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Digital Capital as a Microfoundation of Competitiveness in Integrated Border Economies: Evidence from the Laredo–Nuevo Laredo Corridor

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Abstract

This study proposes the concept of digital capital as a structural microfoundation of competitiveness in information-intensive border economies, using the Laredo-Nuevo Laredo corridor as an analytical case. In a context of deep integration, nearshoring, and digitalization of international trade, regional competitiveness depends not only on physical infrastructure, but also on the human-digital capacity to operate highly technical logistics environments. This study develops the digital capital and resilience model in integrated border economies, which states that university digital capital composed of access, connectivity, digital skills, and strategic use of technologies strengthens academic resilience, acting as a transmission mechanism towards the effective accumulation of human capital in information-intensive sectors. An empirical strategy based on a multivariate analysis with a sample of university students from the Mexican side of the corridor is proposed. Data collection for the study is currently underway, so this working paper presents a conceptual and methodological framework under development. The central contribution lies in integrating human capital theory, digital inequality, and applied international economics within the same analytical scheme, relocating the university digital divide as a variable with structural implications for regional competitiveness in highly integrated border economies.

Keywords: Digital capital; academic resilience; regional competitiveness; frontier economies; digital divide; nearshoring; international trade

I. Introduction

The digitalization of international trade has transformed the structural foundations of regional competitiveness into open economies. In highly integrated border corridors, productive efficiency no longer depends exclusively on physical infrastructure, geographical proximity, or logistics costs, but on the ability to operate digital infrastructures that support cross-border coordination, real-time traceability, and regulatory interoperability.

Human capital theory has established that the accumulation of skills and knowledge constitutes a central determinant of productivity and economic growth (Becker 1993; Romer 1990). In the field of international trade, the quality of human capital influences productive specialization and insertion in global value chains (Grossman and Helpman 1991; Helpman 2018). In parallel, the literature on digital inequality has evolved from approaches focused exclusively on access to multidimensional models that distinguish between access, skills, and strategic use (van Dijk 2020).

However, both agendas have remained relatively disconnected in the analysis of trade-intensive border economies. While the international economy examines physical infrastructure, trade flows, and productive integration, the literature on the digital divide has focused predominantly on educational inclusion and social outcomes. There is little research linking the accumulation of university digital capital with the competitive performance of highly digitized border corridors.

This disconnect is particularly relevant in the Laredo–Nuevo Laredo corridor, which accounts for approximately 35% to 40% of overland trade between Mexico and the United States, exceeding \$300 billion

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annually (Bureau of Transportation Statistics 2023). The corridor's sectoral structure dominated by information-intensive manufactured goods requires permanent electronic coordination between companies, logistics operators, and regulatory authorities. In this environment, digitalization is not an operational complement, but a structural condition of contemporary cross-border trade.

The digital transformation of commerce not only modifies logistics processes but also reconfigures the regional occupational structure. The automation of customs procedures, the electronic transmission of documentation, and binational regulatory interoperability demand professional profiles, advanced digital literacy, analytical capacity, and continuous technological adaptation. In this context, university education acquires a strategic role in the accumulation of capacities that will eventually sustain regional competitiveness.

The university digital divide, understood as differences in access, quality of connectivity, and functional digital skills, can generate cumulative effects on academic and professional trajectories. In economies that are highly linked to international trade, these differences acquire implications that transcend the educational field and can have an impact on patterns of labor insertion and occupational segmentation.

This study proposes the **digital capital and resilience in integrated border economies model** which conceptualizes university digital capital as a structural microfoundation of regional competitiveness. The model states that the unequal accumulation of digital capital influences academic resilience and, through it, expectations of labor insertion in sectors intensive in international trade.

The central contribution of the work lies in integrating human capital theory, digital inequality, and applied international economics within the same analytical framework, moving the analysis of the digital divide from the exclusively educational field to the field of regional trade competitiveness. In information-intensive corridors such as Laredo-Nuevo Laredo, understanding the human-digital dimension of competitiveness allows the traditional framework of infrastructure and trade analysis to be broadened, incorporating microstructural capacity building as a strategic determinant of regional development.

