 X_{ihv} + \alpha_b + u_{ihv} \quad (1)$$

Y_{ihv} is an outcome variable of interest measured for enterprise i from a household h and village v . $NEFF_v$ is a binary indicator variable that equals 1 if the enterprise in village v is exposed to the NEFF intervention, and 0 otherwise. β_1 provides the ITT effect, which is the impact of

being exposed to the NEFF treatment relative to the control group. Thus, β_1 quantifies the average difference in the outcome Y_{ihv} between enterprises in the NEFF-treated villages and those in control villages, *ceteris paribus*. Testing $\beta_1 = 0$ provides a test of whether the NEFF intervention had a causal effect on enterprise performance. β_2 is the coefficient vector associated with the control variables (X_{ihv}) that accounts for observable enterprise and household characteristics. Term X_{ihv} includes controls for enterprise and household covariates like sector, age, marriage age, years of education, number of household member, average age of household member etc. α_b is a fixed effect for block. Last but not the least u_{ihv} is the error term. The ITT analysis provides an estimate of the impact of simply being in a village exposed to the NEFF intervention on entrepreneurial outcomes, even if not all enterprises within the village directly receive the NEFF loan. This approach captures the overall effect of the program on the entire village, including potential spillover effects on non-recipient enterprises.

5.2 Treatment Effect on Treated (TOT)

The TOT accounts for the enterprise-level variations in the treatment status. The underlying assumption is that the village-level randomized allocation will determine the actual treatment status at the enterprise level. As a result, the observed and unobserved attributes of NEFF and non-NEFF enterprises are identical irrespective of their treatment status. In our sample, out of 2576 enterprises, 1205 enterprises received NEFF and are therefore considered part of the treated group, while 1371 enterprises that did not receive NEFF are in the control group. The TOT specification is as follows:

$$Y_{ihv} = \beta_0 + \beta_1 NEFF_{ihv} + \beta_2 X_{ihv} + \alpha_b + u_{ihv} \quad (2)$$

Y_{ihv} represents the outcome variable for a specific enterprise i within a household h in village v . The variable of interest, $NEFF_{ihv}$, is a binary indicator that signifies whether the enterprise i from household h and village v is treated enterprises or not. It takes a value of 1 if received

NEFF and 0 otherwise. The coefficient β_1 captures the Treatment on the Treated (TOT) effect, which quantifies the impact of the NEFF intervention on those enterprises that actually received it, compared to all other enterprises in the treatment area. Essentially, β_1 estimates the average effect of the NEFF exposure on the outcomes, such as revenue, profit, or other performance metrics of the enterprises.

Our specification also controls for several observable confounding factors through X_{ihv} , which includes enterprise and household covariates such as enterprise sector, enterprise age, education of enterprise owner, number of household members, and other demographic and operational variables. These covariates help isolate the NEFF treatment's effect from other variables that might influence the enterprise's outcomes. Additionally, α_b represents block-specific fixed effects, controlling for all unobserved heterogeneity that could influence the outcomes within blocks but vary between them, such as regional economic conditions or block-level policies. The error term, u_{ihv} , accounts for the random variation in the outcome Y_{ihv} that is not explained by the treatment status or the covariates included in the model. The TOT analysis focuses specifically on the impact of the NEFF intervention on those enterprises that actually received the NEFF loan. This approach provides a more direct measure of the program's effectiveness for its intended beneficiaries, but may not capture broader community-level effects.

In simpler terms, while ITT shows us how NEFF affects entire villages, TOT helps us understand how NEFF specifically impacts the enterprises that received NEFF loans. Together, these two approaches give us a complete picture of both direct benefits to loan recipients and broader effects on village economies.

5.3 Difference-in-Differences (DiD)

The Difference-in-Differences approach leverages the panel structure of our data, where the same enterprises are observed across multiple time periods before and after NEFF implementation. This methodology provides a robust framework for causal identification by comparing changes in outcomes between treatment and control groups over time, thereby controlling for both time-invariant unobserved heterogeneity and common temporal shocks that affect all enterprises.

The DiD estimator is particularly well-suited for our research design because it addresses potential confounding factors that could bias simple cross-sectional comparisons. While villages were quasi-randomly allocated to NEFF treatment based on CAP repayment rates, there may still be unobserved differences between treatment and control villages that could influence enterprise outcomes. Similarly, the nano-enterprise sector experienced various macro-economic changes during our study period that affected all enterprises regardless of treatment status. The DiD approach effectively nets out both these time-invariant village-level differences and common time trends to isolate the causal effect of NEFF intervention.

The DiD specification for our analysis is as follows:

$$Y_{ihvt} = \beta_0 + \beta_1 (NEFF_e * POST_t) + \beta_2 NEFF_e + \beta_3 POST_t + \beta_4 X_{ihvt} + \mu_i + \lambda_t$$

Where Y_{ihvt} represents the outcome variable for enterprise i from household h in village v at time t . The variable of primary interest is the interaction term $(NEFF_e * Post_t)$, where $NEFF_e$ is a binary indicator equal to 1 if enterprise e was allocated to NEFF treatment and 0 otherwise, and $POST_t$ is a binary indicator equal to 1 for the post-intervention period (2024-2025) and 0 for the pre-intervention period (2022-2023).

The coefficient β_1 captures the DiD treatment effect, representing the average causal impact of NEFF exposure on enterprise outcomes. This coefficient estimates how much more (or less) the treatment group's outcomes changed compared to the control group's change over the same time period. In essence, β_1 quantifies the difference between the before-after change in treatment villages and the before-after change in control villages, providing an unbiased estimate of the NEFF intervention's impact under the parallel trends assumption.

The specification includes $NEFF_e$ to control for time-invariant differences between treatment and control villages, while $POST_t$ captures common time trends affecting all enterprises. The term X_{ihvt} includes time-varying enterprise and household covariates that may influence outcomes. The enterprise fixed effects μ_i control for all time-invariant unobserved heterogeneity at the enterprise level, while time fixed effects λ_t account for macro-economic shocks, policy changes, and seasonal factors that affect all enterprises simultaneously.

The DiD approach offers several advantages for evaluating NEFF's impact in our context. First, it exploits both cross-sectional and temporal variation in treatment exposure, providing more precise estimates than purely cross-sectional comparisons. The panel structure allows us to observe how the same enterprises respond to treatment over time, eliminating concerns about compositional changes that could bias cross-sectional analyses.

Second, DiD effectively controls for time-invariant unobserved heterogeneity that might correlate with both NEFF allocation and enterprise outcomes. While our villages appear quasi-randomly allocated, any remaining systematic differences between treatment and control areas are netted out by the differencing process, strengthening causal identification.

Third, the approach accounts for macro-economic and sectoral trends that affected all nano-enterprises during our study period. The post-COVID recovery environment created substantial

economic volatility that could confound simple before-after comparisons. By using control villages to estimate counterfactual trends, DiD isolates NEFF's incremental impact beyond these common shocks.

The combination of DiD with our quasi-experimental design provides robust identification of NEFF's causal effects while addressing the key threats to validity inherent in evaluating development interventions in dynamic economic environments.

Chapter 6: Impact of NEFF Intervention on Enterprise Performance and Business Practices

6.1 Impact on Enterprise Performance: Revenue, Cost, and Profits

In this section we present the impact of NEFF support on enterprise performance including revenue, costs, and profits. The data on enterprises' financial performance for both the current period and retrospective data of revenue, cost, and profit were collected. Therefore, the analysis of the impact of intervention has been conducted using difference-in-difference (DiD) methodology that relies on the panel nature of the information. The primary coefficient of interest is associated with the term (NEFF*POST), which captures the average treatment effect on the treated (ATT).

