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Article

Post-Pandemic Entrepreneurship and the Role of Delivery Services in Fostering Innovative Business Growth: Evidence from La Libertad, Peru

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Abstract

In post-pandemic Peru, delivery platforms have become key market-access infrastructure for microenterprises, yet regional evidence remains limited. This study examines whether—and under what conditions—adopting delivery services fosters the growth of innovative businesses in La Libertad (2021–2025). We conducted a cross-sectional survey of 200 microentrepreneurs (August–September 2024) to measure delivery adoption, business model innovation (BMI), digital capabilities, institutional environment, and performance. Using PLS-SEM (SmartPLS 4) with bootstrapping and complementary regressions, we tested direct, mediating, and moderating effects with controls and robustness checks. Delivery adoption was positively associated with business growth ($\beta = 0.29$, $p < 0.001$); part of this effect operated through BMI (indirect = 0.106, $p < 0.001$). Digital capabilities strengthened the adoption–growth relationship (interaction $\beta = 0.13$, $p = 0.011$), and a more favorable institutional environment increased the odds of formalization among firms using delivery (OR = 1.68; 95% CI [1.20, 2.41]). Model fit and predictive relevance were acceptable. We conclude that delivery can catalyze growth and formalization when coupled with business-model redesign and capability building within supportive local conditions. Given the cross-sectional, non-probabilistic design and the absence of objective environmental metrics, causal claims and generalizability are limited; this study addresses economic and social dimensions of entrepreneurship, with environmental sustainability requiring future research with verified data.

Keywords: delivery platforms; business model innovation; digital capabilities; microenterprises; formalization; PLS-SEM; La Libertad (Peru)

1. Introduction

Following the acute phase of COVID-19, economic recovery in Latin America has been marked by a restructuring of the entrepreneurial fabric and an acceleration of commercial digitization. In Peru, access to and use of e-commerce enabling technologies has become more widespread: in the fourth quarter of 2024, 96.0% of households reported having at least one information and communication technology (ICT), and 89.8% of the Internet-using population accessed it via mobile phone, reflecting the basic conditions for the expansion of business models intensive in digital channels [1]. Likewise, 15.1% of Internet users reported having made online purchases of products and/or services in October, November, and December 2024, an indicator that, although still moderate, shows a growing trend compared to 2023 (14.5%) [1]. These metrics of digital adoption provide the backdrop for analyzing the role of delivery services in the creation and growth of innovative businesses in specific regional contexts such as La Libertad.

Recent literature characterizes delivery services as part of an ecosystem of transactional platforms that reduce barriers to entry, provide ready-to-operate infrastructure (payments, last-mile logistics, online reputation), and enable new market access logics for nascent ventures [2]. However,

it also warns of the strategic dependence and power asymmetries that emerge when the "platform-dependent" entrepreneur is subordinated to rules of visibility, fees, and governance that they do not control [2]. This duality—facilitating access and dependence—raises policy and management questions that remain open in heterogeneous regional economies.

In parallel, evidence on online food delivery (OFD) shows that these platforms have reconfigured the marketing environments for food and related services, accelerating the transition from offline to online and expanding on-demand delivery coverage [3]. A recent systematic mapping identifies regulatory gaps in labeling, promotion, composition, and pricing, underscoring that the public policy framework has not fully incorporated OFD platforms despite their scale and influence [3]. In terms of entrepreneurial opportunity, this implies a dynamic but still unstable e y space, in which commercial innovation coexists with challenges of quality, information, and competitive equity.

The department of La Libertad—one of the economic hubs of northern Peru—has productive and business conditions that make it relevant for studying this phenomenon. According to PRODUCE's regional diagnostic report, in 2024 La Libertad had 127,299 formal companies and 126,462 MSMEs, of which 83.9% were concentrated in commerce and services. In addition, for every 100 existing companies, 7 entered the market and 2 left, reflecting an active business dynamic. However, 84.4% of MSMEs remain informal, which may affect their sustainability and access to financing [4]. These figures are part of a regional economy that contributed 4.8% of the national GDP in 2024 and employed around one million workers, with a greater concentration in services (38.9%) and agriculture (22.0%) [4].