This paper develops a conceptual framework and an empirical strategy aimed at evaluating the role of university digital capital as a microfoundation of competitiveness in information-intensive frontier economies. The study is currently in the data collection and processing phase, so the definitive empirical results will be incorporated into a later version.

The contribution of this version lies in the theoretical formulation of the digital capital and resilience model in integrated border economies, as well as in the rigorous methodological specification that will allow the evaluation of the hypotheses raised. The empirical strategy has been designed to ensure econometric consistency, internal validity, and statistical robustness once the fieldwork is completed.

The document should be understood as a research in progress that presents a structured analytical framework, formalized hypotheses, and a sound methodological proposal, which aims to contribute to the debate on regional competitiveness, digitalization, and human capital in highly integrated border corridors.

II. The Laredo–Nuevo Laredo corridor as an information-intensive economy

The Laredo-Nuevo Laredo binational corridor is the main land node of bilateral trade between Mexico and the United States.

From a sectoral perspective, the trade flowing through the corridor is concentrated in information-intensive manufactured goods, including transportation equipment, auto parts, machinery, electrical equipment, and electronics. This pattern is consistent with the vertical specialization documented in global value chains (Hummels, Ishii, and Yi 2001; World Bank 2020), where productive fragmentation requires permanent cross-border coordination and high-precision logistics synchronization.

Beyond the trade volume, the structural relevance of the broker lies in its information-intensive nature. Operational efficiency increasingly depends on electronic document transmission platforms, digitized customs systems, binational regulatory interoperability, and real-time traceability. In this context, digitalization is a structural condition of contemporary trade, not an operational complement.

The recent phenomenon of nearshoring and reconfiguration of value chains in North America (IMF 2023; Alfaro and Chor 2023) has reinforced this dynamic. The relocation of manufacturing to Mexico has

increased pressure on integrated border corridors, increasing demand for efficient digital coordination and reducing margins of tolerance for technological disruptions.

In economic terms, the corridor can be characterized as a highly specialized logistics ecosystem where physical infrastructure, international bridges, highways, and tax yards, interacts with digital infrastructure, electronic platforms, customs management systems, and interoperable databases. The complementarity between both dimensions defines regional competitiveness.

This complementarity implies that technological interruptions, deficiencies in electronic transmission, or insufficient digital training of human capital can translate into significant transaction costs and loss of logistical efficiency. In trade-intensive economies, the human capacity to operate digital systems becomes an essential component of regional operational resilience.

Increasing competition among logistics corridors in North America means that traditional comparative advantages such as geographic location or road connectivity may prove insufficient without a solid foundation of digitally prepared human capital. The competitive sustainability of the corridor, therefore, depends not only on physical infrastructure, but also on the quality of human capital capable of operating highly digitalized logistics environments.

The analysis of university digital capital acquires strategic relevance. If the regional economy is structurally dependent on information-intensive processes, the unequal accumulation of digital skills during higher education could have an impact on patterns of labor insertion and, ultimately, on the competitive performance of the runner.

Although the empirical survey focuses on public universities on the Mexican side of the corridor, the analysis is framed in a functionally binational economy. The Laredo-Nuevo Laredo corridor operates as an integrated system where logistics, customs and production processes depend on permanent cross-border coordination. Human capital trained on the Mexican side participates directly or indirectly in supply chains that interact with companies, operators, and authorities on the U.S. side. In this sense, the accumulation of university digital capital should not be interpreted as a strictly local phenomenon, but as a component of a shared economic architecture whose efficiency depends on human-digital capacities distributed on both sides of the border. This perspective supports the argument that the effects analyzed, although measured within a specific geographic space, have structural implications for the functioning of the binational corridor as a whole.

III. Conceptual framework: Digital capital as soft productive infrastructure

The concept of digital capital (DC) is proposed in this study as a specific extension of human capital applied to information-intensive economies. Unlike approaches that reduce the digital divide to a problem of technological access, digital capital is conceptualized as a multidimensional construct composed of four interrelated dimensions: (1) access to appropriate devices, (2) quality and stability of connectivity, (3) functional digital competencies, and (4) strategic use oriented to academic and professional objectives.

