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Hardware Over Human Capital? Smartphone Access, Generative AI and Early-Stage Entrepreneurship in Latin America

¿El hardware por encima del capital humano? Acceso mediante teléfonos inteligentes, IA generativa y emprendimiento inicial en América Latina

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Abstract

The public release of ChatGPT in late 2022 put advanced AI (Artificial Intelligence) in the hands of anyone with internet access. Using Latinobarómetro survey data from 2020 and 2023 (N = 38,106 across 17 countries), how this generative AI shock affected nascent entrepreneurship is examined, measured via Total Entrepreneurial Activity (TEA). A country-year difference-in-differences analysis shows that higher education in 2023 had no significant effect relative to less-educated peers, indicating little measurable impact beyond 2020 expectations. In contrast, adults with smartphones had a 6.1 percentage-point increase in TEA compared to non-owners (p = 0.001). These findings are robust to clustered wild-bootstrap tests. Results suggest that immediate entrepreneurial gains from generative AI favor those with physical access to technology.

Resumen

El lanzamiento público de ChatGPT a finales de 2022 puso capacidades avanzadas de inteligencia artificial al alcance de cualquier persona. Utilizando datos de Latinobarómetro 2020 y 2023 (N = 38,106 para 17 países), analizamos cómo este avance impactó el emprendimiento en ciernes, medido a través de la Actividad Emprendedora Total (TEA). Los resultados muestran que la educación superior no tuvo un efecto significativo sobre la TEA en 2023 respecto a 2020, mientras que los adultos con teléfono inteligente aumentaron su actividad emprendedora en 6.1 puntos porcentuales (p = 0.001). Estas estimaciones son robustas frente a pruebas de inferencia agrupadas, lo cual sugiere que el acceso a la tecnología potencia el emprendimiento basado en IA, permitiendo que la innovación se desarrolle con rapidez y ampliando las capacidades aportadas por el capital humano formal.

KEYWORDS / PALABRAS CLAVE

Artificial Intelligence, digital divide, total entrepreneurial activity, Latin America; smartphone access / Inteligencia artificial, actividad empresarial total; brecha digital; América Latina, acceso mediante teléfonos inteligentes.

JEL Classification / Clasificación JEL: *M13 O33; L26, O54.*

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1. Introduction

In December 2022, OpenAI released ChatGPT, placing frontier-level artificial-intelligence capabilities in the hands of anyone with an internet connection. Within two months, the tool surpassed 100 million users—faster uptake than any previous consumer technology—allowing individuals to automate copywriting, market research, coding snippets, and customer support without specialized skills or capital. Such a sudden, zero-price shock to cognitive production tools could, in principle, lower the barriers to starting a business, especially in middle-income regions where formal support for entrepreneurship is patchy (Farrell et al., 2024). Yet access to these benefits is conditional: a would-be founder must possess an internet-enabled device and sufficient digital literacy to exploit the tool. Whether the new technology amplifies existing human capital advantages or instead redistributes opportunities toward those with simple hardware access is therefore an empirical question; one that Latin America's heterogeneous landscape of education attainment and smartphone penetration is uniquely suited to answer.

Classic theories of entrepreneurship posit that formal education and managerial skills increase the likelihood of venture creation (Lazear, 2005; Parker, 2018) and enhance entrepreneurial survival and performance (Van Der Sluis et al., 2008; Bates, 1990; Unger et al., 2011). Digital-divide scholarship, however, stresses physical access to technology as one of the binding constraints on ameliorating deployment costs for new and established businesses (OECD, 2021). Which channel dominates in the wake of a radically accessible AI (artificial intelligence) tool: the human-capital ladder or the hardware step?

Smartphone ownership in Latin America is increasingly the most important channel for accessing AI, as mobile devices are the primary gateway to the internet for much of the population. With limited access to desktop computers and inconsistent broadband infrastructure in many areas, smartphones offer an affordable and accessible way to connect to AI-powered tools. Despite substantial socioeconomic inequalities, Latinobarómetro survey data (Corporación Latinobarómetro, 2020, 2023) with 1200 observations per country show a significant overall increase in smartphone penetration in Latin America in 2023 compared to 2020 (see Table 1).

Table 1. Smartphone Penetration Rates. Percentage (%) of Smartphone Owners

	2020	2023	Change
Argentina	69.5	95.1	25.6
Bolivia	25.1	92.1	67.0
Brazil	53.6	90.9	37.3
Chile	67.5	98.3	30.8
Colombia	47.8	89.8	42.0
Costa Rica	48.1	79.6	31.5
Dominican Republic	37.4	76.2	38.8
Ecuador	35.8	92.4	56.6
El Salvador	39.8	70.1	30.3
Guatemala	32.3	70.2	37.9
Honduras	40.8	69.8	29.0
Mexico	54.2	88.3	34.1
Panama	39.1	75.5	36.4
Paraguay	45.0	95.7	50.7
Peru	40.2	85.5	45.3
Uruguay	51.8	96.0	44.3
Venezuela	57.3	80.1	22.8
Average	46.2	85.0	38.8
Median	45.0	88.3	37.3

Source: Corporación Latinobarómetro 2020, 2023.

From 2020 to 2023, high-income countries (Chile, Panama, and Uruguay) show an average increase of 37 pp (percentage points); low-income countries (Bolivia and Honduras) show an average increase of 48 pp; and the remaining middle-income countries show an average increase of 37 pp.* The overall sample average penetration rate of 85% for 2023 is consistent with the data for the smartphone penetration rate for Latin America provided by Slotta (2024), based on information from the Statista database, which claims that there were 600 million smartphone subscriptions in 2023 forecasted to grow to 700 million in 2029, jumping from a penetration rate

* Based on the World Bank Country Classification by Income Level (Metreau et al., 2024).

of 80% in 2023, to over 90% in 2030. This paper seeks to address three central questions: first, did the emergence of ChatGPT in 2023 have a differential impact on early-stage entrepreneurship among adults with varying levels of education? Second, does direct smartphone access moderate this effect? Third, is any observed education gap further influenced by national AI-readiness capacities?