Table 2: Impact of NEFF Program on Enterprise Performance

	Profit (z)	Cost (z)	Revenue (z)
NEFF × Post	0.149** (0.072)	-0.025 (0.073)	0.117* (0.069)
Year=2023	0.188*** (0.010)	0.101*** (0.009)	0.206*** (0.010)
Year=2024	0.292*** (0.051)	0.190*** (0.053)	0.363*** (0.048)
Observations	6306	6645	6306
Control Mean (2023)	0.014	-0.054	-0.005
Control Mean (2024)	0.161	0.050	0.194
Enterprise FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Covariates	No	No	No
SE Clustering	Enterprise	Enterprise	Enterprise

Standard errors clustered at the enterprise level

The analysis includes 2,215 distinct enterprises observed across three years (2022, 2023, and 2024), creating a balanced panel dataset. Total observations vary by outcome due to missing values - profit and revenue models use 6,306 observations (missing 339 due to incomplete financial records), while the cost model uses the full 6,645 observations. Missing data is randomly distributed across treatment and control groups, ensuring unbiased results. We have used z-score for revenue, cost, and profit.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

From Table 2, we find that the impact of the intervention on enterprise profits is positive and statistically significant. The point estimates suggest that NEFF enterprises on average experienced an increase of 0.149 standard deviations² in their standardized profit measures during the post-intervention period compared to their counterparts in non-NEFF enterprises (p-value = 0.039). This represents a substantial improvement in profitability, indicating that access to NEFF financing enabled enterprises to enhance their profit-generating capacity significantly.

The magnitude of this effect is economically meaningful when contextualized within the nano-enterprise sector. The 95% confidence interval ranges from 0.008 to 0.290 standard deviations, indicating that we can be confident the true effect lies within this range. Given that many nano-enterprises operate with thin profit margins close to subsistence levels, an improvement of 0.149 standard deviations represents a substantial welfare gain for participating entrepreneurs. This effect size is comparable to other successful microenterprise interventions documented in the development economics literature, suggesting that NEFF achieves meaningful impact scales.

The program also demonstrates a positive impact on enterprise revenue generation. NEFF enterprises recorded revenue growth of 0.117 standard deviations³ higher than non-NEFF enterprises (p-value = 0.089), suggesting that the intervention successfully enabled enterprises to expand their sales and market reach. This revenue enhancement indicates that the additional capital provided through NEFF was effectively utilized to pursue growth opportunities that were previously inaccessible due to credit constraints.

² NEFF enterprises experienced an average increase of ₹26,435 annual profits compared to non-NEFF enterprises (p = 0.074; 95% CI: -₹2,587 to ₹55,458)

³ NEFF enterprises generated an additional ₹23,900 annual revenue compared to non-NEFF enterprises (p = 0.089; 95% CI: -₹3,624 to ₹51,424)

The revenue may increase through several channels. First, additional working capital may enable enterprises to maintain larger inventories, reducing stockouts and lost sales opportunities. Second, access to credit may allow enterprises to purchase higher-quality inputs or equipment that enhance product quality and customer satisfaction which in turn increase the revenue.

Notably, our results show that enterprise costs decrease slightly, with a small coefficient of - 0.025 standard deviations ⁴although that is not statistically significant (p-value = 0.736). This finding is particularly important as it suggests that the profit improvements achieved by NEFF enterprises are attributed primarily from revenue enhancement rather than cost optimization. In other words, NEFF recipients were able to generate additional income without proportional increases in their operational expenses.

The absence of significant cost effects carries important economic implications. In competitive markets such as those found in rural settings, where no single enterprise has significant monopoly power to influence market prices, revenue growth is typically associated with proportional increases in production costs as enterprises scale up their operations. The fact that NEFF enterprises achieved revenue gains without corresponding cost increases suggests one of several possibilities. First, the program may enable enterprises to achieve economies of scale, where fixed costs are spread over larger production volumes, reducing average costs per unit. Second, NEFF access may allow enterprises to purchase inputs in bulk or access wholesale markets, reducing per-unit input costs.

⁴ NEFF enterprises showed a small decrease of ₹1,452 costs compared to control enterprises (p = 0.736; 95% CI: -₹9,900 to ₹6,996)

The combination of significant profit gains, positive revenue effects, and neutral cost impacts reveals an economically coherent pattern that illuminates the mechanism through which NEFF operates. Unlike typical business expansion in competitive markets where revenue growth is accompanied by proportional cost increases, NEFF appears to enable enterprises to achieve economies of scale or access higher-margin opportunities. This suggests that the program addresses binding credit constraints that previously prevented enterprises from pursuing their most profitable activities.

The profit elasticity with respect to treatment (0.149) exceeding the revenue elasticity (0.117) indicates that NEFF recipients achieve margin improvements alongside scale expansion. The pattern suggests that NEFF enabled enterprises to move along their production possibility frontier toward more efficient combinations of inputs and outputs.

From a theoretical perspective, these results align with models of credit-constrained entrepreneurship where access to capital enables firms to reach their optimal scale of operation. Prior to NEFF, enterprises may have been operating below their efficient scale due to insufficient capital, inability to purchase optimal input quantities, or constraints on inventory investment. The program appears to relax these constraints, enabling enterprises to exploit previously inaccessible profitable opportunities.

The temporal fixed effects show strong positive trends across all outcomes, with 2023 and 2024 coefficients indicating robust growth in the nano-enterprise sector during our study period. The 2024 effects are particularly pronounced, ranging from 0.190 standard deviations for costs to 0.363 standard deviations for revenue, suggesting accelerating sectoral performance. Against this backdrop of strong baseline growth, NEFF's additional impact demonstrates the program's effectiveness in generating incremental benefits beyond natural market dynamics.

These findings indicate that NEFF successfully achieves its intended objective of enhancing enterprise performance through improved access to credit. The revenue-focused impact mechanism, combined with cost neutrality, suggests that the program enables genuine productive expansion rather than mere operational optimization, supporting the case for targeted credit interventions in constrained entrepreneurship environments.

To further validate our difference-in-differences identification strategy and examine the temporal evolution of treatment effects, we present dynamic treatment effects in Figure 8. These event study specifications estimate year-specific treatment effects relative to the treatment timing, providing crucial evidence on the parallel trends assumption and revealing how NEFF impacts unfold over time.