From the theory of human capital (Becker 1993), the skills and knowledge acquired through education and experience increase individual productivity and generate private and social returns. In the context of the digital economy, these skills include technological capabilities that allow them to operate platforms, interpret digital information, and adapt to dynamic technological environments. However, the traditional literature does not explicitly distinguish between general human capital and specific digital capabilities required in trade-intensive economies.

Digital capital, in this framework, constitutes a particular form of human capital complementary to organizational technology and digital infrastructure. From the perspective of endogenous growth (Romer 1990), the accumulation of technological capabilities can generate increasing returns and positive externalities. In integrated border corridors, where electronic coordination is a structural condition of trade, these externalities acquire macroeconomic relevance.

The concept also dialogues with the literature on global value chains (Baldwin 2016; Grossman and Rossi-Hansberg 2008), where productive fragmentation implies a high dependence on the transmission of information in real time. The ability of human capital to operate digitalized environments becomes a determining element of logistics efficiency and regulatory compliance.

In this study, digital capital is also conceptualized as soft productive infrastructure. Traditionally, regional policy has prioritized physical infrastructure as a determinant of competitiveness (Porter 1990). However, in digitalized economies, hard infrastructure needs to be complemented by human capabilities that allow complex electronic systems to operate. Without this complementarity, physical investment does not reach its productive potential.

The notion of soft productive infrastructure expands the traditional approach to regional competitiveness by incorporating the human-digital dimension within the economic architecture. While physical infrastructure facilitates the flow of goods, digital capital facilitates the efficient flow of information, a critical condition in deep integration environments.

This conceptualization allows for the analytical integration of higher education and international trade within the same explanatory framework. In highly digitized border corridors, university education not only fulfills a social function, but also a structural economic function. The unequal accumulation of digital capital can, therefore, generate divergences in labor trajectories within the same geographically integrated region.

Digital capital is not limited to isolated technical skills but constitutes an accumulative asset that interacts with the regional productive structure. In trade-intensive frontier economies, this asset acquires a strategic character as it becomes an essential component of competitiveness and operational resilience.

IV. Academic resilience as a transmission mechanism

The literature on academic resilience has evolved from psychological approaches focused on individual coping to models that integrate structural resources and cumulative capital (Martin and Marsh 2006; Masten 2014). In this study, academic resilience (AR) is conceptualized as the student's ability to maintain performance, continuity, and adaptation in the face of external shocks or structural limitations.

AR is not understood as an innate trait or as an abstract individual virtue because of the interaction between personal resources and material conditions. In contexts of digitized higher education, access to appropriate devices, stable connectivity, and technological skills becomes a principal component of such resilience.

In environments where university education depends on virtual platforms, electronic academic management systems, and digital resources, the lack of digital capital can translate into greater exposure to interruptions, delays, and loss of educational continuity. Conversely, a strong digital capital base reduces vulnerability to technological or institutional shocks.

From an economic perspective, academic resilience can be interpreted as a mechanism for stabilizing human capital. The accumulation of skills does not occur in linear trajectories, but under conditions of uncertainty. Resilience to disruption protects educational investment and reduces the risk of human capital depreciation.

In the context of the Laredo-Nuevo Laredo corridor, where the regional economy depends on information-intensive sectors, this dynamic takes on a structural dimension. If digital capital strengthens academic resilience, and this in turn protects and enhances the accumulation of productive skills, then CD operates as a micro-foundation of regional competitiveness.

The link can be represented as a three-level causal chain:

Digital Capital (DC) → Academic Resilience (AR) → Insertion Potential in Information-Intensive (IP) Sectors

The first link reflects how digital resources reduce academic friction. The second suggests that more stable educational trajectories increase the probability of insertion in strategic sectors. The third connects individual dynamics with regional economic performance.

This framework allows for the integration of education microeconomics and regional economics within a coherent structure. University digital inequality ceases to be only a problem of educational equity to become a possible factor of productive segmentation within an integrated border economy.