The structure of the paper is as follows. Section two introduces the theoretical framework underpinning our analysis. Section three reviews existing literature on AI adoption and digital divides, highlighting key insights and gaps. Section four describes the data sources and the construction of key variables. Section five outlines the identification strategy employed to establish statistical associations among variables. Section six presents the empirical results and discusses its implications for entrepreneurship and education policy. Section seven provides descriptive statistics that contextualize our findings. Building on these insights, section eight offers policy recommendations to enhance equitable access to AI-driven opportunities. Section nine concludes the paper, and Section ten discusses its limitations and suggests directions for future research.

2. Theoretical Framework

The relationship between emerging technologies and entrepreneurial intentions builds on long-standing cognitive and behavioral theories. Still, recent scholarship highlights the accelerating role of AI in shaping entrepreneurial cognition. The Theory of Planned Behavior (Ajzen, 1991) remains foundational for explaining entrepreneurial intentions. Yet, contemporary research shows that digital tools significantly expand perceived behavioral control and reduce informational uncertainty. Recent work by Dwivedi et al. (2023) on the implications of generative AI demonstrates how tools such as ChatGPT can enhance individuals' capacity to perceive by providing instant access to knowledge and decision support. Similarly, studies on AI-driven human capital (e.g., Xu et al., 2018) argue that algorithmic assistance functions as a complement, or partial substitute, for formal training. In this sense, smartphone-enabled AI access can strengthen the cognitive antecedents of entrepreneurial intention by supplying real-time expertise typically acquired through structured entrepreneurial education.

Recent developments in digital entrepreneurship theory further emphasize how mobile and AI technologies reshape opportunity development and early-stage

venture formation. Nambisan et al. (2019) and Von Briel et al. (2018) argue that digital technologies lower experimentation costs and increase the accessibility of entrepreneurial resources, especially for nascent entrepreneurs with limited formal training.

AI-integrated entrepreneurial cognition also aligns closely with contemporary extensions of classical theories of decision-making under uncertainty. Effectuation theory (Sarasvathy, 2001) explains how entrepreneurs leverage the means at hand, their skills, networks, and available resources, and take action without needing a predetermined goal. Entrepreneurs create value by iterative experimentation rather than from fixed planning. Under this framework, recent scholarship has begun to extend Sarasvathy's effectuation theory by arguing that AI tools significantly enrich entrepreneurs' "means", the foundational resources in effectual logic, through the provision of synthesized insights, scenario simulations, and decision guidance. For instance, in a conceptual paper, Sathiswaran et al. (2023) propose a framework combining AI (e.g., machine learning and natural language processing) with effectuation, showing how AI enables entrepreneurs to analyze large datasets, detect trends, and iteratively test market strategies under uncertainty.

Meanwhile, Saura and Bužinskienė (2025) show that positive correlations between innovation, market dynamics, and risk management emphasize AI's potential to enhance entrepreneurial decision-making and market adaptability.

Furthermore, the AI-Enabled Individual Entrepreneurship Theory (AIET), recently articulated by Ganuthula (2025), argues that artificial intelligence fundamentally transforms solo entrepreneurship by amplifying individual capabilities, lowering capital barriers, and mitigating risks through three interconnected mechanisms: skill augmentation, capital structure transformation, and risk profile modification. By integrating knowledge-based and resource-based perspectives, the AIET suggests that individual entrepreneurs can now scale and sustain ventures in ways previously reserved for larger organizations. The theory also emphasizes sustainability, aligning with global development goals, such as economic inclusion and resource efficiency, while noting ethical challenges (e.g., algorithmic bias) and the need for equitable access to AI across regions. Together, these modern analyses suggest that AI tools serve as augmentative tools, enabling entrepreneurs to follow effectual principles more effectively by providing synthetic knowledge, simulated pathways, and real-time decision heuristics.

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3. Literature Review

3.1 Productivity and Firm Dynamics

Early empirical work on artificial intelligence focused on frontier firms in advanced economies and consistently linked AI adoption to productivity gains. Using data from 5179 customer support agents working for a Fortune 500 software firm, Brynjolfsson et al. (2023) show that a large language model tool for customer service scripting increased call center productivity by 14 percentage points and narrowed the performance gap between novice and experienced workers. Agrawal et al. (2023) predict a broad reconfiguration of business models, framing AI as a contributor to the sharp decline in the cost of future business prediction. Czarnitzki et al. (2023) use firm-level panel data from a sample of German manufacturers and find that the adoption of AI technologies has a positive and significant impact on firm productivity. It shows that both the use of AI and the intensity with which firms exploit its potential significantly increase sales and value-added. At the macro-country level, Zhai and Liu (2023) show a positive correlation between national AI-related R&D investment, patent intensity, and multi-factor productivity growth.