In economic terms, INEI reported that 17 departments—including La Libertad—recorded growth in activity in the fourth quarter of 2024 compared to the same period in 2023, suggesting an environment of recovery that could boost the adoption of delivery channels by local business initiatives [5]. However, the policy literature for MSMEs in Latin America emphasizes that gaps in digital capabilities, formalization, financing, and human capital continue to constrain the productivity and scaling of firms, making it necessary to place the expansion of delivery within a broader agenda for the development of the entrepreneurial ecosystem [6].

From the perspective of business model innovation, delivery services have catalyzed the emergence of agile formats such as ghost/dark kitchens and quick commerce, which reduce fixed costs (real estate and floor space) and accelerate time to market through operations focused on production and dispatch [7,8]. These formats—although not without labor and regulatory issues—have been documented in Latin American cities and other urban contexts, suggesting that the recombination of minimal physical assets with digital assets (platforms, apps, demand analytics) enables new locally based ventures with expanded reach [3,7].

The expansion of platforms has also reconfigured work patterns. The International Labor Organization (ILO) has documented the growing participation of workers in digital platforms in the region and the coexistence of income opportunities with deficits in social protection and working conditions, especially in delivery modalities [9]. For the entrepreneurial ecosystem, these tensions matter because of their impact on costs, brand reputation, and operational sustainability, and because the rules of the game around platform employment can affect the scalability and formalization of innovative businesses that depend on delivery [3,9].

This study focuses on the economic and social dimensions of entrepreneurship through delivery platforms, specifically examining business growth, employment generation, and formalization. While the environmental impacts of delivery services (packaging waste, last-mile emissions) are acknowledged as relevant concerns in the literature [3,7], the present research does not measure these variables objectively. Future studies should incorporate verified environmental metrics to provide a comprehensive sustainability assessment.

From a sustainability perspective, the economic and social dimensions of delivery platform adoption align with debates on inclusive growth, decent work, and resilience of microenterprises in developing economies. Sustainable entrepreneurship in this context requires not only business

viability but also the generation of quality employment, formalization that ensures access to social protection and financing, and reduction of structural inequalities in market access [6]. The labor conditions and employment frameworks around platform work directly impact the social sustainability of ventures that depend on delivery [9]. While the environmental dimension of delivery (carbon footprint, waste) remains under-researched in regional contexts, understanding the economic-social sustainability of platform-based ventures is a prerequisite for comprehensive policy frameworks.

Despite growing attention, empirical evidence remains biased toward large cities or national analyses. In Peru, sectoral reports on e-commerce and delivery platforms offer useful aggregates, but rarely disaggregate impacts on business creation and growth at the departmental level or by cohort of ventures after 2020 [10,11]. In La Libertad, where the MSME fabric is concentrated in commerce and services and informality is high, it remains to be seen whether—and under what conditions—delivery acts as an effective lever for the creation of innovative businesses and as an accelerator of their growth in sales and employment.

Theoretically, this work is based on three constructs. First, the adoption of delivery platforms as a mechanism for market access: platforms reduce barriers to entry, increase visibility, and standardize commercial processes, but they also generate dependence on platform governance and fees [2,6]. Several studies have shown that intensive use of platforms correlates with revenue growth in the early stages, conditioned by algorithm rules and fees [2,3]. Consequently, the following hypothesis is proposed: H1: The adoption of delivery platforms has a positive effect on the growth of new businesses in La Libertad.

Second, business model innovation: formats such as ghost kitchens and dark stores reconfigure the value chain, reduce physical assets, and accelerate time-to-market; their deployment is often accompanied by reconfigurations in assortment, packaging, and pricing specific to the delivery channel [7,8]. Theory suggests that the platform enables but does not guarantee growth: business model renewal is a key intermediate mechanism. Therefore, H2: Business model innovation positively mediates the relationship between delivery adoption and business growth.

Third, digital capabilities and institutional environment: evidence from MSME policies indicates that digital skills, last-mile logistics, analytics, and online reputation management moderate performance in digital; in turn, regulatory and employment frameworks on platforms influence costs and scalability [3,6,9]. This leads to two additional hypotheses: H3: The digital capabilities of entrepreneurship positively moderate the effect of delivery adoption on growth. H4: The quality of the institutional environment (digital infrastructure and labor regulation on platforms) positively moderates the relationship between delivery adoption and the creation of formal businesses.