The approach avoids falling into technological determinism. Digital capital does not automatically guarantee successful job placement, but it does reduce structural restrictions that limit academic and

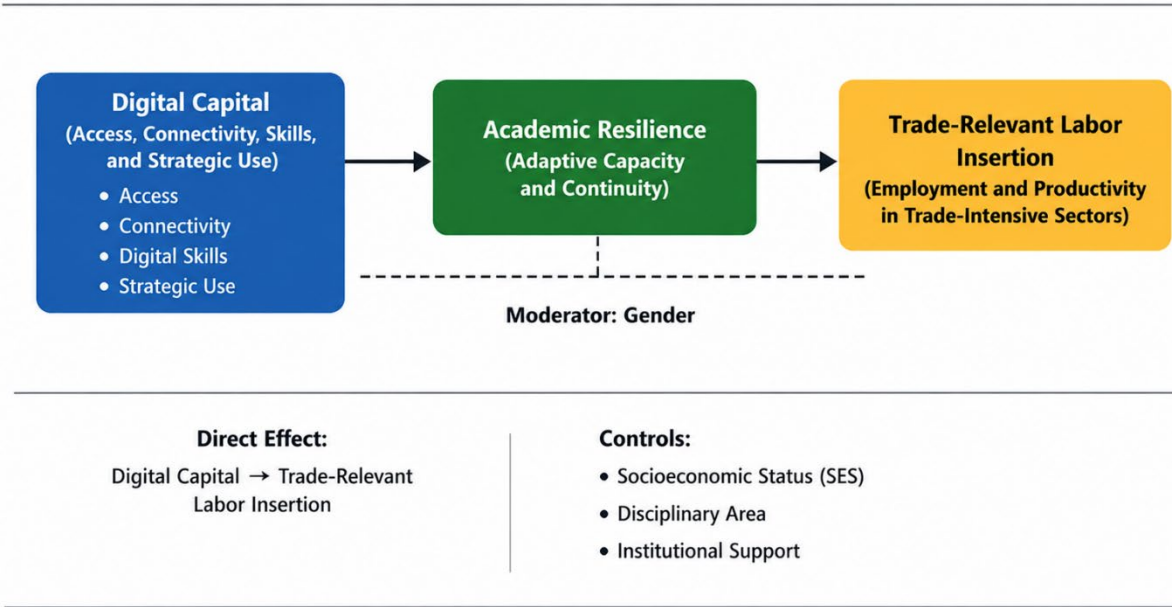
professional trajectories. Academic resilience functions as a mediating variable that translates digital resources into training continuity and accumulation of skills.

In analytical terms, AR makes it possible to operationalize the bridge between digital endowment and expected economic results. This strengthens the internal coherence of the model and provides a theoretical foundation for subsequent empirical specification.

Academic resilience is the mechanism through which digital capital can acquire structural relevance in trade and information-intensive economies. Without this mechanism, the link between digital education and regional competitiveness would remain conceptually incomplete.

Based on the theoretical framework developed, the analytical structure of the digital capital and resilience model in integrated border economies can be synthesized in the following conceptual representation, which illustrates the structural relationships between digital capital, academic resilience, and implications for regional competitiveness.

Figure 1: The Analytical Structure of the Digital Capital and Resilience Model for Integrated Border Economies.



Source: Own elaboration.

V. Digital capital and resilience model in integrated border economies model and hypothesis

5.1. Conceptual structure of the model

The theoretical framework developed suggests that digital capital (DC) positively influences academic resilience (AR), which acts as a mediating variable in the effective accumulation of human capital in digitalized educational environments. In information-intensive frontier economies, this mechanism can be interpreted as a micro-foundation of regional competitiveness.

Formally, the model is based on the following structural relationship:

$$RA_i = f(CD_i, X_i, \varepsilon_i)$$

where:

- RA_i represents the individual's level of academic resilience, i

- CD_i represents individual digital capital,
- X_i is a vector of control variables,
- ε_i is the term error.

The central hypothesis states that:

$$\frac{\partial RA_i}{\partial CD_i} > 0$$

In other words, higher levels of digital capital are associated with higher levels of academic resilience.

5.2. Operationalization of variables

Dependent variable

Academic Resilience (RA)

It is proposed to measure RA using an internationally validated scale (e.g. Academic Resilience Scale or equivalent adapted instruments), generating a continuous index.