3.2 The Digital Divide: Hardware versus Skills

At a first level, "digital divide" refers to the gap between demographics and regions with access to modern digital ICT (information and communication technology) and backbone infrastructure and those without it, or with limited access (Hynes, 2021). Gomes and Lopes (2022) examine the direct influence of ICTs on entrepreneurial activity across 37 OECD (Organisation for Economic Co-operation and Development) countries within the context of open innovation networks. They find that access to mobile cellular telephones has the strongest influence on the rate of new firm creation, followed by fixed broadband and internet access. A review of G20 members concludes that hardware subsidies remain a prerequisite for inclusive digital transformation (OECD, 2021). On the second and third levels, the digital divide emphasizes that access to hardware may not automatically lead to the use of such technology, unless the gaps in digital skills and meaningful gaps are narrowed (Van Dijk, 2006). Herrera et al. (2025) highlight that, beyond physical access, significant gaps persist in the competencies needed to leverage digital tools; they urge investment in education from early childhood onward to support inclusive development.

3.3 ICT and Entrepreneurship in Emerging Markets.

ICT access generally encourages new firm formation by lowering entry costs and expanding market reach. A comparative study of 59 developing, emerging, and developed economies finds that higher ICT penetration is consistently associated with larger entrepreneurial populations, underscoring the universal role of digital infrastructure in fostering new-firm creation (Afawubo & Noglo, 2022). The adoption of QR-code–based mobile money platforms significantly improves sales growth and overall performance among small and medium enterprises (SMEs) in developing countries, underscoring the pivotal role of digital payments in entrepreneurial outcomes (Ledi et al., 2023). Complementary evidence from 14 African economies shows that access to traditional financial services, particularly bank capital, combined with the availability of mobile money, leads to productivity improvements for SMEs (Konte & Tetteh, 2023). Soluk et al. (2021) present survey data from 1000 entrepreneurs in rural India that confirm that the adoption of digital technologies, such as smartphone applications, strengthens family and community support and thus fosters entrepreneurship in an ecosystem with weak formal institutions.

3.4 AI Readiness

The term AI readiness refers to a government's capacity across strategy, regulation, capacity, infrastructure, data, and human capital to safely and effectively adopt AI in public services (Oxford Insights, 2024). Several alternative indexes are found in the literature: *1)* The 2024 Oxford Insights Government AI Readiness Index (Oxford Insights, 2024), which aggregates 40 indicators for 188 countries covering vision, governance, digital infrastructure, and human resources. At its core, the index answers the question of how ready governments are to implement AI in the delivery of public services. *2)* The 2024 Stanford University Institute for Human-Centered AI Index Report (Maslej et al., 2023) is designed to track, analyze, and illustrate the global development and impact of AI in both public and private sectors. Similarly, the index tracks policymakers' interest in AI, as measured by the legislative records of 127 countries, showing that the number of bills containing "artificial intelligence" that were passed into law grew from just 1 in 2016 to 37 in 2022. Finally, 3) Cazzaniga et al. (2024) present a description and methodology of the International Monetary Fund (IMF) AI Preparedness Index, which assesses the level of AI preparedness across 174 countries, based on a set of macro-structural indicators that cover the countries' digital infrastructure, human capital and labor market policies, innovation and economic integration, and regulation and ethics.

3.5 Smartphone Ownership, Connectivity, and the Use of Digital Technologies

Empirical evidence indicates that smartphone ownership is consistently linked with greater engagement in digital technologies and services, supporting its use as a proxy for potential GenAI access. Smartphone owners tend to exhibit higher rates of internet use, digital information seeking, and markers of digital literacy than non-owners, demonstrating that ownership correlates with broader digital engagement rather than mere device possession (Oshima et al., 2021). Widespread mobile internet access and social media engagement, used by over two-thirds of the global population, facilitate rapid information acquisition, networking, and opportunity recognition, positioning mobile-connected individuals to participate more readily in early-stage entrepreneurial activity (Kemp, 2025). Complementing this evidence, the 2025 U.S. adult broadband and smartphone usage survey conducted by the Pew Research Center reports that 91% of surveyed adults own a smartphone, with 84% of them indicating no broadband use at home, implying that their connectivity to the internet and its applications occurs primarily through smartphone use (Pew Research Center, 2025).

Additionally, research in clinical and behavioral settings shows that smartphone ownership is associated with greater use and interest in mobile applications, indicating that owners are more likely to engage with software tools on their devices (Hsu et al., 2022).

A survey of 203 medical students in Nigeria found that all respondents owned a smartphone and that a large majority reported active use of generative AI tools such as ChatGPT and Gemini on those devices, supporting the notion that smartphone ownership correlates with generative AI engagement (Odelami et al., 2025). Though further academic evidence of the direct link between smartphone ownership and generative AI use is difficult to find, what does exists is evidence from consumer surveys indicating that a substantial proportion of individuals who are aware of generative AI access it directly via their smartphones, with around 70–73% of generative AI aware users reporting GenAI (generative artificial intelligence) use on their phone (Counterpoint Research, 2024), and up to 90% of U.S. adults reporting some form of AI usage on their phones (Talker Research, 2026)

Collectively, these studies support the position that smartphone ownership reflects not just hardware possession but meaningful digital connectivity and usage patterns that increase the likelihood of encountering and using advanced digital tools such as GenAI applications.

3.6 Technology and Higher Education as Determinants of Total Entrepreneurial Activity (TEA)

TEA measures the share of individuals who are actively starting or running a venture that is less than 42 months old (GEM, 2025). The Global Entrepreneurship Monitor (GEM) 2024 Adult Population Survey asks the question: "How important do you anticipate artificial intelligence tools will be for implementing your business model and strategy in the next three years?" (GEM, 2025, p. 76) The respondents' answers are presented in Table 2 (see Table 2).

Table 2. Percentage (%) of Surveyed Early-Stage Entrepreneurs Who Consider AI Important for Business Implementation

Country	Argentina	Brazil	Costa Rica	Chile	Ecuador	Mexico	Venezuela
%	38	21	42	53	33	29	45

Source: GEM (2025, p. 77).