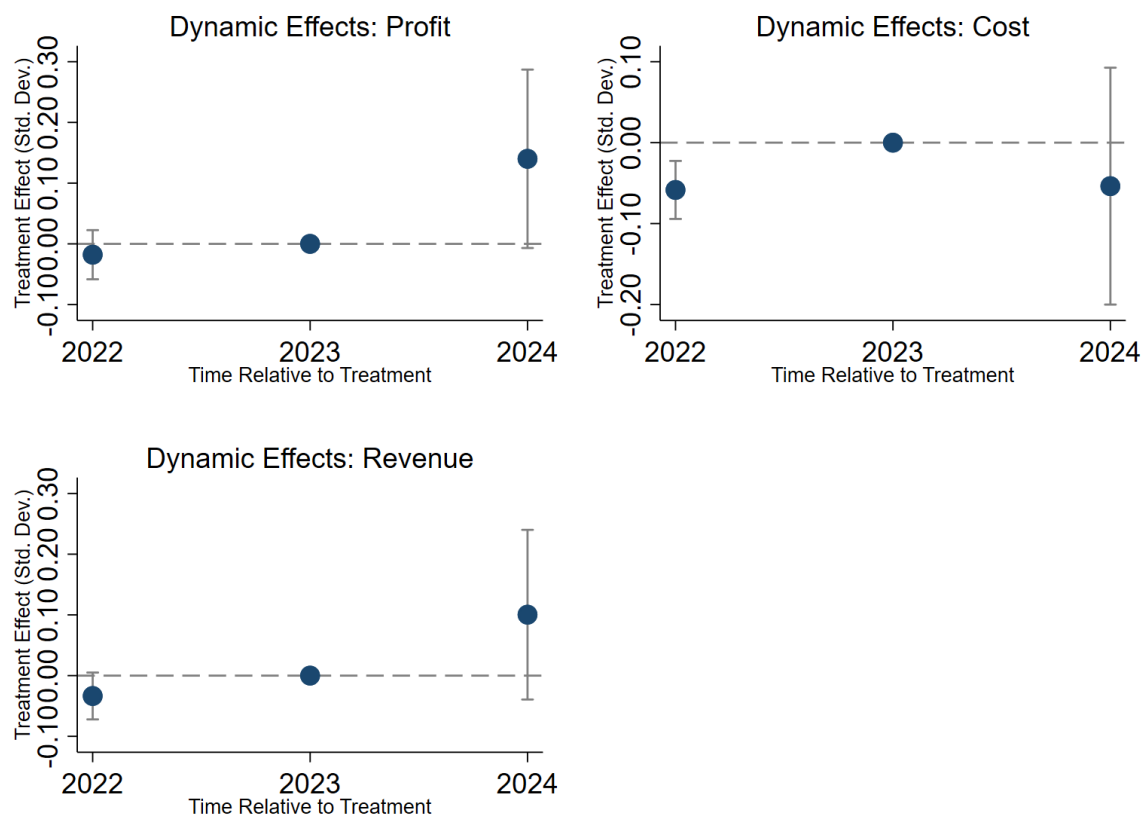


Figure 8 : Event study on enterprise performance

The dynamic effects analysis strongly supports our identification strategy, with pre-treatment effects (2022) clustered around zero across all three outcomes. For profits, the 2022 coefficient is -0.02 with confidence intervals spanning zero, indicating no systematic differences between treatment and control enterprises prior to NEFF implementation. Similarly, revenue and cost effects in 2022 are small and statistically insignificant, providing compelling evidence that the parallel trends assumption holds. The absence of pre-existing differential trends validates our DiD design and strengthens confidence in the causal interpretation of our main results. Notably, the treatment effects emerge distinctly in 2024, with profit effects reaching 0.149 standard deviations, revenue effects of 0.10 standard deviations, and cost effects remaining near zero. This temporal pattern indicates that NEFF impacts materialize with some lag, likely reflecting the time required for enterprises to effectively deploy additional capital and realize productivity gains. The concentrated emergence of effects in 2024 suggests that the program's impact mechanisms—whether through inventory optimization, equipment investment, or market expansion—require a gestation period before generating measurable improvements in enterprise performance.

6.2 Impacts on Firm Growth

Enhanced business practices and improved access to credit should theoretically translate into measurable improvements in enterprise performance. However, detecting these growth effects can be challenging due to the heterogeneity among nano-enterprises in our sample and the time required for financial interventions to materialize into observable performance changes. Our analysis focuses on the IHS transformations of enterprise sales and profits for two primary reasons. First, from an economic theory perspective, we expect NEFF to have proportional rather than absolute treatment effects – that is, the program is more likely to help enterprises of different initial sizes grow by the same proportion rather than by the same absolute amount.

Second, these transformations improve statistical power by reducing the influence of large outliers that are common in nano-enterprise data.

Table 3: Impact on last month's Sales and Profits by Survey Round

	IHS Last Month Profit	IHS Last Month Sales	Sales and Profits Index
Panel A: Round 1 Effects	0.022 (0.095)	0.018 (0.071)	0.011 (0.037)
Control Group Mean	9.056	9.892	-0.094
Observations	2209	2209	2209
P-value	0.819	0.800	0.773
Enterprise Controls	Yes	Yes	Yes
Block Fixed Effects	Yes	Yes	Yes
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$			
	IHS Last Month Profit	IHS Last Month Sales	Sales and Profits Index
Panel B: Round 2 Effects	0.251** (0.104)	0.348*** (0.098)	0.165*** (0.046)
Control Group Mean	9.267	9.967	-0.017
Observations	1912	1912	1912
P-value	0.017	0.000	0.000
Enterprise Controls	Yes	Yes	Yes
Block Fixed Effects	Yes	Yes	Yes

Standard errors clustered at the panchayat level. Standard errors in parentheses.

IHS: Inverse Hyperbolic Sine transformation

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3 presents the estimated treatment effects on last month's sales, profits, and our composite Sales and Profits Index across two survey rounds. The results reveal a striking temporal pattern in NEFF's impact on enterprise growth, with minimal effects in Round 1 followed by substantial and significant improvements in Round 2.

The first follow-up survey (Round 1) reveals limited evidence of NEFF impact on enterprise growth measures. The point estimates are small and statistically insignificant across all three outcomes: IHS last month profit increases by only 0.022 SD ($p = 0.819$), IHS last month sales by 0.018 SD ($p = 0.800$), and the Sales and Profits Index by 0.011 SD ($p = 0.773$). These

negligible effects suggest that NEFF's impact on enterprise performance requires time to materialize, consistent with the notion that credit interventions need a gestation period before generating measurable improvements in business outcomes.

The second follow-up survey (Round 2) demonstrates dramatic improvements in NEFF's impact on enterprise growth. The program generates significant positive effects across all three measures: IHS last month profit increases by 0.251 SD ($p = 0.017$), IHS last month sales by 0.348 SD ($p < 0.001$), and the Sales and Profits Index by 0.165 SD ($p < 0.001$). These substantial effects indicate that NEFF's impact on enterprise performance strengthens considerably over time, suggesting that the program's benefits compound as enterprises become more adept at utilizing additional capital and implementing improved business practices.

The magnitude of the Round 2 effects is economically meaningful. The impact on our overall Sales and Profits Index of 0.165 SD standard deviations represents a substantial improvement in enterprise performance. The sales effect (0.348) is particularly noteworthy, indicating strong revenue growth that likely reflects improved inventory management, expanded customer reach, or enhanced service quality enabled by better working capital access. The evolution from minimal effects (0.011 SD index effect) to substantial improvements (0.165 SD index effect) suggests that NEFF's benefits accumulate over time as enterprises learn to optimize their use of additional capital and implement business improvements.

The sales effects show particularly strong growth from Round 1 (0.018 SD) to Round 2 (0.348 SD), indicating that revenue generation is a primary channel through which NEFF impacts enterprise performance. This pattern is consistent with our earlier findings on investment behaviour, where working capital improvements enabled enterprises to maintain better inventory levels, reduce stockouts, and capture previously missed sales opportunities.

Interpreting the magnitude of these treatment effects requires careful consideration of the IHS transformation. The Round 2 impact on IHS last month sales of 0.348 SD represent substantial revenue growth for participating enterprises. While the exact percentage interpretation depends on the initial sales levels, this magnitude suggests meaningful improvements in business performance that could significantly enhance entrepreneur welfare.

The control group means provide important context for these effects. In Round 2, the control group achieved an IHS last month profit mean of 9.267 and sales mean of 9.967, indicating that NEFF effects represent incremental improvements beyond the natural growth trajectory of nano-enterprises during this period.

The strengthening effects over time also have important policy implications. The substantial Round 2 impacts suggest that credit interventions may require extended implementation periods to achieve their full potential. Programs evaluated only in the short term may underestimate the true development impact of credit access improvements.

6.3 Impact of NEFF Program on Investment Behavior

In this section, we examine the impact of NEFF support on enterprise investment patterns, both in terms of overall investment levels and the composition of investment activities. Understanding investment behaviour is crucial as it reveals how enterprises utilize additional capital and provides insights into the mechanisms driving the performance improvements documented in the previous section. The analysis categorizes investment decisions into working capital, asset creation, and debt reduction activities, each serving different strategic purposes in enterprise development.

Table 4 presents the impact of NEFF on various dimensions of enterprise investment behaviour. The results reveal a substantial positive effect on overall investment levels, with NEFF enterprises increasing their standardized investment by 0.298 standard deviations ($p < 0.001$) compared to non-NEFF enterprises. This represents one of the largest treatment effects observed in our analysis, indicating that investment is a primary channel through which NEFF influences enterprise performance.