Main independent variable

Digital Capital (CD)

It is constructed as a composite index from four dimensions:

1. Access to suitable devices
2. Stability and quality of connectivity
3. Functional digital skills
4. Academic strategic use of technologies

Standardization and construction are recommended by:

- Exploratory factor analysis (EFA), or
- Normalized weighted index.

Controlled variables (X)

To avoid bias due to omitted variables, the following are incorporated:

- Gender (female dummy = 1)
- Socioeconomic level
- Type of career
- Semester completed
- Weekly working hours
- Grade point average

5.3. Basic econometric specification

The initial empirical specification can be formulated as:

$$RA_i = \beta_0 + \beta_1 CD_i + \beta_2 Genero_i + \beta_3 SES_i + \beta_4 Trabajo_i + \beta_5 Promedio_i + u_i$$

where:

- β_1 captures the marginal effect of digital capital on academic resilience.
- u_i is the term of disturbance.

5.4. Extension: Model with gender interaction

Since the study incorporates a gender perspective, it aims to assess whether the effect of digital capital differs between men and women:

$$RA_i = \beta_0 + \beta_1 CD_i + \beta_2 Mujer_i + \beta_3 (CD_i \times Mujer_i) + X_i\gamma + u_i$$

Here:

- β_3 measures whether the impact of digital capital on resilience is differential by gender.
- A significant coefficient would indicate structural heterogeneity.

5.5. Methodological considerations

Model type

- OLS regression if AR is continuous.
- Ordinal/logistic model if resilience is categorized.

Robustness

- Robust standard errors.
- Multicollinearity tests.
- Heteroskedasticity test.
- Alternatively: quantile regression to explore heterogeneous effects.

Potential limitations

- Self-selection bias.
- Potential endogeneity between CD and academic performance.
- Cross-sectional nature of the data.

5.6. Structural interpretation

The key parameter is β_1 : Yes

- It is positive and significant → evidence consistent with the hypothesis of digital capital as an academic stabilizer.
- If the interaction with gender is also significant → evidence of digital structural inequality with differentiated implications.

This would allow us to argue that university digital inequality is not only an educational phenomenon, but a possible mechanism of future segmentation in trade-intensive economies.

VI. Proposed empirical strategy

6.1. Research design

The study adopts a quantitative cross-sectional design aimed at analyzing the relationship between digital capital and academic resilience in public universities located in the Laredo-Nuevo Laredo binational corridor. The approach is explanatory, with emphasis on identifying structural associations consistent with the theoretical framework proposed.

The unit of analysis is the university student enrolled in public institutions on the Mexican side of the corridor. The selection of the geographical space responds to its character as a border economy intensive in trade and information, which allows linking micro-educational dynamics with regional productive structure.

6.2. Population and sample

The target population is composed of undergraduate students enrolled in public universities in Nuevo Laredo, Tamaulipas.

The sample is estimated to be between 300 and 500 students, sufficient size to:

- Ensure adequate statistical power.
- Allow multivariate estimates.
- Evaluate interactions by gender.

The sampling design can be structured as:

- Stratified sampling by career or semester.
- Or convenience sampling with subsequent bias control.

Sociodemographic variables will be recorded to control observable heterogeneity.

6.3. Measuring instrument

The proposed instrument consists of three main blocks:

(1) Digital capital

Items they capture:

- Personal computer availability.
- Internet connection quality.
- Stability of the service.
- Use of academic platforms.
- Self-perception of digital skills.
- Use of technological tools for academic purposes.

Likert-type scales (1–5) will be used to measure intensity.

(2) Academic resilience

An internationally validated scale (adapted to the local context) will be used, which assesses:

- Persistence in the face of difficulties.
- Ability to adapt.
- Academic self-confidence.
- Academic stress management.

(3) Control variables

- Gender
- Age
- Approximate socioeconomic status
- Grade point average
- Working hours
- Career or disciplinary area

6.4. Index construction

Digital capital (CD)

It is proposed:

1. Standardization of items.
2. Exploratory factor analysis to verify dimensional structure.
3. Construction of a normalized composite index.