Note: Only these Latin American countries are included in the survey.

Low response rates (below 50%) may be attributable to entrepreneurs not considering tools they don't know about.** Raising awareness and then training to develop digital marketing skills could be crucial to the success of the new business (GEM, 2025).

Other studies highlight the greater importance of AI tools for the creation of new businesses. Giuggioli and Pellegrini (2023) systematically reviewed 60 studies on the link between AI and entrepreneurship. Their main finding is that AI has profound implications for entrepreneurship, affecting entrepreneurs in four ways: through opportunity recognition, decision-making, performance, and education and research. Moreover, in a study of 100 startups, Weber et al. (2021) observe the rapid emergence of startups that incorporate AI into their products or services, with AI fostering novel business models. Using a sample of 58 countries from the GEM database, including both developed and developing countries, Alderete (2017) shows that greater mobile-broadband penetration is strongly associated with higher TEA rates. Overall, the surveyed studies provide favorable evidence that technology, using AI and greater mobile broadband, has a positive effect on new business creation.

** The GEM Report stresses that the emerging nature of AI means that a significant number of respondents chose to reply "Don't know" rather than an importance level (GEM, 2025).

Regarding higher education as an entrepreneurial enabler, empirical evidence is mixed. On the one hand, Jiménez et al. (2015) show that tertiary education increases formal entrepreneurship by fostering higher self-confidence, lower perceived risk, and enhanced human capital. Lechuga et al. (2022) present a study based on data from 212 universities participating in the 2016 edition of the Global University Entrepreneurial Spirit Students' Survey (GUESSS), highlighting that university entrepreneurship education positively impacts entrepreneurial behavior and enhances future entrepreneurs' ability to identify opportunities. The Global Entrepreneurship Monitor (GEM) literature typically reports a positive education premium in opportunity-driven Total Entrepreneurial Activity (TEA) for Ibero-America (González-Ramos et al*.,* 2025; GEM, 2020).

Alternatively, Maharama and Chaudhury (2022) provide evidence that higher education is not necessarily positively correlated with entrepreneurship intentions. In their study, based on a sample of 485 students from private and public universities in India, they find that Business Management and Commerce students have a greater inclination toward entrepreneurship than students in professional streams such as law, pharmacy, engineering, etc. Moreover, Habivov et al. (2016), using a cross-sectional sample of 29 transitional economies, find that university education reduces the likelihood of being self-employed.***

In summary, both higher education and technology play important roles in shaping total early-stage entrepreneurial activity (TEA), but they operate at different temporal speeds. Tertiary education builds entrepreneurial capacity gradually through structured learning, skill development, and experience accumulation. In contrast, AI-driven tools such as ChatGPT provide immediate access to synthesized knowledge, real-time data interpretation, and decision support. This difference in speed offers distinct advantages: higher education supports deep cognitive development over time, while AI enables rapid access to and processing of information, reducing uncertainty and lowering entry barriers in fast-moving markets. As a result, the immediacy, adaptability, and data-driven nature of AI may exert a stronger influence on short-term entrepreneurial decisions, particularly those concerning whether to initiate or delay a new business venture.

*** A transition economy refers to countries transitioning from a centrally planned economic system to a free market economy.

3.7 Hypotheses to Be Tested

Based on the theoretical framework and literature review presented above, two hypotheses are derived for empirical testing:

- H1: (No higher-education advantage). The 2023 GenAI shock tempered the TEA advantage traditionally enjoyed by highly educated adults, as connectivity and applications, including AI tools, increasingly exert greater influence.
- H2: (Hardware and connectivity premium emergence). The same shock disproportionately increased TEA among smartphone owners, because on-device access is a binding constraint on connectivity and GenAI use.

4. Data Sources

We use the Latinobarómetro individual surveys for 2020 and 2023, the most recent pre- and post-ChatGPT surveys that include the Entrepreneurship & New Technologies battery (Corporación Latinobarómetro, 2020, 2023).

Latinobarómetro is an annual cross-national survey that tracks public opinion, social conditions, and economic behavior across Latin America. Since 1995, the Chile-based Latinobarómetro Corporation has commissioned local polling firms in each participating country to interview a nationally representative sample of about 1000 adults (18+) using a common questionnaire. Stratified multistage sampling and post-stratification weights ensure results mirror each country's census profile for region, urban–rural status, gender, and age.

The instrument covers more than 100 items, including politics, trust, well-being, employment, and digital technology, allowing researchers to observe regional trends and make country-to-country comparisons over time. Fieldwork is usually conducted between September and December, with response rates that exceed 65%. Microdata and documentation are released each year in SPSS/CSV formats, making Latinobarómetro one of the few open, harmonized data sources suitable for repeated cross-sectional analyses of Latin-American societies using the quasi-experimental method of difference-in-differences regression.

The sample used in this study comprises 17 Latin American economies: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador,

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Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, El Salvador, Uruguay, and Venezuela. The pooled dataset contains 38,106 respondents. All analyses apply Latinobarómetro's post-stratification WT (weight) to project micro-observations to national adult populations. The key variables are presented in Table 3 (see Table 3).

Table 3. Key Variables in the Model

Construct	Latinobarómetro Item (S)	Coding
Early-Stage Entrepreneurship (TEA)	S24.A Self-employed OR S25 Business owner / Informal self-employed	TEA_i = 1 if either; else 0.
Post-ChatGPT indicator (post-2023)	Survey year	1 for 2023, 0 for 2020.
Education treatment (HighEduc)	1 7-point ladder	1 = post-secondary or higher (Codes 5–7).
Digital-access proxy (smartphone)	S26.L / S20.D Owns smartphone with internet	1 = Yes, 0 = No.
Controls	AGE, SEX	Mitigate demographic heterogeneity. 2= female.

