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# *Administrative Reform and Business-Facing Governance: Does Digital Transformation Enable Capability Conversion in Vietnam?*

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***Abstract:*** *Internal reform achievements need not reach the people who deal with government. This article asks whether administrative reform implementation capacity is associated with business-facing governance across Vietnam's 63 provinces and centrally governed cities, and whether digital transformation strengthens any such association. The evidence is a balanced province-year panel for 2019-2024, analysed with two-way fixed-effects models and province-clustered standard errors; moderation models run on 2020-2024, since the Provincial Digital Transformation Index begins in 2020. Reform implementation capacity is proxied by the Public Administration Reform Index, business-facing governance by the Provincial Competitiveness Index, and digital transformation by the Provincial Digital Transformation Index. Pooled, the reform–governance association is positive. The preferred within-province estimate is smaller and statistically imprecise (b = 0.106, p = .183), and the interaction with digital transformation is imprecise as well (b = 0.167, p = .599), with no statistically discernible conditional region. Alternative indicators, lagged models, different controls, within-year standardisation, exclusion of the 2022 method-change year, and leave-one-province-out analyses all preserve these inferences. None of this shows reform or digital transformation to be ineffective. What it fits is a capability-conversion problem: formal reform and broad digital development do not necessarily produce contemporaneous improvement in what firms' experience. The article contributes a conditional, organisational account of subnational public-management performance and points to process-level implementation as the priority for research and policy evaluation — linking reform and digitalisation indicators to changes one can observe in regulatory procedures, interagency coordination, and firms' administrative encounters.*

**Keywords**: public administration reform; digital transformation; business-facing governance; subnational governance.

**JEL**: H83; O33; C23.

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## Introduction

Why is one government more capable than another? The question sits at the heart of public administration, development studies, and institutional economics. What a state holds on paper matters less than what it does with it: whether services reach users, whether reforms take hold, whether firms find the administration workable. Capability, on this reading, is no single trait. It spans analytical, operational, organisational, and political competences — which is why provinces holding comparable resources and identical mandates can still diverge sharply once implementation begins.

Decentralised systems sharpen the puzzle. Subnational governments work inside one national framework, yet they differ in how they execute, learn, coordinate, and engage local actors, so identical formal institutions can yield very different governance (Androniceanu & Streimikiene, 2025). Digital transformation adds a further layer. Digital tools can improve efficiency and transparency, but what they contribute depends on organisational integration, not on the technology itself.

Picture a province that streamlines its procedures and expands its digital infrastructure, yet whose firms notice no real change in the governance they deal with (Androniceanu, 2025). That gap matters for the business environment. Firms meet the state at the counter and in the inspection, not in an internal reform score. Why improvements in administrative reform and digital systems can sit alongside uneven business-facing governance is the puzzle this article takes up.

Treating capability as the possession of institutional resources or formal reform achievements implies that governments with similar scores should achieve similar outcomes. In contrast, treating capability as the ability to mobilise and embed organisational capacities suggests that outcomes depend on a conversion process: routines, coordination, frontline implementation, and stakeholder-facing delivery. This study develops a second interpretation.

Existing research explains how state and administrative capacities shape development and institutional effectiveness (Besley & Persson, 2009; Evans & Rauch, 1999; Fukuyama, 2013; Wu *et al.*, 2015). However, little is known about how internal capabilities become governance that external stakeholders perceive. Cross-country comparisons often combine wide institutional differences, making this organisational link difficult to isolate. A within-country provincial design holds the national constitutional framework constant and shifts attention towards implementation variation.

Vietnam provides a substantively important post-socialist setting for this study. Market-oriented reform has expanded the role of private firms and foreign investment, while the party-state retains extensive authority over administrative organisation and subnational governance (Malesky & London, 2014). Provinces share national institutions and reform programmes but retain meaningful implementation discretion, and changes in subnational authority can affect public services and investment (Luu *et al.*, 2022; Malesky *et al.*, 2014). Vietnam also maintains nationwide indices that distinguish internal administrative reform from

business-facing governance. This combination makes provincial variations relevant to broader debates on institutional change, reform implementation, and economic governance in post-communist economies.

Digital transformation may condition this process; however, this study does not treat technology as a standalone driver of better governance. DTI is instead examined as an organisational enabling condition that may help provinces translate administrative reform implementation capacity into business-facing governance.

This leads to the central research question: to what extent is administrative reform implementation capacity associated with business-facing governance within Vietnamese provinces, and does digital transformation strengthen that association? This formulation moves beyond a linear capability–performance model and asks whether changes in internal administrative capacity are reflected in the outcomes experienced by firms.

Four contributions follow. The study separates capability possession from capability conversion, and it locates subnational variation inside a common post-socialist institutional framework, connecting administrative reform to wider debates on economic institutions and local implementation. It also treats digital transformation as a potentially complementary organisational condition, not an automatic performance enhancer. Finally, it brings several province-level indicators into one longitudinal design that keeps persistent cross-provincial differences apart from short-run within-province change.

