DETERMINANTS OF LOAN REPAYMENT IN MICROFINANCE INSTITUTIONS: A CASE STUDY OF NESDA- ORAN

محددات سداد القروض في مؤسسات التمويل المصغر: دراسة حالة NESDA-وهران

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ABSTRACT

This research examines loan repayment determinants among NESDA microfinance beneficiaries in Oran, Algeria. The study analyzes 410 cases from NESDA's portfolio using quantitative methods including logistic regression, chi-square tests, t-tests, and ANOVA. Key findings reveal triangular financing—partnerships between NESDA, commercial banks, and beneficiaries—as the most effective mechanism for reducing default risk through enhanced oversight and accountability. Higher project costs significantly increase repayment difficulties, while prior entrepreneurial experience paradoxically elevates default probability, suggesting overconfidence among experienced borrowers. Education level and female gender demonstrate protective effects against default. Sector of activity shows substantial variation in repayment performance. The analysis provides NESDA with actionable recommendations: maximize triangular financing arrangements, establish project cost ceilings, implement enhanced monitoring for experienced entrepreneurs, prioritize educated beneficiaries, develop sector-specific support programs, and expand female participation. These evidence-based strategies address critical institutional challenges and fill important research gaps in North African microfinance. The findings validate both classical agency theory and behavioral economics frameworks while offering practical pathways to improve portfolio quality, financial sustainability, and entrepreneurship support effectiveness throughout Algeria.

Keywords: microfinance, loan repayment, NESDA, financial inclusion, risk management, behavioral economics
JEL Classification: G21, O16, O5

ملخص:

تُحلل هذه الدراسة محددات سداد القروض لدى مستفيدي التمويل الأصغر بـ NESDA في وهران، الجزائر. يُحلل البحث 410 ملف من محفظة NESDA باستخدام منهجيات كمية تشمل الانحدار اللوجستي، اختبارات χ^2، t-test، وANOVA. تُظهر النتائج الأساسية التمويل الثلاثي - الشراكة بين NESDA والبنوك التجارية والمستفيدين - كآلية الأكثر فعالية لتقليل مخاطر التخلف عبر الإشراف المزدوج وتعزيز المساءلة. تكاليف المشاريع المرتفعة تُزيد صعوبات السداد بشكل كبير، بينما الخبرة الريادية السابقة ترفع احتمال التخلف بشكل متناقض، مُشيرة للثقة الزائدة لدى رواد الأعمال ذوي الخبرة. مستوى التعليم والإناث يُظهران تأثيراً وقائياً ضد التخلف. القطاع الاقتصادي يُظهر تبايناً كبيراً في الأداء. يُقدم التحليل لـ NESDA توصيات عملية: تعظيم التمويل الثلاثي، وضع سقوف لتكاليف المشاريع، تطبيق مراقبة محسنة لرواد الأعمال ذوي الخبرة، إعطاء الأولوية للمتعلمين، تطوير برامج دعم قطاعية، وتوسيع مشاركة الإناث. تُعالج هذه الاستراتيجيات القائمة على الأدلة التحديات المؤسسية الرئيسية وتُملأ فجوات بحثية مهمة في التمويل الأصغر المغاربي.

الكلمات المفتاحية: التمويل الأصغر، سداد القروض، NESDA، الشمول المالي، إدارة المخاطر، الاقتصاد السلوكي.
تصنيف JEL: G21, O16, O5

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INTRODUCTION

Microfinance has emerged as a critical tool for financial inclusion and poverty reduction in developing countries, particularly for populations excluded from formal banking systems. In Algeria, the National Entrepreneurship Support and Development Agency (NESDA), formerly known as ANSEJ, plays a pivotal role in supporting young entrepreneurs through structured financing and mentorship programs. However, the sustainability of microfinance institutions (MFIs) depends fundamentally on borrowers' capacity and willingness to meet their financial obligations (Ledgerwood, 1999). Understanding the determinants of loan repayment behavior is therefore essential for improving institutional performance and ensuring the long-term viability of entrepreneurship support programs.

Despite the global recognition of microfinance's potential, loan default remains a persistent challenge. In many North African contexts, repayment rates range from 45-75%, below the 95%+ benchmarks established in mature microfinance markets. This research addresses the central question: *What are the principal determinants of loan repayment among NESDA beneficiaries, and to what extent do individual, economic, and institutional factors influence repayment compliance?*

This article presents a comprehensive empirical analysis of factors affecting loan repayment behavior based on rigorous quantitative analysis of 410 case records from NESDA's Oran office. The research combines theoretical frameworks from classical finance and behavioral economics with advanced statistical modeling techniques including multivariate logistic regression.

1. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

1.1. Microfinance: Evolution and Performance Indicators

Microfinance encompasses a comprehensive range of financial services—including microcredit, microsavings, microinsurance, and remittance services—designed to serve low-income populations systematically excluded from formal banking (Ledgerwood, 1999). The concept originated with Muhammad Yunus's Grameen Bank in Bangladesh during the 1970s, which demonstrated that poor populations possess the capacity to repay loans when offered appropriate financing mechanisms (Yunus, 1999). This revolutionary insight transformed poverty alleviation policy globally, emphasizing group lending and social collateral over traditional guarantees.

Loan repayment rates serve as the primary performance indicator for microfinance institutions, directly determining financial sustainability and operational viability. A high repayment rate (typically >90%) enables institutions to recycle recovered funds into new loans, thereby amplifying social impact while maintaining institutional health. Conversely, high default rates (>20%) strain resources, necessitate costly provisions for doubtful debts, and undermine credibility with external stakeholders including donors, investors, and regulators (Kofi Mowu, 2019).

In the Algerian context, microfinance evolved through public initiatives like the Agence de Développement Social (ADS) in 1999 and Agence Nationale de Gestion du Micro-Crédit (ANGEM) in 2004, addressing youth unemployment amid economic challenges (Boudedja, 2008). Despite progress, regulatory constraints and low repayment rates limited impact, leading

to the creation of NESDA (formerly ANSEJ) in 2020 to support entrepreneurial development beyond mere job creation.

1.2 Economic Theories of Loan Repayment Behavior

Classical finance theories provide foundational explanations for repayment behavior. The trade-off theory posits borrowers balance tax advantages of debt against bankruptcy costs, influencing repayment timing (Myers, 1984). Ricardian equivalence suggests rational agents anticipate future obligations, adjusting savings accordingly, though this assumes perfect information rarely found in microfinance contexts.

Agency theory highlights information asymmetries between lenders and borrowers, leading to adverse selection (pre-loan) and moral hazard (post-loan) (Akerlof, 1970). In microfinance, borrowers may misrepresent project viability or divert funds, increasing default risk (Couchoro, 2007).

Behavioral economics challenges perfect rationality. Prospect theory shows loss aversion drives risk-averse repayment to avoid default penalties (Kahneman & Tversky, 1979). Endowment effect leads borrowers to overvalue funded assets, delaying repayment (Thaler, 1980). Overconfidence among experienced entrepreneurs—observed in NESDA data—explains paradoxical higher default rates.

Nudge theory (Thaler, 2024) advocates subtle interventions like repayment reminders or social norms to improve compliance without coercive measures.

Table 1. Theoretical Frameworks Explaining Loan Repayment Behavior in Microfinance

Theory	Core Assumption	Repayment Implication	Key Reference
Trade-off	Rational debt optimization	Balance costs/benefits	Myers (1984)
Agency	Information asymmetry	Adverse selection/moral hazard	Akerlof (1970)
Prospect	Loss aversion	Risk-averse early repayment	Kahneman & Tversky (1979)
Nudge	Behavioral defaults	Gentle incentives improve compliance	Thaler (2024)

Source : Adapted by authors

1.3 Empirical Determinants of Repayment

Literature identifies borrower, loan, institutional, and external factors. Borrower factors: Higher education correlates with better repayment (Honlonkou, 2002), though NESDA data shows vocational training linked to higher risk, suggesting competency mismatches. Prior experience paradoxically increases defaults (OR=2.69), possibly due to overconfidence.

Loan factors: Project cost positively predicts default (OR=1.68); larger projects strain capacity (Elloumi & Kammoun, 2013). Triangular financing (NESDA-bank-borrower) reduces risk by 92.5% via dual oversight.

Institutional factors: Strong post-loan monitoring and group pressure enhance repayment (Armendáriz & Morduch, 2010). NESDA's grace periods and staggered repayment support viability but require better risk screening.

External factors: Economic shocks, sector volatility (commerce/artisanat highest χ^2=98.66, p<.001), and social norms influence outcomes (Azokly, 2010).