Source: Corporación Latinobarómetro, 2020, 2023.

5. Identification Strategy

The empirical testing of the previously mentioned hypotheses is carried out by estimating the following two difference-in-differences (DID) equations, which use repeated cross-sectional data to compare the change in outcomes over time between a treatment group and a control group.

Higher education as the treatment variable (1)

Smartphone penetration as the treatment variable (2)

Where age, gender, higher education, and smartphone ownership are included, and country and year are fixed effects. In equation (1), the coefficient measures the extra 2023 change for highly educated adults relative to less-educated peers within the same country, and for equation (2), the coefficient measures the extra 2023 change for smartphone owners relative to non-owners.

Given that in equations (1) and (2) the dependent variable is binary, the regressions become linear probability models. The conditional expectation of Y_{ict} given X_{ict}, $E(Y_{ict}|X_{ict})$, can be interpreted as the conditional probability that the event will occur given X_{ict}, that is $P_r(Y_{ict}=1|X_{ict})$. Thus, the regressions $E(Y_{ict}|X_{ict})$ represent the probability that an individual engages in early-stage entrepreneurship, conditional on possessing higher education in equation (1) and smartphone ownership in equation (2).****

The functional equation to be estimated for higher education:

The functional equation to be estimated for smartphone ownership:

5.1 Estimation Details

- Estimator: Linear-probability models. Fixed-Effects Ordinary Least Squares (FEOLS).*****
- Fixed effects: Country dummies and year capture unobserved heterogeneity and common shocks.
- Age and sex, which act as cofounders, are included as control variables in both regression equations.
- Standard errors: Clustered by country (17 clusters); inference via wild-cluster bootstrap (R fwildclusterboot, 9999, Rademacher draws).
- Missing data: Complete-case estimation retains all 38,106 observations.
- Weights: All regressions use WT; unweighted results are qualitatively identical.

6. Empirical Results

**** In equation (2), $(Y_{ict}|X_{ict})$ represents the probability of an individual engaging in early-stage entrepreneurship conditional on owning a smartphone compared with the control group with individuals not owning a smartphone.

***** When including fixed effects on the righthand side of a FEOLS model, the R package applies a within transformation: it demeans every variable by its country average and, in a second step, by its year average. After this double demeaning, the grand mean of the dependent variable is zero, so an explicit intercept would be perfectly collinear with the fixed-effect dummies. Therefore, a FEOLS model drops the constant automatically.

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The empirical results of this study suggest that immediate entrepreneurial gains from generative AI favor those with physical access to technology. These results can be seen in Tables 4 and 5, prepared by the authors (see Table 4 and Table 5).

Table 4. Higher Education as the Treatment Variable

Predictor	**Coefficient**	**Std. Error**	**T value**	**Pr(>t)**
Higher Education	-0.009097	0.010919	-0.833147	4.1703e-01
Post-2023*Higher Education	-0.026469	0.012910	-2.050324	5.7088e-02
Control variables				
Age	0.000117	0.000468	0.249788	8.0593e-01
Sex	-0.171933	0.015245	-11.277991	5.0283e-09 ***
Smartphone	0.014763	0.014171	1.041752	3.1301e-01
Significance codes: *** = 0; ** = 0.01; * = 0.05				
R^2 = 0.073752; observations: 38,106; bootstrapping samples = 9,999; confidence interval for Post2023*smartphone coefficient: (-0.0548 , 0), with value = 0.0511 and t statistic = -2.054				

Source: Prepared by the authors using model estimates.

Table 5. Smartphone Ownership as Treatment Variable

Predictor	**Estimate**	**Std. Error**	**T value**	**Pr(>t)**
Smartphone	0.000123	0.015323	0.008008	9.9371e-01
Post2023*smartphone	0.061887	.015633	3.958754	1.1256e-03 **
Control variables				
Age	0.000131	0.000465	0.281893	7.8164e-01
Sex	-0.172265	0.015144	-11.374862	4.4486e-09 ***
Higher Education	-0.22917	0.009286	-2.468008	2.5245e-01
Significance codes: *** = 0; ** = 0.01; * = 0.05				
R^2 = 0.074127; observations: 38,106; bootstrapping samples = 9,999; confidence interval for Post2023*smartphone coefficient: 0.0279 - 0.0959 with value = 0.0016 and t statistic = 3.9589				

Source: Prepared by the authors using model estimates.

Table 4 reports the specification in which the 2023 dummy interacts with the highly educated flag, with controls for age, gender, and smartphone ownership, plus country and fixed effects (see Table 4). Estimated parameters associated with the higher- education variables proved non-significant. In Table 5, we replace higher education with smartphone ownership (see Table 5). Our difference-in-differences estimates show that the 2023 rise in AI had a positive, statistically significant effect on nascent entrepreneurship in Latin America, mainly because people gained greater access to AI tools. Specifically, in the 2020 wave,****** smartphone owners and non-owners were almost equally likely to be early-stage entrepreneurs. That is, before ChatGPT, merely owning a smartphone did not make someone more (or less) likely to start a business. The coefficient labelled smartphone equals +0.0001 ≈ 0 pp and is not statistically different from zero ($p = 0.99$).