The justification for the study rests on its scientific and social relevance. In scientific terms, it provides disaggregated regional evidence for a debate dominated by analyses of large markets and examines mechanisms (mediations and moderations) that have been little explored in contexts of high informality such as La Libertad. In social and public policy terms, it identifies conditions under which delivery can become a lever for formalization, productivity, and decent employment in the commerce and services sectors—outcomes aligned with Sustainable Development Goal 8 (decent work and economic growth)—without neglecting the risks of platform dependency and labor precariousness that threaten the sustainability of these ventures. The information generated can guide promotion instruments (training, technical assistance in e-commerce, incentives for formalization) and regulatory adjustments (data protection, algorithmic transparency, working conditions on platforms).

Within this framework, the overall objective is to analyze the extent to which and under what conditions the adoption of delivery services contributes to the creation and growth of innovative businesses in La Libertad in the post-pandemic period (2021–2025). The specific objectives are: (i) to estimate the association between the use of delivery platforms and growth (sales/employment); (ii) to evaluate the mediating role of business model innovation; (iii) to examine the moderating role of digital capabilities and the institutional environment; and (iv) to characterize profiles of ventures that

maximize the value of delivery in commerce and services. Research question: How and under what conditions does the use of delivery platforms contribute to the creation and growth of innovative businesses in La Libertad during the period 2021–2025?

2. Materials and Methods

This research adopted a quantitative cross-sectional approach with a non-experimental design to examine the relationships between the adoption of digital technologies, business model innovation, and the growth of microenterprises in the context of business sustainability [12]. The study was conducted during August and September 2024 in the department of La Libertad, focusing on small productive units that represent an essential component of the local economic ecosystem, particularly relevant in developing countries where microenterprises face unique challenges in their digital transformation process [13].

The sample consisted of 200 microentrepreneurs selected through non-probabilistic convenience sampling, a figure that exceeds the minimum requirements established for structural equation models using partial least squares, considering the complexity of the proposed model [14]. The inclusion criteria established that participants must be actively managing their businesses, have at least one year of operation, and be willing to provide information about their digital practices and business strategies. Data on demographic characteristics, level of formalization, economic sector, and provincial location were collected to allow for differentiated analysis.

The collection instrument consisted of a previously validated structured questionnaire that measured three main dimensions: the degree of adoption of digital technologies (independent variable), innovation in the business model as a mediating variable [15], and business growth as a dependent variable. In addition, measurements of digital capabilities and environmental characteristics were included as moderating variables, following the theoretical framework of dynamic capabilities applied to contexts of sustainable digital transformation [16]. The instrument demonstrated adequate internal consistency in a preliminary pilot study, ensuring its reliability for the specific context of the study.

Environmental sustainability indicators were not included in the measurement instrument; the study concentrates on economic performance and social outcomes (formalization, employment).

SmartPLS 4, a software specialized in structural equation modeling using partial least squares, recognized for its ability to handle complex models with latent variables and mediation-moderation relationships [17], was used for data analysis. Prior to the main analysis, exhaustive preprocessing was performed, including the detection and treatment of outliers, the analysis of missing data with imputation in cases where they represented more than 5% per variable, and the standardization of scales to facilitate comparability.

The descriptive analysis provided means, standard deviations, and proportions with their respective 95% confidence intervals, offering an initial overview of the sample characteristics. To test the hypotheses, three complementary analytical strategies were implemented following the methodological guidelines for studies of digital transformation in small businesses [18]. First, the direct effect of technology adoption on business growth (H1) was evaluated using HC3 robust error regression, controlling for demographic and contextual variables; in cases where the dependent variable was categorical, binary logistic regression was applied.

Second, to examine the mediating role of innovation in the business model (H2), a structural equation model was constructed in SmartPLS, calculating indirect effects using bootstrapping with 5,000 replicates [19]. This procedure allowed us to obtain robust confidence intervals and evaluate the predictive capacity of the model through indicators such as R^2 , f^2 , and Q^2 , complemented by the PLSpredict technique. The choice of innovation in business models as a mediating mechanism is based on recent empirical evidence demonstrating its role in channeling digital transformation and organizational performance in innovative SMEs [20]. The validity of the measurement model was verified using the HTMT criterion for discriminant validity, together with composite consistency

analysis and factor loadings, following established protocols to ensure the robustness of the structural model.

Third, the moderating effects of digital capabilities and the business environment (H3 and H4) were evaluated by incorporating interaction terms focused on the structural model. Additionally, multigroup analyses were performed by segmenting the sample by economic sector, province, and level of formality, provided that the sample size of each segment had sufficient statistical power. This multilevel approach allowed us to capture the heterogeneity characteristic of microenterprises in sustainability contexts [21].

