

From Firms to Ecosystems: Institutional Complementarities and the Uneven Digital Development of Small-Firm Economies in Post-Soviet Transition States

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ABSTRACT: Why do national and regional economies composed largely of small firms diverge so sharply in their capacity to digitalize, even when individual firms face broadly similar technologies and price signals? This paper shifts the level of analysis from the single enterprise to the institutional ecosystem in which small and medium-sized enterprises (SMEs) are embedded. It argues that the digital development of a small-firm economy is not the arithmetic sum of individual adoption decisions but an emergent property of institutional complementarities — the mutually reinforcing fit among finance, skills formation, digital public infrastructure, and regulatory quality. Drawing on the varieties-of-capitalism tradition, institutional economics, and the resource-dependence view of the firm, the paper develops an ecosystem-complementarity framework and applies it comparatively to post-Soviet transition economies (Ukraine, Georgia, Armenia, Moldova, Kazakhstan, and the Baltic states). It contends that where complementary institutions co-evolve, individual firm-level resource constraints are relaxed at the population level; where they do not, public investment in any single institution yields disappointing returns because the binding constraint lies elsewhere. The paper contributes to social and economic development studies by reframing the "digital divide" between transition economies as an institutional-complementarity gap, and it closes with implications for sequencing development policy and an agenda for comparative empirical research.

KEYWORDS: economic development, institutional complementarities, small and medium-sized enterprises, digital public infrastructure, transition economies, varieties of capitalism, digital divide, development policy

1. INTRODUCTION

The diffusion of digital technology across small-firm economies has become a central concern of development policy, yet outcomes across otherwise comparable transition states differ far more than a purely technological account would predict. Two economies may face the same global software vendors, the same falling hardware costs, and the same international connectivity, and still generate radically different rates of productive digital adoption among their small firms. This paper treats that divergence as a problem in the economics and sociology of institutions rather than in technology.

The argument builds directly on a firm-level insight developed elsewhere: that small-firm adoption failure is frequently misdiagnosed as a technological deficit when it is in fact an institutional and resource-dependence phenomenon. This paper asks the logically prior, population-level question: what determines whether an entire small-firm economy relaxes or entrenches those resource dependencies? The answer advanced here is that digital development depends on institutional complementarities — the degree to which a country's financial system, skills-formation institutions, digital public infrastructure, and regulatory environment fit together and reinforce one another.

The contribution is threefold. First, the paper scales the analytic frame from the firm to the ecosystem. Second, it specifies the mechanism — complementarity — that connects macro-institutions to micro-adoption. Third, it uses this mechanism to derive concrete guidance on the sequencing of development interventions, a question that firm-level frameworks cannot address.

2. THEORETICAL BACKGROUND

2.1 Institutional Complementarities and Varieties of Capitalism

The varieties-of-capitalism literature holds that national economic performance depends less on the strength of any single institution than on the coherence among institutions — the extent to which arrangements in finance, labor, training, and inter-firm relations reinforce one another (Hall & Soskice, 2001). Complementarity implies that the return to improving one institution is conditional on the state of the others: a well-capitalized credit market delivers little digital investment if the labor market cannot

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supply technical skills. For transition economies, this reframes digital development as a coordination problem across institutional domains rather than a deficiency in any one of them.

2.2 Institutions, Transaction Costs, and Development

Institutional economics locates the wealth and poverty of economies in the quality of the rules — property rights, contract enforcement, and regulatory predictability — that govern exchange (North, 1990; Acemoglu & Robinson, 2012). Where these rules are weak, transaction costs rise and the horizon over which firms are willing to invest contracts. Digital adoption, which requires firms to commit capital today against uncertain future returns, is acutely sensitive to this horizon. The framework here treats regulatory quality not as background but as a load-bearing component of the adoption ecosystem.

2.3 Digital Public Infrastructure as a Shared Resource

A growing development literature identifies digital public infrastructure — interoperable identity, payment, and data-exchange systems provided as public goods — as a decisive enabler of private digital activity (World Bank, 2016). Read through the resource-dependence lens, such infrastructure lowers the external dependencies that individual small firms cannot otherwise overcome: it substitutes a shared public capability for capabilities each firm would have to procure privately. This connects the macro-institutional argument to the firm-level resource-constraint account.



Figure 1. The four institutional domains of the small-firm adoption ecosystem and their mutual fit. Adapted from the theoretical apparatus of Section 2; the arrows between domains denote complementarity rather than causal sequence.

3. METHOD

The study employs a comparative-case synthesis in the interpretive, theory-building tradition (Eisenhardt, 1989; Ragin, 1987), reading published country analyses and cross-national indicators against the theoretical apparatus of Section 2. It is explanatory rather than confirmatory, aiming to generate a framework and testable propositions.