In the 2023 wave, individuals who own a smartphone are about 6.2 percentage points more likely to be in early-stage entrepreneurship in 2023 than non-owners (interaction = 0.0619, wild-cluster = 0.0016). These patterns are consistent with a mechanism in which AI's early, widely adopted uses: idea testing, marketing content, translation, customer messaging, and low-code prototyping are mobile-first and therefore mediated by device access rather than formal schooling, thus eroding the traditional education premium. In other words, when AI lowers the fixed costs of entry tasks, everyday capability and connectivity dominate as the immediate bottlenecks at the startup margin, while the comparative advantage of formal education may shift toward later growth or wage employment within firms.

Policy follows naturally: expanding affordable access to smartphones and data plans, and providing hands-on training in AI-enabled mobile workflows are likely to raise TEA in the near term. Fostering access to smartphones as an end-user device to connect with the communications network is consistent with the following OECD (2021) recommendations:

> To help close digital divides, people need access to *high-quality* communication networks and services at competitive prices, regardless of where they live [...] Policies and regulations that foster competition, promote investment in fixed and mobile networks, and reduce barriers to infrastructure deployment have been extremely effective in boosting connectivity in G20 countries... (OECD, 2021, p. 27)

****** A wave is one iteration of a survey conducted at a particular time. Many large datasets are collected repeatedly (every year, every few years, etc.), and each round is called a wave.

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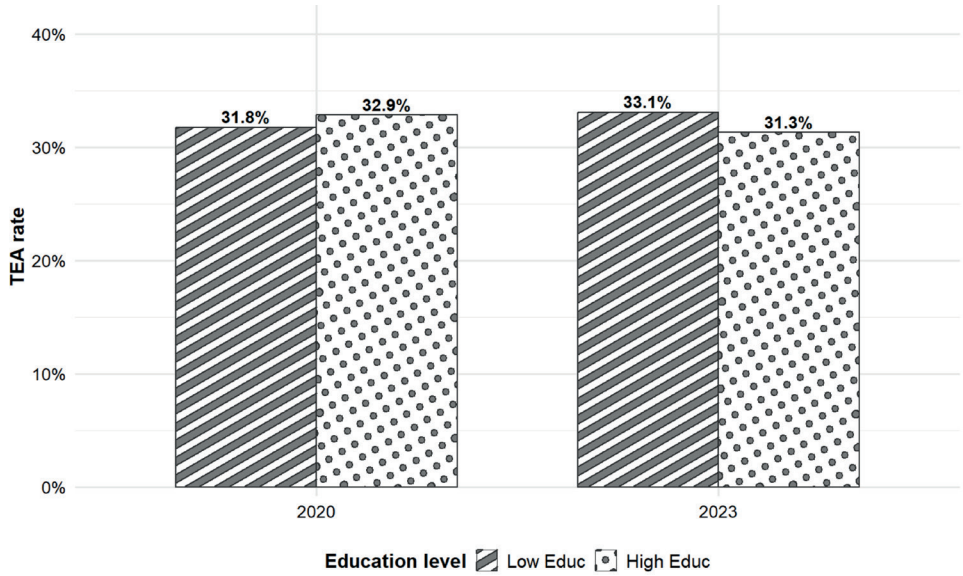
7. Descriptive Patterns of Survey Data

The sign and relative importance of the estimated interaction parameters can be assessed on a one-to-one basis against the descriptive behavior of higher education and smartphone ownership among early-stage entrepreneurs. Survey data show that the raw gap between education groups flipped sign from 2020 to 2023: Figure 1 shows that among low-educated adults, TEA rose from 31.8 % to 33.1 %, whereas among highly educated adults it fell from 32.9 % to 31.3 % (see Figure 1).

Figure 1. Early-Stage Entrepreneurship by Education, 2020 vs. 2023

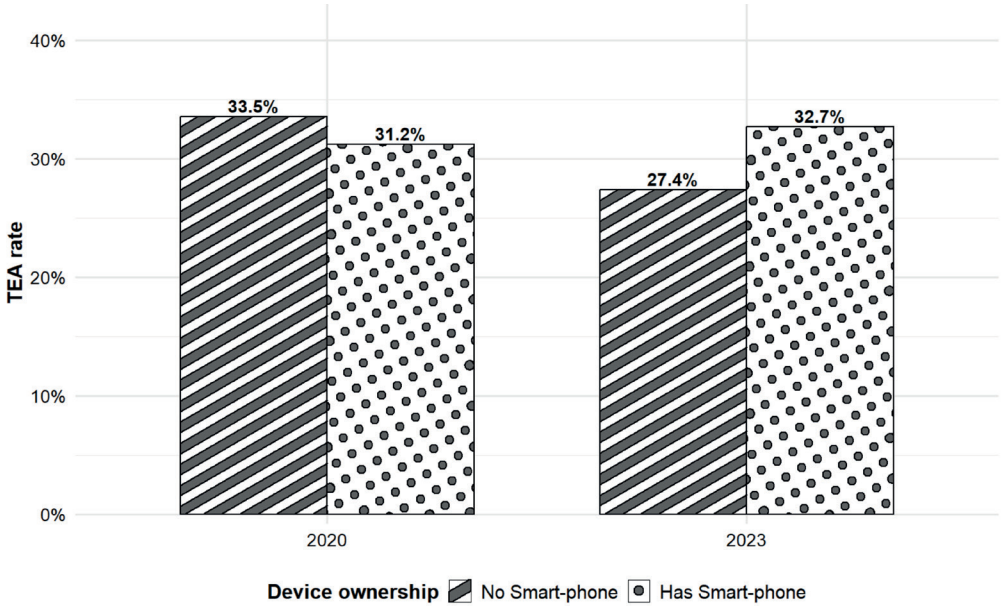


Source: Corporación Latinobarómetro 2020, 2023.