To minimize the common method, bias inherent in cross-sectional self-report studies, procedural remedies were implemented during data collection, including psychological separation between measurements, the use of reverse items, and guarantees of anonymity [22]. Ex post, diagnostic tests such as Harman's single factor and complete collinearity analysis using VIF were applied, following the methodological recommendations established to control for potential biases in survey research [23]. The significance level was set at $\alpha = 0.05$ with two-tailed tests; in analyses involving multiple comparisons, adjustments were applied using the Holm-Bonferroni or Benjamini-Hochberg methods to control the false discovery rate.

The study complied with all ethical standards required by MDPI Sustainability. Informed consent was obtained from all participants, ensuring the confidentiality and anonymity of their responses. Data were stored securely and used exclusively for research purposes. The data availability statement and complete ethical considerations are included in accordance with the journal's editorial policies.

3. Results

3.1. Quality of the Measurement Model: Reliability and Validity

The internal consistency of the constructs was adequate: Cronbach's α coefficients ranged from 0.82 to 0.91; composite reliability (CR) ranged from 0.87 to 0.93; and average variance extracted (AVE) ranged from 0.56 to 0.62, exceeding the threshold of 0.50. Standardized loadings ranged from 0.72 to 0.89. Discriminant validity was corroborated by the Fornell–Larcker criterion (square roots of AVE greater than correlations) and by HTMT (<0.85 in all pairs). Collinearity was not problematic (VIF 1.21–2.43). These procedures follow the recommendations for measurement evaluation in PLS-SEM [19,24,25].

Table 1. Reliability and validity of the measurement model (PLS).

Construct (abbreviation)	Items	Cronbach's α	CR	AVE
Delivery adoption (ADOP)	5	0.86	0.90	0.61
Business model innovation (BMI)	10	0.91	0.93	0.60
Digital capabilities (DIGCAP)	6	0.88	0.91	0.62
Perceived institutional environment (INST)	5	0.82	0.87	0.56
Business growth (GROWTH)	3	0.78	0.84	0.57

Table 2. Fornell–Larcker criterion (diagonal = $\sqrt{\text{AVE}}$).

	ADOP	BMI	DIGCAP	INST	GROWTH
ADOP	0.781				
BMI	0.57	0.774			
DIGCAP	0.38	0.41	0.787		
INST	0.29	0.33	0.36	0.749	
GROWTH	0.42	0.39	0.31	0.27	0.755

Table 3. HTMT indices (all couples < 0.85).

	ADOP	BMI	DIGCAP	INST	GROWTH
ADOP	—	0.71	0.62	0.49	0.56
BMI		—	0.64	0.52	0.60
DIGCAP			—	0.58	0.55
INST				—	0.47
GROWTH					—

Note. Abbreviations: ADOP = adoption of delivery platforms; BMI = business model innovation; DIGCAP = digital capabilities; INST = institutional environment; GROWTH = business growth.

3.2. Goodness of Fit and Predictive Power

The overall fit of the PLS-SEM model was adequate: SRMR = 0.058, d_{ULS} = 0.874, d_G = 0.642, and NFI = 0.93; structural collinearity remained below critical thresholds ($VIF < 3$). The explanatory power was substantial ($R^2_{GROWTH} = 0.47$; $R^2_{BMI} = 0.42$). Effect sizes (f^2) suggest moderate effects of ADOPT \rightarrow GROWTH ($f^2 = 0.18$) and ADOPT \rightarrow BMI ($f^2 = 0.29$), and small–moderate effects of BMI \rightarrow GROWTH ($f^2 = 0.16$). Predictive relevance (blindfolding) was positive for endogenous constructs ($Q^2_{GROWTH} = 0.31$; $Q^2_{BMI} = 0.26$). In PLSpredict, $Q^2_{pred} > 0$ and RMSE/MAE lower than the linear model for most indicators, supporting the predictive utility of the model [19,26–28].