Table 4: Impact of NEFF Program on Investment Behavior

	Investment (z)	Count Investment	WC Investment	AC Investment	Count AC Investment	Count DR Investment
NEFF × Post	0.298*** (0.072)	-0.169*** (0.055)	0.156*** (0.025)	-0.075 (0.075)	0.071*** (0.021)	0.044** (0.018)
Controls						
Year=2023	0.152*** (0.012)	-0.154*** (0.033)	-0.040*** (0.006)	-0.079 (0.059)	0.086*** (0.012)	0.086*** (0.012)
Year=2024	0.247*** (0.045)	-0.642*** (0.044)	-0.283*** (0.019)	-0.495*** (0.071)	-0.807*** (0.016)	-0.821*** (0.014)
Observations	6645	6325	5909	2540	6154	6154
Control Group Mean (2023)	-0.052	1.568	0.969	0.406	0.829	0.829
Control Group Mean (2024)	0.070	0.897	0.698	0.000	0.017	0.003
Enterprise FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	No	No	No	No	No	No
SE Clustering	Enterprise	Enterprise	Enterprise	Enterprise	Enterprise	Enterprise

Standard errors clustered at the enterprise level

Investment (z) is standardized and winsorized at 1st and 99th percentiles

WC = Working Capital, AC = Asset Creation, DR = Debt Reduction

The analysis includes 2,215 distinct enterprises observed across three years (2022, 2023, and 2024), creating a balanced panel with up to 6,645 total observations. Total observations vary across investment measures because questions are conditioned on whether enterprises invested in particular categories (WC, AC, DR) during the study period. Total investment amount uses the full sample (6,645), investment count (6,325), working capital investment (5,909), asset creation investment (2,540), and investment activity counts (6,154 each).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The magnitude of this investment effect provides strong evidence that NEFF successfully addresses credit constraints that previously limited enterprise expansion. The 0.298 standard

deviation⁵ increase represents substantial additional capital deployment, suggesting that prior to NEFF, enterprises had identified profitable investment opportunities but lacked the financial resources to pursue them.

Interestingly, while total investment amounts increase substantially, the count of investment activities decreases by 0.17 ($p < 0.01$). This apparent contradiction reveals an important pattern: NEFF enables enterprises to make fewer but larger investments rather than spreading resources across many small activities. This concentration of investment suggests improved capital allocation efficiency, where enterprises can now pursue optimal-scale investments rather than being constrained to sub-optimal smaller investments due to capital limitations.

The analysis reveals a strong positive impact on working capital investment, with NEFF enterprises increasing such investments by 15.6 percentage points ($p < 0.001$). Working capital investments enhance enterprise liquidity and operational capacity, enabling businesses to maintain larger inventories, extend customer credit, and smooth production cycles. This substantial effect suggests that many NEFF recipients were previously operating with sub-optimal working capital levels due to credit constraints.

The working capital investment increase aligns closely with our earlier findings on revenue growth, suggesting a coherent mechanism whereby additional liquidity enables enterprises to capture previously missed sales opportunities. Enhanced working capital allows enterprises to reduce stockouts and take advantage of bulk purchase discounts from suppliers. The statistical significance and economic magnitude of this effect indicate that working capital constraints were binding for many enterprises prior to NEFF intervention.

⁵ Total Investment Amount: NEFF enterprises increased their total investment by ₹52,674 compared to control enterprises ($p < 0.001$; 95% CI: ₹27,709 to ₹77,639)

The impact on asset creation investment presents a more nuanced pattern. While the coefficient for asset creation amount is negative (7.5 percentage points), although it is not statistically significant ($p = 0.314$), indicating no substantial difference in the monetary value of asset investments between NEFF and non-NEFF enterprises. However, the count of asset creation investments increases 7 percentage points (0.071, $p < 0.001$), suggesting that NEFF enterprises are more likely to engage in asset creation activities.

NEFF demonstrates a positive impact on debt reduction activities, with the count of debt reduction investments increasing by 4 percentage points ($p < 0.05$). While this effect size is modest compared to other investment categories, it reveals an important dimension of how enterprises utilize additional capital. The ability to reduce outstanding debt improves enterprise financial health, reduces interest burden, and creates fiscal space for future growth investments. The debt reduction effect suggests that some NEFF recipients prioritize financial sustainability alongside growth investments. This balanced approach to capital utilization indicates financially sophisticated behaviour among entrepreneurs, who recognize that reducing high-interest debt can be as valuable as new productive investments.

In summary, investment effects reveal a coherent economic strategy among NEFF recipients. The substantial increase in total investment combined with the decrease in investment count suggests improved capital allocation efficiency. Rather than spreading limited resources across many small activities, NEFF enables enterprises to make strategically focused investments at optimal scale.

The strong working capital effect indicates that liquidity constraints were the most binding constraint for most enterprises. This finding aligns with theoretical models of credit-constrained firms, where working capital shortfalls can severely limit production and sales even

when longer-term investment opportunities exist. The program's success in relaxing these constraints explains much of the revenue and profit growth documented in previous sections.

The dynamic investment effects presented in Figures 9 provide crucial evidence supporting our identification strategy while revealing the temporal evolution of NEFF's impact on investment behaviour. The event study specifications demonstrate that pre-treatment differences between NEFF and control enterprises are generally small and statistically insignificant across most investment outcomes, validating the parallel trends assumption underlying our difference-in-differences design. For total investment amounts, the 2022 coefficient is slightly negative (-0.148) with confidence intervals spanning zero, indicating no systematic pre-existing differences in investment levels. Similarly, working capital investment shows minimal pre-treatment effects, while asset creation and debt reduction activities exhibit small coefficients that are not statistically distinguishable from zero, providing strong support for our causal identification strategy.

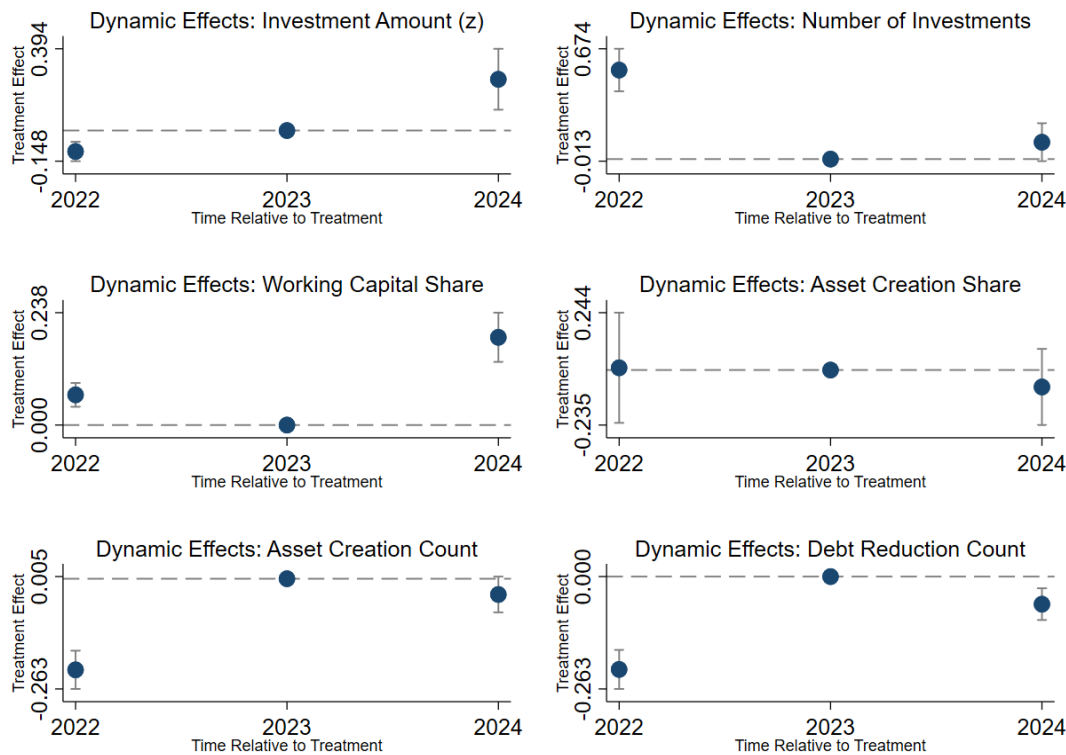


Figure 9: Event study on enterprise finance

The temporal pattern reveals that NEFF's investment effects materialize primarily in 2024, with the total investment effect reaching 0.298 standard deviations and working capital effects achieving 0.156 standard deviations. This delayed emergence of investment impacts suggests that enterprises require time to identify optimal investment opportunities, develop implementation plans, and deploy additional capital effectively. The concentrated emergence of effects in 2024 also indicates that NEFF's impact on investment behaviour represents a genuine response to improved capital access rather than pre-existing differential trends. Notably, while the number of investments shows some volatility across periods, the overall pattern confirms that NEFF enables enterprises to make more strategic, larger-scale investments rather than numerous small activities, consistent with our interpretation of improved capital allocation efficiency following the relaxation of credit constraints.