Internal consistency will be evaluated using Cronbach's alpha.

Academic resilience (RA)

A continuous index will be constructed from the sum or weighted average of validated items.

6.5. Estimation strategy

The following shall be estimated:

Base model:

OLS regression with robust errors.

Extended model:

Interactions by gender.

Additional tests:

- Multicollinearity (VIF).
- Heteroskedasticity.
- Alternative robustness with quantile regression.
- Possible logit/ordinal specification if the dependent variable requires it.

6.6. Validity and reliability

The following will be evaluated:

- Internal consistency of scales.
- Factorial coherence.
- Coefficient stability in alternative specifications.
- Sensitivity to inclusion/exclusion of controls.

6.7. Ethical considerations

The study will be conducted under informed consent, ensuring:

- Anonymity.
- Confidentiality.
- Use for academic purposes only.

No sensitive information that allows individual identification will be collected.

6.8. Anticipated limitations

- Cross-sectional nature of study.
- Possible self-selection bias.
- Self-reported measurement.
- Absence of longitudinal data.

These limitations will be made explicit in the discussion section.

From a methodological perspective, the design adopted privileges the identification of structural associations consistent with the theoretical framework, explicitly recognizing the limitations inherent in a cross-sectional study based on self-reported measurements. Although estimation using ordinary least squares allows the evaluation of conditional relationships between digital capital and academic resilience, strict causality is not assumed at this stage. The model incorporates a broad set of control variables to reduce bias by omission of relevant variables, and the evaluation of alternative specifications and robustness tests to verify coefficient stability is contemplated. Future extensions could incorporate more demanding identification strategies such as longitudinal designs, instrumental variables, or fixed-effect models to strengthen causal inference. This methodological explicitness seeks to guarantee analytical transparency and coherence between the empirical scope of the study and the conclusions derived.

VII. Theoretical contribution

The findings proposed in this study allow us to reinterpret the university digital divide as a phenomenon with structural economic implications in integrated border economies. In the context of the Laredo-Nuevo Laredo corridor, where the productive structure depends intensively on digitized logistics processes and cross-border electronic coordination, digital capital acquires a strategic character.

From a microeconomic perspective, digital capital strengthens academic resilience by reducing technological frictions in educational trajectories. This reduction of friction protects the accumulation of human capital and reduces the risk of training discontinuity. In economies where employability increasingly depends on digital skills, this protection can translate into individual competitive advantages.

The central argument of the study transcends the individual level. In border corridors highly specialized in international trade, the aggregate accumulation of digital capital can influence the quality of human capital available for strategic sectors. If the regional economy is information-intensive, university digital inequality can be transformed into future productive segmentation.

This link suggests that digital capital operates as **microfoundation of regional competitiveness**. While the traditional literature on competitiveness has emphasized physical infrastructure, foreign direct investment, and logistical advantages (Porter 1990), the present approach introduces the human-digital dimension as a complementary structural component.

The deep integration between Mexico and the United States, reinforced by the USMCA and recent nearshoring processes, intensifies this dynamic. The reconfiguration of supply chains in North America implies a growing reliance on efficient digital coordination. In this environment, border regions with greater digital capital accumulation could consolidate sustainable dynamic advantages.

The gender perspective introduces an additional dimension. If the effect of digital capital on resilience is differential between men and women, technological inequality could amplify pre-existing structural gaps in information-intensive labor markets. This implies that the digital divide not only has a distributive dimension, but also a potential impact on trajectories of sectoral insertion.

From a public policy perspective, the study suggests that investment in university digital capital should be considered a strategic complement to investment in logistics infrastructure. Connectivity programs, strengthening advanced digital skills, and access to appropriate devices can be interpreted as indirect regional competitiveness policies.

The analysis allows for the integration of higher education within the framework of the regional economy. The public universities on the Mexican side of the corridor not only fulfill a social formative function but also constitute critical nodes in the generation of capacities required by trade-intensive sectors. The quality of university digital capital can have an impact on the competitive sustainability of the corridor in the medium term.