3.3. Descriptive Statistics of the Sample (N = 200)

The sample included 200 enterprises in La Libertad with a median of 4 workers (IQR: 2–7) and 25.3 months of operation (SD: 12.1). Fifty-six percent reported formal status and 44% inform. Sectors: food and beverages 40%, retail 37%, and services 23%. By province: Trujillo 62%, Chepén 9%, Virú 8%, Pacasmayo 7%, Ascope 6%, Otuzco 4%, and others 4%. Delivery intensity averaged 38% of sales (SD: 21%), with 1.7 active platforms (SD: 0.8) and 19.6 months of use (SD: 8.4). BMI, digital capabilities, and institutional environment showed averages of 4.8 (SD: 0.9), 4.5 (SD: 1.1), and 4.1 (SD: 1.0), respectively. Average annual growth was 12.4% in sales (SD: 19.3) and +0.9 jobs (SD: 2.2).

Table 4. General and group-specific descriptives.

Variable	Mean/Median (SD/IQR)	n / %
Employees (median, RIC)	4 (2–7)	—
Seniority (months, mean SD)	25.3 (12.1)	—
Delivery sales (%)	38.0 (21.0)	—
Active platforms (n)	1.7 (0.8)	—
Formal status	—	112 (56%)
Informal status	—	88 (44%)
Food and beverages	—	80 (40%)
Retail	—	74 (37%)
Services	—	46 (23%)
Trujillo Province	—	124 (62%)

3.4. Structural Model and Hypothesis Testing

The direct effect of delivery adoption on growth (H1) was positive and significant ($\beta = 0.29$; $t = 4.75$; $p < 0.001$; 95% CI [0.17; 0.41]). The mediation of business model innovation (H2) was corroborated by the effects ADOP \rightarrow BMI ($\beta = 0.48$; $t = 9.12$; $p < 0.001$) and BMI \rightarrow GROWTH ($\beta = 0.22$; $t = 3.15$; $p = 0.002$); the indirect effect ADOP \rightarrow BMI \rightarrow GROWTH was 0.106 (bootstrap 5,000), 95% CI [0.05; 0.17], $p < 0.001$. The moderation of digital capabilities (H3) was significant ($\beta_{interaction} = 0.13$; $t = 2.54$; $p = 0.011$), with a greater slope of ADOP \rightarrow GROWTH at high levels of DIGCAP. For H4, logistic regression with ADOP \times INST interaction showed an increase in the probability of

formalization (OR = 1.68; 95% CI [1.20; 2.41]; $p = 0.003$). The specification and reporting follow good practices of moderation and mediation [29–33].

In substantive terms, these coefficients indicate meaningful effects. The standardized path coefficient of 0.29 (H1) suggests that a one-standard-deviation increase in delivery adoption is associated with approximately 0.3 standard deviations higher growth—a moderate effect aligned with the observed mean sales growth of 12.4%. The mediation analysis reveals that business model innovation accounts for roughly one-third of the total effect of adoption on growth (indirect/total = $0.106/0.396 \approx 27\%$), underscoring that platform adoption without strategic reconfiguration yields limited returns. The moderating effect of digital capabilities ($\beta = 0.13$) implies that firms with high digital literacy experience adoption-to-growth slopes approximately 45% steeper than those with low capabilities. Finally, the odds ratio of 1.68 for formalization indicates that ventures operating under favorable institutional conditions are 68% more likely to formalize when adopting delivery platforms, controlling for adoption intensity and other covariates.

Table 5. Structural equations (PLS-SEM) for GROWTH (bootstrap 5,000).

Hypothesis	Path	β	t	p	95% CI	f ²	Decision
H1	ADOPT → GROWTH	0.29	4.75	<0.001	[0.17; 0.41]	0.18	Accepted
—	ADOP → BMI	0.48	9.12	<0.001	[0.38; 0.57]	0.29	—
—	BMI → GROWTH	0.22	3.15	0.002	[0.08; 0.36]	0.16	—
H2	ADOP → BMI → GROWTH (ind.)	0.106	—	<0.001	[0.05; 0.17]	—	Accepted
H3	ADOP×DIGCAP → GROWTH	0.13	2.54	0.011	[0.03; 0.23]	0.04	Accepted

Table 6. Fit and explanatory power of the PLS model.

SRMR	0.058
d_ULS	0.874
d_G	0.642
NFI	0.93
R ² _BMI	0.42
R ² _GROWTH	0.47
Q ² _BMI	0.26
Q ² _GROWTH	0.31
PLSpredict (Q ² _pred)	> 0

Table 7. Institutional moderation and formalization (logistic regression).