The negative, non-significant education interaction coefficient is consistent with early diffusion of GenAI, which lowers entry barriers, thereby pulling marginally qualified individuals into nascent entrepreneurship and illustrating the post-ChatGPT shift in the traditional education premium.

In contrast, Figure 2 shows that among the TEA group, smartphone owners climbed from 31.2 % to 32.7 %, while non-owners dropped sharply (33.5 % → 27.4 %) (see Figure 2).

Figure 2. Early-Stage Entrepreneurship by Smartphone Access



Source: Corporación Latinobarómetro 2020, 2023.

Conversely, the strong positive smartphone interaction underscores a new "hardware divide": only those with on-device access to generative AI tools appear able to capitalize quickly on the new technology. Thus, the data highlights the lower importance of higher education as a TEA enabler, while smartphone ownership is more important, demonstrating consistency between model estimates and raw data behavior. These contrasts motivate the formal difference-in-differences test that follows (see Figure 3).

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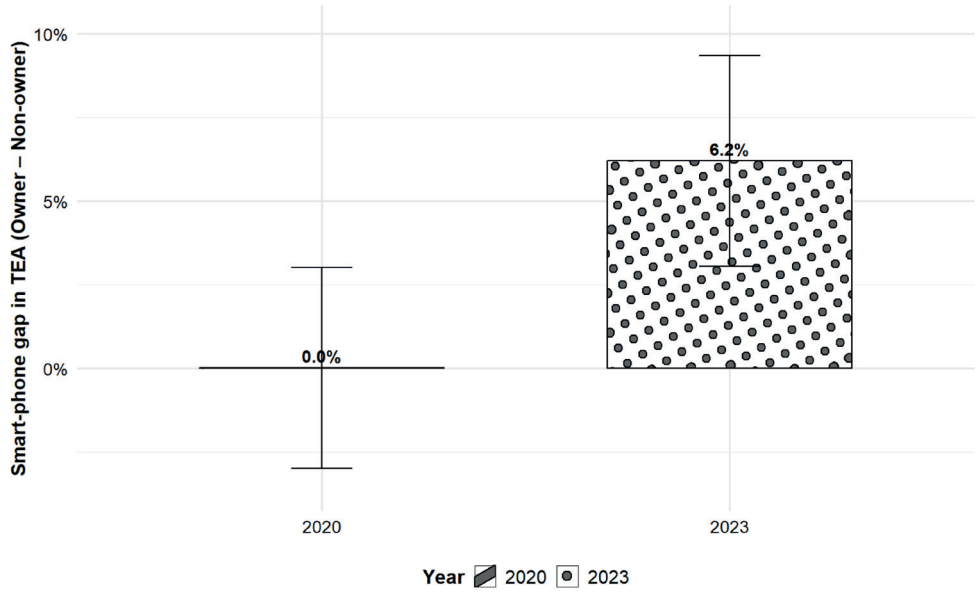
Figure 3. Smartphone Ownership Gap in Early-Stage Entrepreneurship, 2020 vs. 2023



Source: Prepared by the authors using model estimates.

Error bars show the difference in predicted TEA rates between smartphone owners and non-owners. In 2020, the gap is negligible (0 pp); by 2023, it widens to +6.2 pp. Whiskers denote 95 % clustered confidence intervals, highlighting a significant post-ChatGPT "hardware premium."*******

8. Discussion and Policy Recommendations

Our baseline difference-in-differences results support H1 (no higher-education advantage). The estimates suggest no detectable higher-education advantage as an entrepreneurial enabler across the 17 Latin American countries comprising the

******* Non-overlapping error bars suggest a statistically significant difference between the control and treatment groups at $p < 0.05$. This suggests that the impact of AI via mobile smartphone connectivity is unlikely to be due solely to random chance.

sample database. In both datasets (2020 and 2023), the higher-education variables and the 2023 interactive variable were not significant at the $p < 0.05$ threshold. This finding is consistent with the hypothesis that the 2023 GenAI shock tempered the TEA advantage traditionally enjoyed by highly educated adults, as connectivity and applications, including AI tools, increasingly exert a stronger influence on entrepreneurial activity.

Three plausible explanations might tentatively explain this result. First, in Latin America, dropout rates are high, and completion rates are low in secondary education. In 2023, on average, 35% of young people aged 21–23 had not completed secondary school (Arias Ortiz et al., 2024). On the other hand, the region's youth have low levels of foundational learning: in reading and science, more than half of the region's 15-year-olds do not meet the minimum competency level, while in mathematics, the percentage rises to 75% (Arias Ortiz et al., 2023). Second, generative AI automates cognitively intensive but generic startup tasks, drafting copy, writing code snippets, and conducting market scans, thereby compressing the advantage previously enjoyed by the well-schooled. Third, in the AI Era, highly educated workers often have attractive salaried alternatives in formal labor markets while robots are increasingly replacing middle-skilled workers, many of whom must turn to entrepreneurship for survival (Fierro et al., 2022). Together, these factors help explain why the traditional human-capital advantage associated with tertiary education appears attenuated in the presence of rapidly diffusing AI-enabled tools, in line with H1.

In contrast, our results provide strong support for H2 (the emergence of a hardware and connectivity premium). Regarding smartphone ownership, the estimates for equation (2) presented in Table 5 reveal the flip side of the education result: smartphone owners experienced a 6.1-percentage-point increase in TEA relative to non-owners (see Table 5). This finding is consistent with the hypothesis that the GenAI shock disproportionately increased TEA among smartphone owners, because on-device access represents a binding constraint on connectivity and the effective use of generative AI tools.