6.4 Impact on business practices:

We tracked several activities of the enterprise owner with respect to their business practices across two survey rounds to examine both short-term and long-term effects of NEFF intervention. It provides insight how access to credit influences entrepreneurial capabilities and business management practices.

The impact of NEFF on marketing practice scores⁶ presents negative effects across both treatment specifications and time periods. In Panel A, enterprise treatment effects show marketing scores declining by 1.492 standard deviations in Round 1 and 1.354 standard deviations in Round 2, both highly statistically significant ($p < 0.001$). The marketing practices score comprises five key activities: visiting competitors' businesses to explore their pricing strategies, asking existing customers about additional products they would like purchased, inquiring from former customers about why they stopped buying, using special offers to attract new customers, and advertising products or services.

⁶ The marketing practices score is the aggregate of following marketing practices: (i) whether visited one of the competitors business to explore their prices, (ii) whether enquired from existing customers about any new product that they would like me to sell to them, (iii) whether enquired from former customers to explore why they have stopped purchasing from my enterprise, and (iv) whether used special offers to attract new customers or have advertised for my product or service

Table 5: Short-term and Long-term Impact of NEFF Program on Business Practices

	Marketing (z)	Record Keeping (z)	Credit Management Index	Business Practices
Panel A: Enterprise treatment effect in Round 1	-1.492*** (0.037)	2.511*** (0.041)	-2.421*** (0.060)	0.130*** (0.013)
Enterprise treatment effect in Round 2	-1.354*** (0.034)	2.471*** (0.034)	-2.225*** (0.044)	0.150*** (0.014)
Survey round=2	0.097*** (0.034)	-0.083** (0.034)	-0.124*** (0.044)	0.031** (0.014)
Observations	5101	5101	5101	4234
Control Mean	-0.131	-0.146	0.535	0.506
Joint P-value	0.000	0.000	0.000	0.000
ST vs LT P-value	0.006	0.450	0.008	0.284
Enterprise FE	YES	YES	YES	YES
Round FE	YES	YES	YES	YES
SE Clustering	Enterprise	Enterprise	Enterprise	Enterprise

Standard errors clustered at the enterprise level

treat_ent_r1: Short-term effects (Round 1 post-treatment)

treat_ent_r2: Long-term effects (Round 2 post-treatment)

Credit Management Index = sum of standardized credit %, credit terms + written records + creditworthiness assessment

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	Marketing (z)	Record Keeping (z)	Credit Management Index	Business Practices
Panel B: Village treatment effect in Round 1	-1.415*** (0.031)	2.490*** (0.034)	-2.392*** (0.048)	0.134*** (0.011)
Village treatment effect in Round 2	-1.425*** (0.042)	2.489*** (0.041)	-2.178*** (0.054)	0.150*** (0.017)
Survey round=2	0.168*** (0.042)	-0.101** (0.041)	-0.171*** (0.054)	0.031* (0.017)
Observations	5101	5101	5101	4234
Control Mean	-0.085	-0.138	0.556	0.505
Joint P-value	0.000	0.000	0.000	0.000
ST vs LT P-value	0.856	0.974	0.003	0.449
Enterprise FE	YES	YES	YES	YES
Round FE	YES	YES	YES	YES
SE Clustering	Enterprise	Enterprise	Enterprise	Enterprise

Standard errors clustered at the enterprise level

treat_vill_r1: Short-term village effects (Round 1 post-treatment)

treat_vill_r2: Long-term village effects (Round 2 post-treatment)

ST vs LT P-value tests if long-term effects differ from short-term effects

Z-score variables are standardized with mean 0 and standard deviation 1

Credit Management Index includes credit sales %, credit terms, written debt records, creditworthiness assessment

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The magnitude suggests that NEFF recipients shifting their business strategies away from intensive competitor monitoring and promotional activities measured in our survey. This pattern may reflect NEFF recipients' ability to rely less on aggressive marketing efforts due to improved operational capacity and customer retention resulting from better service quality enabled by enhanced working capital. When enterprises can maintain adequate inventory levels and provide consistent service through improved liquidity, the need for intensive promotional activities and competitor price monitoring may diminish.

In contrast to marketing practices, NEFF demonstrates strongly positive and persistent effects on record-keeping behaviours⁷. Enterprise treatment effects show record-keeping scores improving by 2.511 standard deviations in Round 1 and 2.471 standard deviations in Round 2 (both $p < 0.001$). The record-keeping practices score encompasses eight business management activities: maintaining written business records, keeping written records for purchase and/or sale activities, frequency of updating records (daily, weekly, monthly, etc.), using digital versus physical record systems, using records to track sales trends from month to month, knowing which products generate the most profit per unit sold, maintaining written budgets for indirect costs, and offering credit sales to customers.

These substantial improvements indicating that access to credit fundamentally transforms how enterprises manage business information and financial planning. The nature of these improvements—spanning from basic record maintenance to sophisticated profit analysis and

⁷ Record keeping practice score is the aggregate of whether the business owner maintains written business records, frequency of updating such records, digital versus physical record, whether enterprise owner uses such records to track sales of products from one month to another, etc.

credit management—suggests that NEFF recipients recognize the increased importance of systematic business documentation when they have taken business loans from financial institutions.

Enterprise treatment effects demonstrate credit management index scores declining by 2.421 standard deviations in Round 1 and 2.225 standard deviations in Round 2 (both $p < 0.001$). Village treatment effects show similar patterns with declines of 2.392 and 2.178 standard deviations in Rounds 1 and 2, respectively. The credit management index encompasses four key components: the percentage of sales conducted on credit, credit terms offered to customers (in days), maintenance of written records of customer debts, and assessment of customer creditworthiness before extending credit. The negative effects across all treatment specifications suggest that NEFF recipients are systematically reducing their reliance on credit sales and associated credit management practices.

This counterintuitive finding requires careful interpretation within the broader context of improved liquidity access. The negative credit management effects may reflect NEFF recipients' reduced dependence on extending customer credit as a sales strategy which is good thing too some extent. When enterprises have better access to financing for inventory and operations, they may prefer immediate cash payments over the future risks.

The business practices score⁸, combining marketing, record-keeping, and credit management components, shows modest positive treatment effects across both panels and time periods. Enterprise treatment effects indicate improvements of 0.130 standard deviations in Round 1

⁸ Business practices and skills score is the sum of marketing, record keeping and credit management practices score.

and 0.150 standard deviations in Round 2 (both $p < 0.001$). Village treatment effects show similar magnitudes of 0.134 and 0.150 standard deviations in Rounds 1 and 2, respectively.