Parameter	OR	95% CI	p
ADOP (main)	1.23	[1.02; 1.49]	0.030
INST (principal)	1.34	[1.11; 1.62]	0.002
ADOP × INST (interaction)	1.68	[1.20; 2.41]	0.003
AUC	0.76	—	—
R ² _Nagelkerke	0.19	—	—
Hosmer–Lemeshow	—	—	0.42

3.5. Complementary Analyses and Robustness

Multigroup analysis by sector, province, and status (formal vs. informal) showed stability of key effects ($|\Delta\beta| < 0.07$). Alternative specifications using OLS with robust errors (HC3) were consistent with PLS-SEM. Out-of-sample prediction showed PLS error metrics lower than the linear benchmark for most indicators. Common method biases were assessed and mitigated with procedural remedies and ex post tests [23,34,35].

4. Discussion

The results show that the adoption of delivery platforms is positively and moderately associated with the growth of startups; furthermore, part of this effect is channeled through business model innovation (BMI), while digital capabilities strengthen this relationship and institutional conditions enhance the probability of formalization. Taken together, these findings answer the research question and validate H1–H4, with a narrative consistent with the post-pandemic context and regional dynamics described in the manuscript.

The positive association between platform adoption and performance is consistent with studies that highlight how SMEs compete through platform capabilities and ambidexterity, expanding their market access [36,37]. Evidence also indicates that digital capabilities enable organizational reconfiguration and the capture of technological complementarities [38,39]. By showing a mediating role of BMI and a moderating effect of digital capabilities, our findings extend that literature by showing that the 'transmission box' between adoption and growth depends on redesigns in value proposition, creation, and capture, as well as on the technological skills base [20,40].

The adoption of delivery reduces search and transaction costs, expands geographic reach, and improves reputational visibility; however, these benefits materialize into sustainable growth when firms reconfigure their model (portfolio/menus, packaging, cycle times, pricing, and in-app promotions), as suggested by the literature on hidden kitchens and on-demand commerce [3,8]. The observed mediation implies that the platform enables, but does not replace, strategic capacity: adoption without BMI produces diminishing returns, while adoption accompanied by BMI activates value capture [20,36].

The moderating effect of digital capabilities reveals complementarity between infrastructure/skills and platform use: when firms possess digital literacy, basic analytics, and online reputation management, the ADOP→GROWTH slope intensifies [30,31]. At the institutional level, finding that better conditions (digital infrastructure, regulatory clarity, and labor frameworks on platforms) increase the likelihood of formalization provides evidence for economies with high informality [41–43].

4.1. Theoretical Contributions

The study contributes to the literature on platform-dependent entrepreneurship by showing, in a subnational and post-pandemic context, that delivery acts as a transactional infrastructure that enables market access, but whose impact on growth depends on internal strategic mechanisms (BMI) and complementary resources (digital capabilities) [2]. Likewise, by documenting that the institutional environment modulates the transition to formality, we connect debates on performance with those on informality and MSME policies in LAC [6,9]. Methodologically, the use of PLS-SEM with discriminant validity (HTMT), predictive relevance (Q^2), and effect sizes aligns with best practices [19,25,28].

4.2. Implications for Economic Development and Public Policy

From an economic and social perspective (SDG 8), promoting the adoption of delivery alongside strengthening digital capabilities and supporting business model innovation can accelerate growth, employment, and formalization. For public policy, this implies prioritizing (i) digital training programs applied to the delivery channel; (ii) assistance in redesigning portfolios and operations (e.g., operational efficiency, delivery times, promotion management); and (iii) improvements in local digital infrastructure and regulatory clarity on platform work [6,9]. The environmental impacts of delivery expansion (packaging waste, emissions) were not measured in this study but represent a critical area for future research and policy attention.

4.3. Comparison with the Local Context

The magnitude of the observed effects is consistent with the backdrop of high mobile Internet penetration and regional productive reactivation, suggesting favorable conditions for scalability via platforms in 2021–2025 [5]. However, high informality and sectoral concentration in trade/services make strategies that combine digital adoption with incentives for formalization and improvements in the environment particularly relevant.

4.4. Limitations

As a cross-sectional study with self-reporting, causal inferences are limited and common method bias may exist despite the remedies applied; the non-probability sample reduces generalization beyond the strata covered. In addition, this study did not measure environmental sustainability indicators; future research should incorporate objective environmental metrics (packaging recyclability, carbon footprint, waste generation) alongside economic and social outcomes to provide comprehensive sustainability assessments.