This result suggests that physical access to AI-capable devices is becoming an increasingly salient determinant of new business creation. Cao and Bhatia (2025) show that generative AI significantly reduces the time and cost of launching digital ventures, leading to a disproportionate rise in entrepreneurship among founders without formal education or managerial experience. By automating many startup tasks that once required specialized expertise, AI lowers entry barriers and

compresses the advantage traditionally held by highly educated founders, even as technical skill still matters for outcomes like funding.

According to World Bank data, mobile broadband through smartphones is the primary way households access the internet in Latin America and the Caribbean, with fixed connections still far less prevalent (Ibarra et al., 2022). Our finding, therefore, updates classic digital-divide theory: a novel "GenAI hardware divide" has emerged in which device ownership determines who can translate the use of communications technology, including AI tools, into entrepreneurial action. In this sense, the results for H2 complement those for H1: while higher education no longer appears to confer a measurable advantage for entry into entrepreneurship, connectivity and device access increasingly shape who can exploit new AI-enabled opportunities.

The above discussion suggests that subsidized AI-capable handsets and zero-rate data plans can create fast and more inclusive pathways to entrepreneurial opportunity. At the same time, policymakers should avoid framing formal tertiary education and digital technologies as substitutes. While higher education remains a critical foundation for human-capital development, the rapid diffusion of AI-enabled technologies is increasingly shaping entrepreneurial activity. Maximizing entrepreneurial outcomes, therefore, requires an integrated strategy that combines traditional schooling with targeted entrepreneurial education and the effective use of digital technologies.

For scholars, these patterns motivate a refinement of existing theories of entrepreneurial propensity, emphasizing the joint and complementary roles of human capital, entrepreneurial training, and digital infrastructure in enabling the realization of opportunities.

9. Conclusions

This paper exploits the near-simultaneous diffusion of generative artificial intelligence (GenAI) across Latin America to identify its short-run impact on nascent entrepreneurship. Using individual-level microdata for 38,106 adults across 17 countries, we find that smartphone ownership—which, in our review of the literature, was consistently linked to greater engagement with digital technologies, including GenAI—, is becoming an increasingly salient determinant of new business creation in the region. By contrast, higher education shows no detectable advantage as an entrepreneurial enabler in this context. These results highlight a "hardware divide," with a tangible premium associated with smartphone ownership.

The post-2023 decline in early-stage entrepreneurship among highly educated adults, as indicated by descriptive trends in the survey data and the non-significance of the high-education regression coefficients, stands in sharp contrast to the rise in new entrepreneurs who own a smartphone as a mediating device for accessing digital technologies. Regression results show that smartphone owners enjoy a substantial 6 percentage point advantage ($p = 0.001$) in starting new businesses, highlighting the growing importance of physical access to connected hardware. While generative AI (GenAI) promises to democratize knowledge work, our evidence suggests that this potential is contingent on access to devices and connectivity. Policymakers aiming to foster inclusive, AI-driven growth in Latin America should therefore treat smartphone and connectivity expansion not as auxiliary infrastructure programs but as core entrepreneurship policy. Bridging this "Hardware Divide" could unlock a generation of micro-entrepreneurs ready to leverage GenAI's capabilities, thus enhancing the value of general cognitive skills and formal education.

The main contributions of this study are the following:

1. *Empirical novelty*. We deliver data-supported statistical estimates of smartphone ownership as a proxy for GenAI's use and its effect on startup entry in emerging markets.
2. *Conceptual shift*. Results suggest a hardware divide superseding the traditional skills divide during disruptive technological shocks.
3. *Policy relevance*. Device-access interventions (subsidized handsets, data plans) may yield faster, more inclusive entrepreneurial gains than education-only strategies in the GenAI era.

10. Limitations and Future Research

A key limitation of this study is that the difference-in-differences design includes only two time periods, preventing a formal test of the parallel trends assumption necessary for causal inference. As a result, while the public release of ChatGPT is treated as a quasi-exogenous shock, the findings should be interpreted as indicative of associations rather than definitive causal effects. Nevertheless, the analysis provides useful insights into potential impacts of ChatGPT's release and highlights patterns that future research with longer pre- and post-treatment data could examine more rigorously. Despite this limitation, the observed patterns offer meaningful insights and underscore areas for further investigation in future studies.

In addition, two periods constrain pre-trend tests; smartphone ownership is not randomized; and LPM (Linear Probability Model) estimates are linear approximations, but clustered inference, country and year fixed effects, and robustness checks support the core conclusion that, post-2023, hardware access beats formal schooling for getting new ventures off the ground. Future research should test whether this hardware divide also shapes post-entry outcomes such as venture growth, innovation, and survival.

- Short observation window. The study captures entry decisions within the first year of ChatGPT's diffusion; medium-term venture survival remains unknown.
- Self-reported variables. TEA and smartphone ownership rely on survey responses; misclassification is possible, although robustness checks show stable coefficients.
- Unobserved confounders. Other 2023 shocks (inflation, labor-market tightening) could interact with education; future work should test synthetic control or triple-difference designs using additional pre-periods.

Regarding the direction of future research, we believe the following are relevant:

1. Longitudinal survival. Link forthcoming Latinobarómetro or GEM waves to track whether GenAI–induced entrants persist, innovate, and create jobs.
2. Quality of entrepreneurship. Distinguish opportunity- vs. necessity-driven ventures; assess whether GenAI lowers entry barriers mainly for one type.
3. Device heterogeneity. Measure hardware quality (processing power, data limits) and shared device use to refine the narrative on the hardware divide.
4. Global replication. Apply the same DiD design to GEM or Gallup data from Africa and Asia to test external validity.
5. Mechanism tests. Combine survey data with platform analytics (e.g., OpenAI API usage) to directly observe patterns of entrepreneurial GenAI adoption.

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