The analysis proceeds in four moves. First, it identifies from the literature the institutional domains whose mutual fit governs small-firm digitalization. Second, it organizes these into an ecosystem-complementarity framework. Third, it applies the framework comparatively to a purposive sample of transition economies — Ukraine, Georgia, Armenia, Moldova, Kazakhstan, and the Baltic states — whose shared institutional inheritance but divergent reform paths make them an unusually informative comparison set. Fourth, it derives three ecosystem archetypes.

4. AN ECOSYSTEM-COMPLEMENTARITY FRAMEWORK

The framework treats a small-firm economy's digital development as jointly governed by two dimensions.

The first is institutional coherence: the degree to which finance, skills formation, digital public infrastructure, and regulatory quality are mutually aligned rather than developing at incompatible speeds.

The second is ecosystem headroom: the aggregate slack — public fiscal capacity, human capital, and infrastructural maturity — available to expand the adoption frontier across the firm population.

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A key implication is that these dimensions interact rather than add. Where coherence is low, additional headroom is dissipated because investment in one domain runs ahead of complementary domains and cannot be absorbed. This reframes what policymakers often call a "digital divide" as, more precisely, an institutional-complementarity gap.

Table 1. Digital-development trajectories by institutional coherence and ecosystem headroom

	LOW COHERENCE	HIGH COHERENCE
High headroom	Misallocation: sequence reforms to align domains before scaling investment	Acceleration: invest to widen the adoption frontier
Low headroom	Trap: prioritize a single complementary bottleneck to unlock the others	Catch-up: leverage coherence to attract external resources

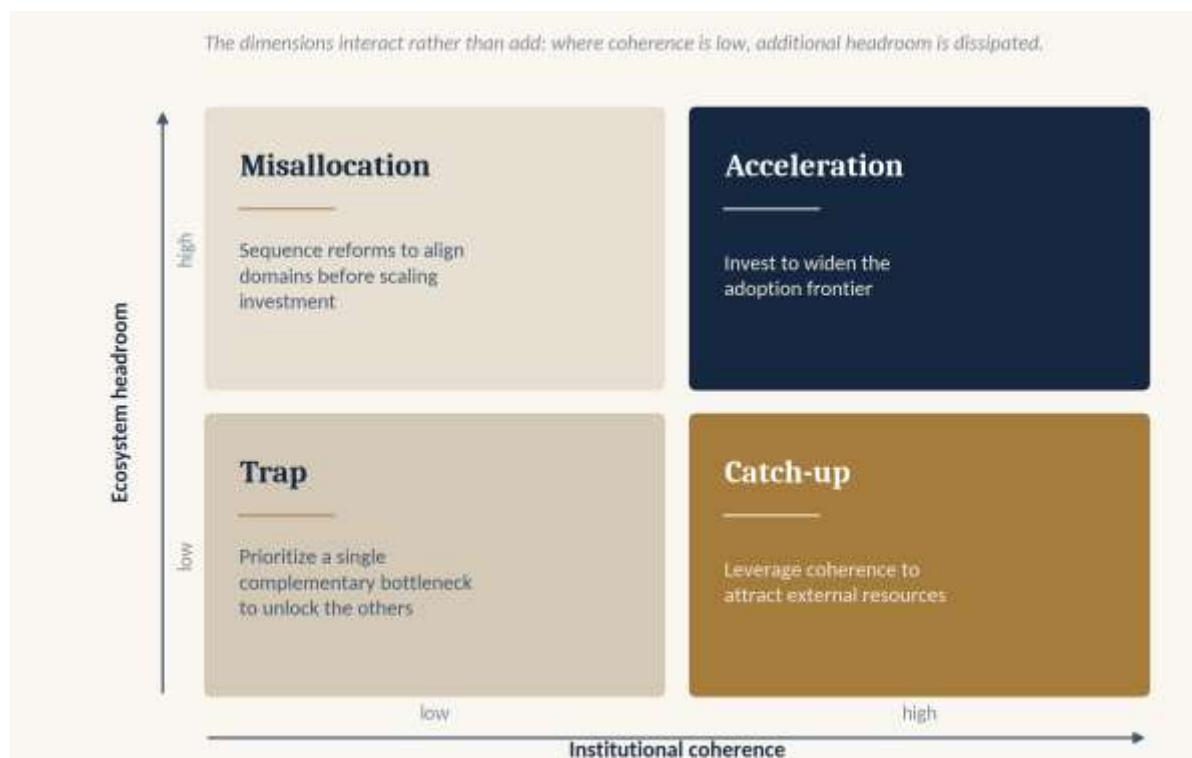


Figure 2. The ecosystem-complementarity framework. The two dimensions interact rather than add: where institutional coherence is low, additional ecosystem headroom is dissipated because investment in one domain cannot be absorbed by the others.