The relatively modest overall business practices effects, despite the large record-keeping improvements, reflect the offsetting influence of substantial negative effects in both marketing and credit management practices. This pattern suggests that NEFF's impact on business practices operates through a complex rebalancing of entrepreneurial activities rather than uniform improvements across all dimensions. While enterprises improve their record-keeping and administrative capabilities, they simultaneously reduce their intensity of market-facing activities (marketing) and customer credit provision.

6.5 Impact of NEFF on Supplier Relations

The analysis of supplier relationship practices shows clear improvements after NEFF intervention across different treatment specifications and time periods. The supplier relation index includes twelve key dimensions of enterprise-supplier interactions. It provides a solid measure of how access to credit affects supply chain management and vendor relationships.

NEFF shows positive effects (Table 6) on supplier relations through the enterprise treatment channel. In Panel A, enterprises receiving direct treatment report an increase in supplier relation scores of 6.428 points in Round 1 and 6.880 points in Round 2 (both $p < 0.001$). The control group's baseline mean is 3.796, which helps put these improvements into perspective. Treated enterprises achieve supplier relation scores that are nearly double those of the control group. The changes from Round 1 to Round 2 suggest that improvements in supplier relationships enhance over time. The difference between short-term and long-term effects is statistically significant (ST vs LT p -value = 0.012). This trend shows that the advantages of better access

to funding for supplier relationships continue to grow and extend beyond the immediate post-treatment period.

Table 6: Impact of NEFF Program on Suppliers Relation

	Supplier Relation
Panel A: Enterprise treatment effect in Round 1	6.428*** (0.129)
Enterprise treatment effect in Round 2	6.880*** (0.125)
Survey round=2	0.120 (0.125)
Observations	5101
Control Mean	3.796
Joint P-value	0.000
ST vs LT P-value	0.012
Enterprise FE	YES
Round FE	YES
SE Clustering	Enterprise
Standard errors clustered at the enterprise level	
treat_ent_r1: Short-term effects (Round 1 post-treatment)	
treat_ent_r2: Long-term effects (Round 2 post-treatment)	
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$	
	Supplier Relation
Panel B: Village treatment effect in Round 1	6.643*** (0.110)
Village treatment effect in Round 2	6.716*** (0.157)
Survey round=2	0.284* (0.157)
Observations	5101
Control Mean	3.949
Joint P-value	0.000
ST vs LT P-value	0.701
Enterprise FE	YES
Round FE	YES
SE Clustering	Enterprise
Standard errors clustered at the enterprise level	
treat_vill_r1: Short-term village effects (Round 1 post-treatment)	
treat_vill_r2: Long-term village effects (Round 2 post-treatment)	
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$	

Village-level treatment effects show similar patterns. Supplier relation scores improved by 6.643 points in Round 1 and 6.716 points in Round 2 (both $p < 0.001$). The control group baseline means of 3.949 for village effects offers a slightly different reference point. However, the size of improvements remains similar to enterprise effects.

The improvements in supplier relations likely happen in various ways due to better access to financing. Improved liquidity may boost enterprises' negotiating power with suppliers. They can provide more reliable payment schedules or take advantage of early payment discounts. Better cash flow stability may also lead suppliers to offer more favourable terms, such as longer credit periods, priority access during shortages, and better pricing arrangements.

Stronger financial capacity may allow enterprises to participate more actively in relationship-building activities. These include regular discussions about product quality and market trends, comparing options among alternative suppliers, and creating longer-term contracts. The broad nature of the improvements across many relationship dimensions suggests that access to credit helps foster more developed and mutually beneficial partnerships with suppliers.

6.5 Impact of NEFF on loans and indebtedness

In this section, we examine NEFF's impact on credit access patterns and loan management behaviour across two survey rounds. The analysis provides insights into how the program affects enterprises' borrowing decisions, debt levels, and interest rate exposure over time. Understanding these credit market effects is crucial for assessing NEFF's role in financial inclusion and enterprise financial management.

Table 7 presents the impact of NEFF on various dimensions of credit access and loan management. The results reveal limited effects on loan access probability, with enterprise treatment effects showing small negative coefficients for having any loan in both Round 1 (-0.109) and Round 2 (-0.153), though neither effect is statistically significant. Similarly, village treatment effects indicate modest negative impacts on loan access probability (-0.119 and -0.151 in Rounds 1 and 2, respectively), but these are also not statistically significant.

The loan count results present a more nuanced pattern. In Round 1, enterprise treatment effects show a positive but non-significant increase in loan count (0.346), while village treatment effects indicate a smaller positive effect (0.280). However, by Round 2, both enterprise and village treatment effects turn negative (-0.021 and -0.049, respectively), though these effects remain statistically insignificant. The significant difference between short-term and long-term effects (ST vs LT p-value = 0.000) indicates that NEFF's impact on borrowing frequency changes substantially over time.

Table 7: Impact of NEFF on loans and indebtedness

	Any Loan	Loan Count	Indebtedness	Interest Rate
Panel A: Enterprise treatment effect in Round 1	-0.109	0.346	33736.273*	-1.189
	(0.335)	(0.775)	(18851.415)	(4.139)
Enterprise treatment effect in Round 2	-0.153	-0.021	4667.565	0.000
	(0.335)	(0.775)	(18850.453)	(.)
Survey round=2	-0.847***	-0.979***	-4667.565***	1.906
	(0.011)	(0.026)	(514.188)	(2.824)
Observations	4234	4554	5101	2471
Control Mean	0.597	0.633	5175.808	13.290
Joint P-value	0.017	0.000	0.000	0.774
ST vs LT P-value	0.005	0.000	0.000	0.774
Enterprise FE	YES	YES	YES	YES
Round FE	YES	YES	YES	YES
clustering				
Unpaid loan amounts winsorized at 10th percentile				
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$				
	Any Loan	Loan Count	Indebtedness	Interest Rate
Panel B: Village treatment effect in Round 1	-0.119	0.280	26440.407	-2.201
	(0.335)	(0.781)	(21062.522)	(4.284)
Village treatment effect in Round 2	-0.151	-0.049	3318.760	0.000
	(0.335)	(0.781)	(21067.872)	(.)
Survey round=2	-0.849***	-0.951***	-3318.760***	1.065
	(0.014)	(0.031)	(705.009)	(3.410)
Observations	4234	4554	5101	2471
Control Mean	0.595	0.623	4936.812	12.997
Joint P-value	0.137	0.000	0.000	0.608
ST vs LT P-value	0.050	0.000	0.000	0.608
Enterprise FE	YES	YES	YES	YES
Round FE	YES	YES	YES	YES
clustering				

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The impact on indebtedness levels shows a different pattern, with positive effects in Round 1 that decline substantially by Round 2. Enterprise treatment effects indicate increased indebtedness of INR 33,736 in Round 1 (marginally significant at $p < 0.10$), declining to INR 4,668 in Round 2 (not significant). Village treatment effects show similar patterns with INR 26,440 in Round 1 and INR 3,319 in Round 2, both statistically insignificant. The significant temporal variation in indebtedness effects (ST vs LT p -value = 0.000) reveals important dynamics in how NEFF recipients manage their debt portfolios over time. The decline from elevated Round 1 indebtedness to lower Round 2 levels suggests that enterprises may initially increase borrowing when NEFF becomes available but subsequently reduce their debt burden as they optimize their capital structure or improve their cash flow management.

This pattern indicates financially prudent behaviour among NEFF recipients, who appear to use the program strategically rather than simply accumulating debt. The reduction in indebtedness over time suggests that NEFF may enable enterprises to transition from high-debt, high-interest financing toward more sustainable capital structures.

The interest rate effects are generally small and not statistically significant across both panels and time periods. Enterprise treatment effects show negative coefficients in Round 1 (-1.189) with missing data for Round 2, while village treatment effects indicate larger negative effects in Round 1 (-2.201). The lack of statistical significance suggests that NEFF's impact on borrowing costs is limited, possibly because the program operates alongside rather than replacing existing credit markets. The absence of significant interest rate effects contrasts with theoretical expectations that increased credit access might improve borrowing terms through competition or risk reduction. This finding suggests that NEFF recipients continue to face

similar borrowing costs in the broader credit market, indicating that the program's benefits operate primarily through access rather than pricing mechanisms.