Table 2. Summary of Empirical Determinants

Category	Key Factors	Effect on Repayment	Supporting Studies
Category	Key Factors	Effect on Repayment	Supporting Studies
Borrower	Education, Experience	Mixed (protective but paradoxical)	Honlonkou (2002); Makhloufi (2025)
Loan	Cost, Type	Higher cost/risk; Triangular protective	Elloumi & Kammoun (2013)
Institutional	Monitoring, Group lending	Positive	Armendáriz & Morduch (2010)
External	Sector, Shocks	Sector-specific risks	Wamba (2015)

1.4 Research Gap and Conceptual Framework

While global studies abound, North African microfinance—particularly NESDA's triangular vs. mixed financing—remains underexplored. Prior work focuses on sub-Saharan contexts (Honlonkou et al., 2006), overlooking Algerian institutional specifics like PNR loans and FNMG guarantees. This study bridges the gap using NESDA's 410-case dataset, testing agency and behavioral theories empirically.

2. METHODOLOGY AND RESEARCH DESIGN

2.1 Sample and Data Collection

This research employs a quantitative empirical approach utilizing secondary data directly from NESDA's Oran office portfolio. The study analyzes 410 loan beneficiary cases selected from a portfolio exceeding 17,000 individual records. The sample includes both regular repayers and those experiencing payment difficulties, ensuring comprehensive representation of repayment behavior diversity. Data was anonymized, coded, and analyzed using SPSS version 26 for statistical rigor. Ethical protocols ensured complete confidentiality of beneficiary information.

2.2 Variables and Operational Definitions

Dependent variable: Loan repayment performance (binary: good repayment vs. poor repayment, based on number of missed installments)

Independent variables: Beneficiary age (years), gender (binary), education level (5 categories), marital status, prior entrepreneurial experience, financing type (triangular vs. mixed), project cost (grouped quartiles), sector of activity (11 categories), number of jobs created.

Control variables: Payment delay frequency, project duration, beneficiary's prior employment status.

2.3 Statistical Analysis Procedures

Multiple complementary statistical techniques were employed: (1) Descriptive statistics; (2) Chi-square tests (χ^2) for categorical variables; (3) Independent samples t-tests for continuous variables; (4) One-way ANOVA for multi-group comparisons; (5) Spearman rank correlation;

(6) Binary logistic regression for multivariate modeling. Statistical significance set at α=.05. All confidence intervals computed at 95% level.

3. EMPIRICAL RESULTS

3.1 Sample Characteristics and Descriptive Statistics

Table 3. Sample Descriptive Statistics (N=410)

Variable	Mean/Percentage	SD/Distribution	Range/Notes
Age (years)	M=34.2	SD=7.8	22-58
Education (% distribution)	Primary 12%	Secondary 34%	Vocational 38%, University 16%
Gender	Male 68%	Female 32%	N=410
Financing Type	Triangular 55%	Mixed 45%	
Project Cost (units)	M=2.24	SD=1.00	0.80-4.50
Good Repayers	45.6%	n=187	
Poor Repayers	54.4%	n=223	

The sample comprises 410 NESDA beneficiaries from Oran with mean age of 34.2 years (SD=7.8), ranging from 22-58 years, representing young to mid-career entrepreneurs. Education distribution shows vocational training as most prevalent (38%), followed by secondary (34%), university (16%), and primary (12%), indicating moderate human capital levels. Males dominate (68%) over females (32%), consistent with entrepreneurship gender gaps in Algeria.

Project financing characteristics reveal majority triangular arrangements (55%) involving NESDA, commercial banks, and beneficiaries, versus mixed financing (45%) with fewer institutional partners. Average project cost stands at 2.24 funding units (SD=1.00), ranging from 0.80-4.50 units, suggesting moderate investment scale with notable variability. Repayment performance reveals concerning portfolio quality: 45.6% (n=187) maintained good repayment with minimal missed installments, while 54.4% (n=223) exhibited poor performance with multiple delays or sustained defaults, yielding a default rate exceeding acceptable microfinance benchmarks (>20%).

Table 4. Chi-Square Test Results for Categorical Variables

Variable	χ^2 Value	df	p-value	Significance
Sector of Activity	98.66	11	<.001	*
Education Level	35.43	4	<.001	*
Financing Type	21.02	1	<.001	*
Gender	8.65	1	.003	**
Prior Experience	5.06	1	.024	*
Project Cost	23.70	1	<.001	*

Age Bracket	0.01	1	.939	ns
Marital Status	0.08	1	.780	ns
Jobs Created	3.43	1	.064	ns

Chi-square tests reveal highly significant associations between repayment performance and several categorical variables. Sector of activity demonstrates the strongest relationship (χ^2=98.66, df=11, p<.001***), indicating substantial variation across 11 economic sectors, with commerce and services likely outperforming manufacturing and agriculture. Education level shows strong significance (χ^2=35.43, df=4, p<.001***), confirming human capital's role in repayment discipline.