Table 2. Institutional domains, their function in the adoption ecosystem, and the complementarity condition on which their returns depend

DOMAIN	FUNCTION IN THE ECOSYSTEM	THE COMPLEMENTARITY CONDITION
Finance	Supplies the credit and investment capacity firms commit against uncertain future returns.	A well-capitalized credit market delivers little digital investment where the labor market cannot supply technical skills.
Skills formation	Supplies the technical capability required to select, operate, and maintain digital tools.	Skills provision converts into adoption only where firms also have finance and a horizon long enough to invest against.

DOMAIN	FUNCTION IN THE ECOSYSTEM	THE COMPLEMENTARITY CONDITION
Digital public infrastructure	Provides interoperable identity, payment, and data-exchange systems as public goods, substituting a shared capability for one each firm would otherwise procure privately.	Shared infrastructure relaxes firm-level dependencies only where regulatory predictability makes commitment rational.
Regulatory quality	Governs property rights, contract enforcement, and regulatory predictability, and so sets transaction costs and the investment horizon.	Improved rules raise adoption only where finance, skills, and infrastructure are not themselves binding.

Note. Domains and functions follow Sections 2.1–2.3 and 4. The complementarity conditions state the paper's general principle — that the return to improving one institution is conditional on the state of the others — in domain-specific form.

5. COMPARATIVE ANALYSIS AND ECOSYSTEM ARCHETYPES

A comparative reading of post-Soviet transition economies suggests that divergence in small-firm digitalization tracks institutional coherence far more closely than aggregate spending on technology or connectivity. Economies that co-developed digital public infrastructure with regulatory reform and skills provision converted external shocks into adaptation, while those that invested unevenly saw investment in one domain stranded by bottlenecks in another. Three archetypes emerge.

Archetype 1 — the coherent adopter ecosystem. Complementary institutions co-evolved, so shared public infrastructure relaxes firm-level dependencies across the population. The development task is one of acceleration and inclusion at the margins.

Archetype 2 — the bottlenecked ecosystem. One domain — typically skills or finance — lags decisively, stranding otherwise adequate investment elsewhere. The appropriate remedy is targeted relief of the single binding constraint rather than broad-based spending.

Archetype 3 — the fragmented ecosystem. Institutions develop at incompatible speeds with weak coordination, so headroom is repeatedly dissipated. Here development must begin with the sequencing and coordination of reform before capital deployment can yield returns.