## 1. Literature review

### 1.1. Government capability and business-facing governance

Why do public authorities operating under comparable formal institutions differ in their abilities to formulate, implement, and sustain collective action? Research on state capacity, administrative capacity, bureaucratic quality, and policy capacity shares a central premise: performance depends not on formal authority or resources alone, but on whether public organisations can mobilise, coordinate, and deploy them (Bersch *et al.*, 2017; Fukuyama, 2013; Wu *et al.*, 2015). Capability is thus an organisational property rather than a single administrative trait.

Fukuyama (2013) separated the quality of governmental institutions from their outcomes, avoiding the circular practice of inferring capability from good results. Wu *et al.* (2015) distinguish analytical, operational, and political competences across individual, organisational, and system levels. Andrews *et al.* (2016) similarly show that public sector capability rests on configurations of attributes rather than the simple accumulation of resources.

Resources become performance only under the right managerial and institutional conditions (Lee & Whitford, 2013), and subnational work treats capacity and realised performance as related but distinct (Koerner & Johnston, 2022). Where implementation fails, the cause may lie in a mismatch between what a task demands and what an organisation can supply (Fernández-i-Marín *et al.*, 2024; Howlett & Ramesh, 2016).

Administrative reform sharpens the distinction. Adopting reform requirements signals formal commitment; implementing them is harder work, requiring organisations to interpret those requirements, embed them in routines, coordinate across units, and keep delivery going. Administrative reform implementation capacity is thus a bounded component of government capability, not the whole construct.

In this study, government capability is the latent multidimensional ability of a provincial government to formulate, implement, and sustain public action. The PAR Index does not measure it as a whole. It represents one bounded part of it, the administrative reform implementation capacity, and is used throughout.

Business-facing governance has shifted attention from internal administration to what firms encounter, including transparency, predictability, responsiveness, consistency, and transaction costs. These qualities shape investment and compliance decisions and connect public administration to the functioning of economic institutions (Fukuyama, 2013; Lee & Whitford, 2013).

Vietnam's PCI is a prominent subnational measure of economic governance, combining enterprise survey responses with administrative data across market entry, land access, transparency, informal charges, policy bias, and legal institutions. What it records is how firms experience provincial governance — not internal administrative capability.

The distinction carries weight in Vietnam's transitional political economy, where provinces implement common national reforms inside a system that pairs central political authority with decentralised economic and administrative responsibility. Provincial discretion and central–local arrangements shape public services and investment outcomes (Luu *et al.*, 2022; Malesky & London, 2014; Malesky *et al.*, 2014). A province may tighten its internal procedures without firms noticing any difference; equally, business-facing governance may shift for reasons an internal reform index never records.

Business-facing governance is, in this literature, an externally assessed outcome. Much less has been said about the organisational route by which administrative capability turns into governance that firms actually perceive — a route that matters most where one national reform programme meets very different local economic institutions.

Digital transformation changes how public organisations work and interact with citizens and firms. Whereas earlier e-government initiatives often digitised existing procedures, digital transformation may reconfigure organisational structures, information flows, and service delivery (Fountain, 2001; Gil-Garcia *et al.*, 2018; Mergel *et al.*, 2019; Vial, 2019).

Digital government gains depend on leadership, institutional coordination, interoperable information, and organisational change. Infrastructure alone rarely improves performance when layered onto fragmented processes (Bannister & Connolly, 2014; Cordella & Bonina, 2012; Dunleavy *et al.*, 2006; Mergel *et al.*, 2019).

Firms make a demanding test case. They meet the state through licensing, taxation, inspection, and other transaction-intensive processes. Digital tools can lighten those burdens and open up information, but the gains often fail to appear where adoption is superficial or poorly coordinated. What the evidence supports, then, is a conditional link between digitalisation and public value, not an automatic one (Janowski, 2015; Twizeyimana & Andersson, 2019).

In Vietnam, DTI captures progress across the digital government, digital economy, and digital society. This reflects more than hardware; however, its breadth also means that it is not a direct measure of firm-facing digital services. Accordingly, the present study tested whether DTI conditions the PAR–PCI association while treating any interpretation as an association between indices rather than a direct observation of a conversion mechanism.

Subnational systems are where these gaps meet: the formal institutions are shared, the implementation is not. An account that holds administrative capability, firm-facing economic governance, and digital transformation in view at once is what the case calls for — and it must keep the institutional peculiarities of a post-socialist transition economy in the frame.

### 1.2. Capability conversion and digital transformation

Multidimensional capability gives a government organisational potential (Andrews *et al.*, 2016; Wu *et al.*, 2015). Holding that potential guarantees nothing about what stakeholders experience. Reading capability as latent potential follows Fukuyama's (2013) separation of governmental quality from outcomes, and it keeps the concept from being defined by whatever succeeded.