Financing type exhibits robust association (χ^2=21.02, df=1, p<.001***), validating triangular financing's superior performance over mixed arrangements. Gender achieves significance (χ^2=8.65, df=1, p=.003**), with females demonstrating better repayment rates. Prior entrepreneurial experience shows marginal significance (χ^2=5.06, df=1, p=.024*), counterintuitively suggesting higher default risk among experienced borrowers. Project cost categorization confirms significant impact (χ^2=23.70, df=1, p<.001***), with higher-cost projects linked to poorer outcomes.

Non-significant variables include age bracket (χ^2=0.01, p=.939 ns), marital status (χ^2=0.08, p=.780 ns), and jobs created (χ^2=3.43, p=.064 ns), indicating these demographic and outcome measures do not predict repayment behavior in this NESDA cohort

3.2. Independent Samples t-Tests: Project Cost Analysis

Table 5. Project Cost Comparison by Repayment Status

Group	Mean	SD	Statistics
Good Repayers (n=187)	M=1.99	SD=0.97	Range: 0.80-3.50
Poor Repayers (n=223)	M=2.49	SD=1.02	Range: 1.20-4.50
Mean Difference	-0.50	95% CI: [-0.69, -0.30]	t(401.3)=-5.03***

Independent samples t-tests comparing project costs between repayment groups reveal highly significant differences. Poor repayers maintained substantially higher average project costs (M=2.49, SD=1.02) compared to good repayers (M=1.99, SD=0.97), with ranges spanning 1.20-4.50 versus 0.80-3.50 units respectively. Levene's test confirmed unequal variances (F=13.47, p<.001), necessitating Welch's t-test which yielded t(401.3)=-5.03, p<.001***.

The mean difference of -0.50 funding units carries a 95% confidence interval of [-0.69, -0.30], confirming good repayers systematically pursue lower-cost projects. This 25% higher average cost among defaulters suggests capacity constraints, implementation complexity, or extended cash flow cycles overwhelm beneficiaries undertaking larger ventures, representing a critical risk factor for NESDA portfolio management.

3.3. ANOVA: Prior Experience and Repayment Performance

Beneficiaries with prior entrepreneurial experience demonstrated significantly worse repayment performance: F(1,408)=22.05, p<.001.

3.4. Binary Logistic Regression: Multivariate Predictive Model

Table 6. Logistic Regression Coefficients and Odds Ratios

Variable	B	SE	Wald	p	OR	95% CI
Financing Type (Triangular)	-2.595	.485	28.57	<.001***	0.075	(0.029-0.186)
Project Cost	0.519	.134	14.96	<.001***	1.68	(1.29-2.18)
Prior Experience	0.991	.315	9.89	.002**	2.69	(1.45-5.00)
Education Level	-0.287	.128	5.03	.025*	0.750	(0.584-0.962)
Gender (Female)	-0.538	.276	3.80	.051†	0.584	(0.339-1.003)
Age (continuous)	0.008	.021	0.14	.708	1.008	(0.968-1.050)
Marital Status	-0.156	.264	0.35	.553	0.856	(0.510-1.435)

Model Statistics: Overall Model $\chi^2(22)=156.62$, $p<.001$; Hosmer-Lemeshow $\chi^2=7.34$, $p=.633$; Classification Accuracy=74.4%; Nagelkerke $R^2=.406$

Binary logistic regression modeling poor repayment probability across 22 predictors demonstrates excellent overall fit ($\chi^2(22)=156.62$, $p<.001$) with good calibration (Hosmer-Lemeshow $\chi^2=7.34$, $p=.633$), achieving 74.4% classification accuracy and explaining 40.6% variance (Nagelkerke $R^2=.406$). Triangular financing emerges as the strongest predictor, reducing default odds by 92.5% (OR=0.075, 95% CI: 0.029-0.186, p<.001***; Wald=28.57), confirming dual institutional oversight's protective power.

Project cost significantly elevates risk (OR=1.68, 95% CI: 1.29-2.18, p<.001***; B=0.519), with each funding unit increasing default probability by 68%. Prior entrepreneurial experience paradoxically triples default odds (OR=2.69, 95% CI: 1.45-5.00, p=.002**), suggesting overconfidence bias among repeat entrepreneurs. Higher education levels provide protective effects (OR=0.750, 95% CI: 0.584-0.962, p=.025*), reducing risk by 25% per level increase.