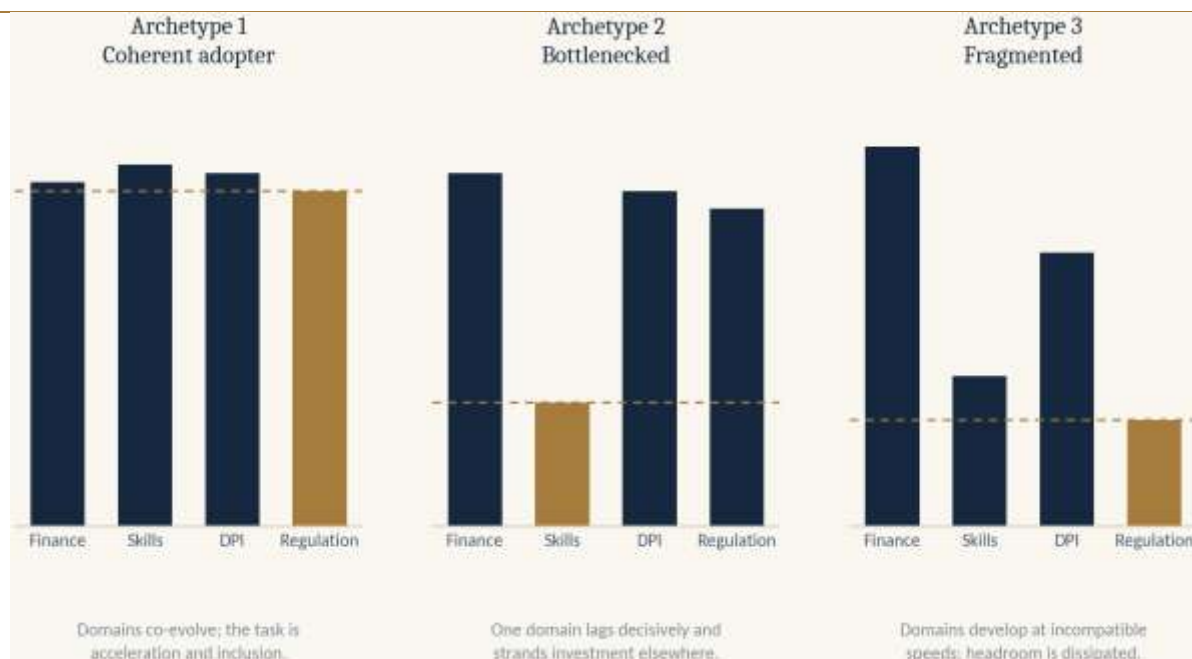


Figure 3. Three ecosystem archetypes as schematic profiles of relative institutional development across the four domains. The dashed line marks the binding complementary constraint. The profiles are illustrative of the archetypes described in this section and are not measured values.

Table 3. The three ecosystem archetypes and their corresponding development tasks

ARCHETYPE	INSTITUTIONAL PATTERN	BINDING ISSUE	DEVELOPMENT TASK
1 Coherent adopter	Complementary institutions co-evolved, so shared public infrastructure relaxes firm-level dependencies across the population.	No single domain lags decisively.	Acceleration and inclusion at the margins.
2 Bottlenecked	One domain — typically skills or finance — lags decisively, stranding otherwise adequate investment elsewhere.	A single binding constraint.	Targeted relief of that constraint rather than broad-based spending.
3 Fragmented	Institutions develop at incompatible speeds with weak coordination.	Headroom is repeatedly dissipated.	Sequencing and coordination of reform before capital deployment.

Note. Summarizes the archetypes set out in Section 5.

6. DISCUSSION AND IMPLICATIONS

For development studies, the analysis shows that cross-national divergence in small-firm digitalization is routinely misread as a gap in technology or investment when it is in fact an institutional-complementarity phenomenon. Aggregating firm-level constraints without attending to their institutional sources produces policy that treats symptoms.

For development policy, the framework yields a sequencing diagnostic: rather than maximizing spending on the most visible domain, support bodies should identify the binding complementary constraint and relieve it first, since the return to any single institution is conditional on the others. This is especially salient across transition economies, where a shared institutional inheritance makes divergent reform sequencing the clearest explanation for divergent outcomes.

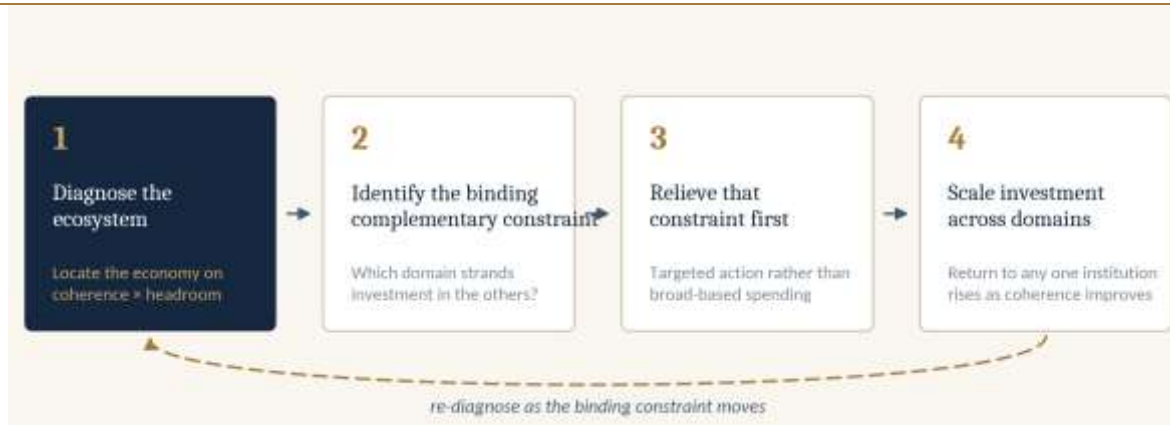


Figure 4. The sequencing diagnostic implied by the framework: identify the binding complementary constraint and relieve it first, then re-diagnose as the constraint moves, since the return to any single institution is conditional on the others.

7. CONCLUSION

This paper reframes the digital development of small-firm economies as an emergent property of institutional complementarities rather than a sum of firm-level decisions. Engaging the varieties-of-capitalism tradition, institutional economics, and resource-dependence theory, it develops a two-dimensional ecosystem-complementarity framework, applies it comparatively to post-Soviet transition economies, and derives three ecosystem archetypes. Its central claim is that digital development outcomes are governed by the coherence among institutions, not by investment in any one of them. Future empirical work should operationalize institutional coherence and test the framework's sequencing propositions through cross-national and longitudinal research.

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