7. Conclusion

This report contributes to the growing literature on credit constraints and entrepreneurship in developing countries by providing rigorous causal evidence on the impacts of the Nano Enterprise Financing Fund (NEFF) intervention in rural Tamil Nadu, India. Leveraging a natural experiment that emerged from quasi-random allocation of the program across villages with similar COVID Assistance Package repayment rates (95-99%), we employ difference-in-differences estimation to identify causal impacts on a comprehensive set of enterprise performance, investment, and business practice outcomes. Our findings advance understanding of how targeted credit interventions affect nano-enterprise development and provide important insights for the design of rural entrepreneurship programs in emerging economies.

The results demonstrate that NEFF generates substantial and statistically significant improvements in enterprise performance, with treated enterprises experiencing profit increases of 0.149 standard deviations and revenue growth of 0.117 standard deviations relative to control enterprises. Importantly, these gains are achieved without proportional increases in operational costs, suggesting that the intervention enables enterprises to achieve economies of scale or access higher-margin opportunities rather than simply expanding existing activities. This pattern is consistent with theoretical models of credit-constrained entrepreneurship where access to capital allows firms to reach their optimal scale of operation, moving along their production possibility frontier toward more efficient input-output combinations. The magnitude of these effects is economically meaningful and comparable to successful microenterprise interventions documented in the broader development literature, indicating that NEFF achieves impact scales that can meaningfully improve entrepreneur welfare.

A particularly notable finding is the temporal evolution of treatment effects, with minimal impacts in the first survey round but substantial and significant improvements by the second round. This pattern provides important evidence that credit interventions require gestation periods to materialize into measurable performance gains, as enterprises need time to identify optimal investment opportunities, develop implementation plans, and effectively deploy additional capital. The strengthening effects over time have crucial implications for program evaluation methodology, suggesting that studies focusing only on short-term impacts may systematically underestimate the true development potential of credit access improvements. This finding contributes to ongoing debates in the development finance literature about appropriate evaluation timelines and the importance of medium-term follow-up in impact assessments.

The investment behaviour analysis reveals that NEFF operates primarily through enabling more strategic capital allocation rather than simply increasing total investment amounts. While overall investment increases substantially (0.298 standard deviations), the number of investment activities decreases, indicating that treated enterprises make fewer but larger-scale investments. This concentration effect suggests improved capital allocation efficiency, where enterprises transition from sub-optimal smaller investments constrained by capital limitations toward optimal-scale activities. The strong positive impact on working capital investment (0.156 standard deviations) indicates that liquidity constraints were the most binding constraint for many enterprises, aligning with theoretical models emphasizing the importance of working capital for firm growth in developing countries. The working capital channel appears central to explaining the revenue and profit improvements, as enhanced liquidity enables enterprises to maintain larger inventories, reduce stockouts, and capture previously missed sales opportunities.

The business practices results provide insights into how credit access affects entrepreneurial capabilities beyond direct financial impacts. The dramatic improvements in record-keeping practices (2.5 standard deviations) represent some of the largest treatment effects observed in our analysis, indicating that access to external financing fundamentally transforms how enterprises approach business documentation and financial planning. This finding contributes to literature on business formalization and suggests that credit interventions can effectively promote administrative sophistication alongside financial access. However, the negative effects on marketing practices require careful interpretation within the specific context of the measured activities. Rather than indicating deteriorating business acumen, this pattern may reflect a strategic shift away from intensive competitor monitoring and promotional activities as improved operational capacity reduces the need for aggressive marketing efforts.

The limited effects on credit market access and borrowing costs provide important insights into how targeted interventions interact with existing financial markets. The absence of significant impacts on loan access probability or interest rates suggests that NEFF operates as a complement to rather than substitute for existing credit sources, indicating that the program's benefits flow primarily through direct capital provision rather than broader market effects. The temporary increase in overall indebtedness followed by subsequent reduction demonstrates financially sophisticated behaviour among recipients, who appear to use the program strategically to optimize their capital structures over time rather than simply accumulating debt.

From a methodological perspective, this study makes several contributions to the impact evaluation literature. The natural experiment design leveraging implementation inconsistencies provides a credible identification strategy that addresses common concerns about selection bias in program evaluation. The comprehensive outcome measurement spanning financial performance, investment patterns, and business practices offers a more complete picture of

intervention impacts than studies focusing solely on profit or revenue effects. The panel data structure enabling difference-in-differences estimation with enterprise fixed effects provides robust controls for time-invariant unobserved heterogeneity while accounting for common temporal shocks affecting all enterprises.

The policy implications of these findings are substantial for the design of rural entrepreneurship programs in developing countries. The strong positive impacts on enterprise performance provide evidence supporting targeted credit interventions as effective tools for rural development, particularly when implemented through community-based organizations with strong social capital and local knowledge. The importance of working capital effects suggests that program design should prioritize flexibility in capital use rather than restricting funds to specific investment categories. The temporal evolution of impacts implies that programs should be designed with sufficient implementation periods and continued monitoring to capture full development potential.

However, the mixed business practice results highlight opportunities for complementary interventions to maximize program effectiveness. The substantial improvements in record-keeping alongside limited marketing skill development suggest that combining credit access with targeted business training could amplify impacts. Future program iterations might benefit from incorporating modules on customer development, market expansion strategies, and advanced business planning to complement the strong financial management improvements observed.

Several limitations of this study warrant consideration. First, our analysis focuses on short to medium-term impacts during the first 18 months post-intervention, and longer-term sustainability effects remain to be assessed. Second, while our identification strategy addresses

selection concerns at the village level, we cannot entirely rule out within-village selection effects that might influence enterprise-level treatment assignment. Third, the specific context of post-COVID rural Tamil Nadu may limit generalizability to other settings, though the fundamental credit constraint mechanisms are likely broadly relevant. Fourth, our outcome measures focus primarily on enterprise-level effects and do not capture potential general equilibrium impacts on local markets or labour demand.

Future research should address these limitations through several directions. First, extended follow-up surveys examining long-term sustainability and growth trajectories would provide valuable insights into whether initial improvements translate into sustained enterprise development. Second, investigating spillover effects on non-participant enterprises and broader village economies could illuminate general equilibrium impacts of targeted interventions. Third, comparative analysis across different implementation contexts would enhance understanding of which program design features are most crucial for success. Fourth, examination of complementary interventions combining credit access with business training, technology adoption support, or market linkage facilitation could identify optimal intervention packages.

The broader implications for development policy extend beyond rural entrepreneurship to fundamental questions about financial inclusion and economic development strategies. The success of NEFF in generating meaningful improvements in enterprise performance through relatively modest credit provision supports arguments for financial inclusion as a development priority. However, the mixed business practice results and limited market effects suggest that credit access alone, while necessary, may not be sufficient for comprehensive enterprise development. This reinforces arguments for integrated approaches combining financial services with capacity building, market development, and institutional strengthening.

In conclusion, this study provides robust evidence that well-designed credit interventions can effectively address binding constraints facing rural nano-enterprises in developing countries. The substantial improvements in enterprise performance, strategic investment patterns, and business formalization demonstrate the development potential of targeted financial inclusion programs. However, the temporal evolution of impacts, mixed business practice effects, and limited market-level changes underscore the complexity of entrepreneurship development and the importance of comprehensive, patient approaches to rural enterprise promotion. As development practitioners and policymakers continue to design interventions supporting rural entrepreneurship, these findings provide valuable guidance for maximizing impact while highlighting areas where complementary investments may enhance program effectiveness.