Longitudinal and quasi-experimental designs are recommended to identify causal effects; field experiments on algorithmic transparency and fees; and interdepartmental comparisons that consider logistical shocks. Future research priorities include: (i) incorporating objective environmental metrics and circularity indicators; (ii) assessing distributional impacts on platform workers, in line with recent labor evidence [9].

Overall, in La Libertad, the adoption of delivery drives the growth of new businesses to the extent that it is accompanied by business model innovation and digital capabilities, within an institutional environment that favors formalization. This framework offers a path for policies and business practices aimed at economic and social sustainability in contexts of high informality.

5. Conclusions

This study analyzed the role of delivery services in the formation and expansion of innovative businesses in La Libertad during the post-pandemic period 2021–2025, contributing region-focused empirical evidence to a debate largely centered on major metropolitan areas. The results show that the adoption of delivery platforms has a positive and statistically significant effect on business growth, confirming the hypothesis that these technologies function as mechanisms that facilitate market access in heterogeneous regional economies.

Nonetheless, the relationship between technological adoption and growth is neither linear nor automatic. Business model innovation emerges as a key mediating mechanism, accounting for roughly one third of the total effect of adoption on performance. These findings underscore that platforms create opportunities but do not substitute for strategic capability. Ventures that reconfigure their value propositions, operations, and value-capture strategies —through adjustments to product portfolios, operational processes, cycle times, and digital promotion schemes—are the ones that translate the delivery channel into sustained increases in sales and employment.

Entrepreneurs' digital capabilities positively moderate this relationship, revealing critical complementarities among technological infrastructure, digital literacy, and effective platform use. Firms with competencies in basic data analysis, online reputation management, and digital tool handling experience amplified effects of adoption on growth, suggesting that the digital divide is a meaningful constraint in the region.

From an institutional perspective, the study documents the influence of the regulatory and infrastructure environment on business formalization. Favorable conditions—improved digital infrastructure, regulatory clarity, and defined labor frameworks for platform work—significantly increase the likelihood of transitioning to formality. This finding is particularly relevant in La Libertad, where 84.4% of MSMEs operate informally, suggesting that the expansion of delivery can catalyze formalization when accompanied by improvements in the institutional environment.

There are direct implications for public policies aimed at economic and social sustainability. Maximizing the potential of delivery as a lever for business development requires multidimensional interventions that go beyond merely promoting technological adoption. Digital training programs should prioritize three competency clusters revealed by our moderation analysis: (i) platform analytics literacy (interpreting delivery metrics, A/B testing promotions); (ii) operational reconfiguration for delivery-first models (menu engineering, packaging logistics, cycle-time optimization); and (iii) multichannel reputation management. Formalization incentives should target the demonstrated mechanism: given that institutional environment quality increases formalization odds by 68%, interventions should combine regulatory simplification with tangible benefits (e.g., preferential credit access conditional on formal status, platform fee subsidies during transition periods). The BMI mediation finding suggests that generic digitalization subsidies are insufficient—support must explicitly fund business model experimentation and professional advisory services for portfolio redesign.

The high sectoral concentration in commerce and services, together with the predominance of microenterprises in the sample, reflects both structural features of the regional business fabric and sector-differentiated adoption dynamics. Innovative formats highlighted in the international literature—such as ghost kitchens and quick commerce—find in La Libertad favorable conditions due to high mobile penetration and economic reactivation, although they face challenges related to informality, training gaps, and precarious platform labor.

Future research should employ longitudinal or quasi-experimental designs to strengthen causal identification, incorporating interdepartmental comparisons that account for logistical shocks and institutional variation. Field experiments on algorithmic transparency, fee structures, and platform governance schemes would yield valuable evidence for sectoral regulation. Priority areas for future research include: (i) the integration of verified environmental sustainability metrics (carbon footprint, packaging lifecycle, waste management) currently absent from this analysis; (ii) longitudinal assessment of distributional impacts on platform workers; and (iii) comparative studies across regions with different regulatory frameworks.

In sum, in the specific context of La Libertad, the adoption of delivery services drives the growth of new businesses when combined with business model innovation and the development of digital capabilities, within an institutional environment that promotes formalization. This analytical framework offers a grounded roadmap for public policy and business practice geared toward economic and social sustainability in regional contexts characterized by high informality, sectoral concentration, and digital divides, contributing specifically to Sustainable Development Goal 8 (decent work and economic growth) while recognizing that comprehensive sustainability assessment requires the integration of environmental dimensions in future research.

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