Female gender shows borderline protection (OR=0.584, p=.051†), while age and marital status prove non-significant (p>.05). The model's 68.2% sensitivity and 80.2% specificity balance false positives/negatives effectively for practical risk screening.

Table 7. Summary of Odds Ratios and Policy Implications

Factor	Odds Ratio	Effect Size	Interpretation
Triangular Financing	0.075	-92.5%	Highly protective; strong recommendation
Project Cost (per unit)	1.68	+68%	Risk factor; implement cost caps
Prior Experience	2.69	+169%	Paradoxical; requires enhanced monitoring
Education Level	0.750	-25%	Protective; prioritize educated beneficiaries
Female Gender	0.584	-42%	Marginal; promising for targeted outreach

The multivariate analysis yields five key predictors with clear policy implications. Triangular financing demonstrates extraordinary protection, slashing default odds by 92.5% (OR=0.075), representing NESDA's most powerful risk mitigation tool through dual institutional oversight and enhanced accountability. Each unit increase in project cost elevates default risk by 68%

(OR=1.68), necessitating immediate implementation of cost ceilings calibrated to beneficiary capacity and sector viability.

Prior entrepreneurial experience counterintuitively triples default odds (+169%, OR=2.69), signaling overconfidence bias and requiring differentiated monitoring protocols for repeat applicants rather than reduced scrutiny. Higher education consistently reduces risk by 25% per level (OR=0.750), validating human capital's role and supporting targeted recruitment of educated beneficiaries alongside training for others.

Female gender shows promising 42% risk reduction (OR=0.584, p=.051†), warranting expanded outreach to achieve gender parity beyond equity goals. These effect sizes provide NESDA with prioritized, evidence-based interventions: maximize triangular partnerships first, cap project costs second, and enhance monitoring of experienced entrepreneurs third.

4. DISCUSSION

This empirical analysis of 410 NESDA Oran beneficiaries identifies critical loan repayment determinants through rigorous statistical modeling. Triangular financing emerges as the dominant protective factor, reducing default odds by 92.5% (OR=0.075) via enhanced institutional oversight. Higher project costs (+68% risk per unit, OR=1.68) and prior entrepreneurial experience (+169% risk, OR=2.69) represent major vulnerabilities requiring immediate intervention.

The logistic model achieves 74.4% classification accuracy with excellent fit (Hosmer-Lemeshow p=.633), confirming predictor robustness. Education provides consistent protection (-25% risk per level), while sector variation (χ^2=98.66, p<.001) demands tailored support strategies.

NESDA should prioritize: (1) maximizing triangular financing penetration to 75-80%; (2) implementing dynamic project cost caps at 2.2 units; (3) enhanced monitoring of experienced entrepreneurs; (4) education-based beneficiary selection; (5) sector-specific interventions; and (6) female entrepreneurship expansion.

These evidence-based recommendations offer NESDA a concrete pathway to improve portfolio quality, reduce financial losses, enhance institutional sustainability, and amplify entrepreneurship support impact across Algeria. The study fills critical North African microfinance research gaps, validating behavioral economics alongside classical agency theory in real-world policy contexts.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

This comprehensive empirical analysis of 410 NESDA Oran beneficiaries identifies critical loan repayment determinants through rigorous multivariate statistical modeling. Triangular financing emerges as the dominant protective factor, reducing default odds by 92.5% (OR=0.075, p<.001) through dual institutional oversight that enhances project screening, monitoring, and borrower accountability—representing NESDA's most powerful risk mitigation mechanism.

Higher project costs systematically increase default risk by 68% per funding unit (OR=1.68, p<.001), confirming capacity constraints among beneficiaries undertaking complex ventures. The counterintuitive finding that prior entrepreneurial experience triples default odds (OR=2.69, p=.002) reveals overconfidence bias, challenging conventional wisdom and necessitating differentiated risk management for repeat applicants.

Education provides consistent protection (OR=0.750, p=.025), sector effects prove highly significant (χ^2=98.66, p<.001), and female gender shows promising trends (OR=0.584, p=.051). The logistic model demonstrates excellent predictive power (74.4% accuracy, Hosmer-Lemeshow p=.633), validating both classical agency theory and behavioral economics frameworks.

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