Evidence suggests that university digital inequality should be analyzed not only as an educational or social problem, but as a variable with potential structural impact on integrated border economies. Digital capital, by strengthening academic resilience, can become a strategic asset in regions whose competitiveness rests on cross-border digital coordination.

In empirical terms, the results are expected to confirm a positive and statistically significant relationship between digital capital and academic resilience, which would support the hypothesis that digital endowments function as stabilizers of learning trajectories in digitalized university environments. It is anticipated that the inclusion of gender interactions will reveal possible differential effects on the magnitude of the impact, which would allow the identification of structural dimensions of digital inequality with implications for future labor insertion in information-intensive sectors. If these associations are confirmed, the study would provide evidence consistent with the idea that the university digital divide not only affects immediate educational outcomes but can also indirectly affect the formation of human capital that sustains regional competitiveness in integrated border economies.

This version of the study corresponds to an intermediate stage of the research project, in which the theoretical model and the econometric strategy have been fully specified before the final empirical estimate. The early presentation of the conceptual framework responds to a deliberate methodological approach: to validate the structural coherence of the model in the specialized academic debate prior to the incorporation of definitive results. In this way, the work is explicitly inserted into the category of progress research, maintaining standards of conceptual rigor and methodological transparency.

VIII. Conclusion

This study proposes and develops the concept of **digital capital as a microfoundation of competitiveness in integrated border economies**, using the Laredo-Nuevo Laredo corridor as an analytical case. Unlike approaches that treat the digital divide as an exclusively educational or distributive problem, the analysis relocates it within the regional economic architecture.

The central argument argues that digital capital, understood as access, connectivity, competencies, and strategic use of technology, strengthens academic resilience in digitized university environments. This resilience, in turn, protects the accumulation of human capital in contexts of technological uncertainty and allows for more stable training trajectories.

In economies that are intensive in trade and information, such as the Laredo-Nuevo Laredo corridor, this dynamic takes on a structural dimension. Regional competitiveness does not depend only on physical infrastructure or trade volume, but on the quality of human capital capable of operating complex digital systems. In this sense, digital capital can be interpreted as soft productive infrastructure complementary to logistics infrastructure.

The theoretical contribution of the study is threefold:

1. **Conceptual:** introduces digital capital as a specific extension of human capital in intensive trade economies.
2. **Mechanics:** identifies academic resilience as a mediating variable that connects digital endowments with effective accumulation of human capital.
3. **Regional:** integrates higher education and frontier economics within the same analytical framework.

The approach incorporates a gender perspective to assess potential heterogeneous effects of digital capital. This allows us to analyze whether university technological inequalities could amplify future labor segmentations in information-intensive sectors. The study recognizes limitations derived from their cross-sectional design and the self-declared nature of the instruments. Future research could incorporate longitudinal data or expand analysis to the U.S. side of the corridor to assess binational comparative dynamics.

The unequal accumulation of university digital capital should not be interpreted only as an educational gap, but as a variable with structural implications in highly integrated frontier economies. In regions where digitalization is an operational condition of trade, digital capital emerges as a strategic asset for long-term competitive sustainability.

In a context of reconfiguration of global value chains, nearshoring, and deepening of U.S. integration under the USMCA, regional competitiveness can no longer be understood exclusively in terms of physical infrastructure or trade volume. Highly integrated border corridors are increasingly competing in the ability to sustain secure, efficient, and coordinated digital flows in real time. In this scenario, the accumulation of university digital capital emerges as a silent but decisive strategic asset: a soft productive infrastructure that can consolidate sustainable dynamic advantages or, in its absence, generate invisible bottlenecks in information-intensive economies.

The debate on the university digital divide transcends the educational sphere and connects directly with regional competitiveness and the digital trade governance agenda (CEPAL 2023; Ferracane and van der Marel 2021). In deeply interdependent frontier economies, such as Laredo–Nuevo Laredo, differences in digital capital accumulation can influence the quality of human capital that sustains strategic logistics, manufacturing, and technology sectors for North America. Consequently, strengthening digital capital is not only a policy of educational inclusion, but also a structural investment in productive resilience and competitive sustainability within a geoeconomic environment characterized by high integration and growing technological dependence.

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