8. Reference

- Baas, T., Schrooten, M., 2006. Relationship Banking and SMEs: A Theoretical Analysis. *Small Bus. Econ.* 27, 127–137.
- Berge, L.I.O., Bjorvatn, K., Tungodden, B., 2011. Human and Financial Capital for Microenterprise Development: Evidence from a Field and Lab Experiment. <https://doi.org/10.2139/ssrn.1750026>
- Besley, T., Coate, S., 1995. Group lending, repayment incentives and social collateral. *J. Dev. Econ.* 46, 1–18. [https://doi.org/10.1016/0304-3878\(94\)00045-E](https://doi.org/10.1016/0304-3878(94)00045-E)
- Buteau, Sharon, Gupta, Abhishek, and Vijay, Sanjana (2022), ‘Multidimensional Impact of Finance on Microenterprises’, (Chennai: LEAD at Krea University)
- de Mel, S., McKenzie, D.J., Woodruff, C., 2009. Measuring microenterprise profits: Must we ask how the sausage is made? *J. Dev. Econ.* 88, 19–31. <https://doi.org/10.1016/j.jdeveco.2008.01.007>
- Gaarder, Edwin and Doorn, Judith van (2021), ‘Enterprise formalization: an introduction’.
- Gindling, T.H., Mossaad, N., Newhouse, D., 2020. Self-employment earnings premiums/penalties and regulations: evidence from developing economies. *Small Bus. Econ.* 55, 507–527.
- International Finance Corporation. (2018). Financing India’s MSMEs: Estimation of Debt Requirement of MSMEs in India. International Finance Corporation Washington, DC.
- Jena, L. P. (2021). Observer Research Foundation. Issue Brief Issue No. 469. Public Credit Guarantee for Small Enterprises in India: An Explainer.
- Krishnan, K.P., Panchapagesan, V., Venkataraman, M., 2017. Distortions in Land Markets and Their Implications for Credit Generation in India. *Econ. Polit. Wkly.* 52, 48–55.
- Kumar, R., 2017. Targeted SME Financing and Employment Effects. World Bank, Washington, DC. <https://doi.org/10.1596/27477>
- Moses, O., Adebisi, J.F., 2013. Small Business Financing in Nigeria: An Investigation of the Angel Option.

- New Approaches to SME and Entrepreneurship Financing [WWW Document], 2015. . OECD.
URL https://www.oecd.org/en/publications/new-approaches-to-sme-and-entrepreneurship-financing_9789264240957-en.html (accessed 12.10.24).
- Nikaido, Y., Pais, J., Sarma, M., 2015. What hinders and what enhances small enterprises' access to formal credit in India? *Rev. Dev. Finance* 5, 43–52.
<https://doi.org/10.1016/j.rdf.2015.05.002>
- Otoo, M., Fulton, J., Ibro, G., Lowenberg-Deboer, J., 2011. WOMEN ENTREPRENEURSHIP IN WEST AFRICA: THE COWPEA STREET FOOD SECTOR IN NIGER AND GHANA. *J. Dev. Entrep. JDE* 16, 37–63.
- Petersen, M.A., Rajan, R.G., 2002. Does Distance Still Matter? The Information Revolution in Small Business Lending. *J. Finance* 57, 2533–2570.
- Rahman, A., Belas, J., Kliestik, T., Tyll, L., 2017. Collateral requirements for SME loans: empirical evidence from the Visegrad countries. *J. Bus. Econ. Manag.* 18, 650–675.
- Rao, P., Kumar, S., Madhavan, V., 2019. A study on factors driving the capital structure decisions of small and medium enterprises (SMEs) in India. *IIMB Manag. Rev.* 31, 37–50. <https://doi.org/10.1016/j.iimb.2018.08.010>
- Singh, C., 2016. Finance for Micro, Small, and Medium-Sized Enterprises in India: Sources and Challenges.
- Sharma, Manoj, et al. (2023), 'Cracking the credit code for nano and microenterprises: Challenges faced and potential solutions, December 2023', (MicroSave Consulting)
- Stiglitz, J.E., Weiss, A., 1981. Credit Rationing in Markets with Imperfect Information.
- Sumanjeet, S., Minakshi, P., 2017. Unleashing The Growth Potential Of Indian MSME Sector. *Comp. Econ. Res.* 20, 35–52.
- Thampy, A., 2010. Financing of SME firms in India: Interview with Ranjana Kumar, Former CMD, Indian Bank; Vigilance Commissioner, Central Vigilance Commission. *IIMB Manag. Rev.* 22, 93–101. <https://doi.org/10.1016/j.iimb.2010.04.011>

Appendix A

A1: Balance Table of all four groups

		(1)		(2)		(3)		(4)	(1)-(2)	(1)-(3)	(1)-(4)	(2)-(3)	(2)-(4)	(3)-(4)
		g1		g2		g3		g4	Pairwis e t-test	Pairwis e t-test	Pairwis e t-test	Pairwis e t-test	Pairwis e t-test	Pairwis e t-test
Variable	N	Mean/(SE)	N	Mean/(SE)	N	Mea n/(S E)	N	Mea n/(S E)	Mean differen ce	Mean differen ce	Mean differen ce	Mean differen ce	Mean differen ce	Mean differen ce
Age	253	43.477	591	43.543	3 1 1	43.7 11	3 9 7	43.4 46	-0.066	-0.234	0.031	-0.168	0.097	0.265
		(0.233)		(0.143)		(0.1 95)		(0.1 72)						
Enterprise Age	253	15.644	590	15.949	3 1 1	17.9 60	3 9 5	18.4 75	-0.305	-2.316	-2.832	-2.011	-2.527	-0.516
		(1.399)		(0.925)		(1.5 31)		(1.3 74)						
Enterprise Diversity Index	253	0.389	591	0.393	3 1 1	0.37 6	3 9 7	0.39 2	-0.004	0.013	-0.004	0.017	0.001	-0.016
		(0.012)		(0.008)		(0.0 13)		(0.0 10)						
Disburseme nt amount	253	33913. 923	591	34210.18 8	3 1 1	3337 0.97 6	3 9 7	3426 1.09 4	- 296.26 5	542.94 7	- 347.17 1	839.21 2	-50.906	- 890.11 8
		(494.9 53)		(316.205)		(449 .485)		(396 .087)						
No. of CAP enterprise	253	12.474	591	12.332	3 1 1	12.6 59	3 9 7	12.3 20	0.143	-0.185	0.154	-0.328	0.012	0.339
		(0.202)		(0.126)		(0.1 95)		(0.1 56)						
Marketing Cost	238	8860.3 86	571	7993.854	2 9 8	1081 8.97 0	3 8 5	9224 .642	866.53 2	- 1958.5 84	- 364.25 6	- 2825.1 16***	- 1230.7 88	1594.3 28
		(748.0 78)		(453.197)		(996 .660)		(751 .734)						
Machinery Cost	238	9008.6 24	571	10667.14 7	2 9 8	1087 7.40 5	3 8 5	9679 .420	- 1658.5 23	- 1868.7 82*	- 670.79 6	- 210.25 8	987.72 8	1197.9 86
		(691.4 92)		(668.420)		(775 .343)		(546 .697)						
Working capital Cost	238	23036. 776	571	22187.11 6	2 9 8	2140 0.99 9	3 8 5	2426 1.26 8	849.66 0	1635.7 77	- 1224.4 92	786.11 7	- 2074.1 52**	- 2860.2 69**

		(970.523)		(653.424)		(829.266)		(835.286)						
Input purchase Cost	238	11349.002	571	11817.229	298	11906.370	385	10417.717	-468.227	-557.368	931.286	-89.141	1399.512	1488.653*
		(681.995)		(772.981)		(753.484)		(453.506)						
Others Proposed cost	238	4778.357	571	4739.456	298	4176.642	385	4308.565	38.901	601.715	469.792	562.814	430.891	-131.923
		(487.020)		(317.141)		(367.587)		(340.590)						

Significance: ***=.01, **=.05, *=.1

A2: Kernal Density Plots for Village-Level Baseline Covariate of all four groups