Before capability surfaces as business-facing governance, it has to travel: through administrative routines, cross-agency coordination, frontline discretion, and stakeholder interaction. A weaker fixed-effects association would not, on this account, show that capability is irrelevant. It would show something narrower — that contemporaneous within-province movements in the observed proxy do not map precisely onto movements in the outcome.

Classical implementation research provides a starting point for capability conversion. Policy objectives are translated through organisations whose routines, resources, discretion, and coordination determine what is delivered (Hill & Hupe, 2002; Lipsky, 1980; Matland, 1995; Pressman & Wildavsky, 1973; Winter, 2003). Collaborative and network governance research likewise shows that outcomes depend on how actors coordinate across organisational boundaries (Ansell & Gash, 2008; Provan & Kenis, 2008).

Policy-capacity research points the same way: analytical, operational, and political capacities have to complement one another, and whole-of-government reform demands coordination across administrative silos (Christensen & Lægreid, 2007; Wu *et al.*, 2015). Capability conversion is the name given here to that embedding of organisational potential in the routines and interactions stakeholders actually meet.

How far conversion goes varies. Where reform capacity is embedded consistently in firm-facing practice, it runs strong; where improvements stop at a few agencies or procedures, it is partial; and formal compliance that never reaches frontline delivery leaves it weak. All of this stays theoretical in the present study. Conversion is not observed as a mediator here, and no imprecise coefficient should be read as though it were.

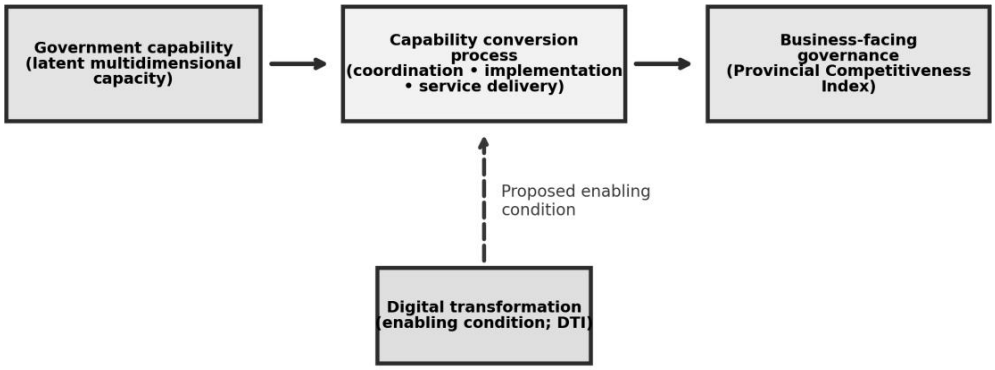
Vietnam's provinces suit this question because common national reforms sit alongside real variation in local implementation. In a post-socialist system that pairs central political authority with subnational economic responsibility, turning formal reform into firm-facing governance is part of institutional change, not a purely technical administrative exercise.

Digital transformation may make conversion more effective by supporting information exchange, process integration, monitoring, and user access. It is best read as organisational change enabled by technology, not as technological modernisation on its own (Mergel *et al.*, 2019; Vial, 2019).

DTI is not treated as an independent measure of government capability. It is an observed broad indicator of digital transformation that may complement administrative reform implementation capacity. Complementarity is reflected empirically in a positive PAR × DTI interaction, but the interaction does not directly measure coordination, adoption, or process redesign.

Whatever digital transformation enables, then, it enables conditionally. Integrated digital systems may reduce losses because administrative capacity is translated into services, whereas fragmented systems may simply automate existing routines. Digitalisation creates the possibility of more effective conversion; it does not guarantee it. Figure 1 summarises the resulting framework.

**Figure 1. Proposed Capability Conversion Perspective**




*Source:* Author's contribution.

### 1.3. Research hypotheses

The Capability Conversion Perspective frames the relationship between administrative reform implementation capacity and business-facing governance as a conditional association rather than a direct causal effect. Two hypotheses follow.
Implementation capacity for administrative reform and business-facing governance. Stronger implementation capacity should support more consistent routines and delivery, increasing the likelihood that firms perceive higher governance quality. PAR was used as the observed predictor and PCI as the business-facing outcome.
**H1.** *Administrative reform implementation capacity is positively associated with business-facing governance.*
Moderating role of digital transformation. Digital transformation can improve information integration, coordination, and responsiveness. If it complements the administrative reform implementation capacity, the positive PAR–PCI association should be stronger at higher levels of DTI.
**H2.** *Digital transformation positively moderates the relationship between administrative reform implementation capacity and business-facing governance, such that the positive association is stronger in provinces with higher levels of digital transformation.*

## 2. Research methodology

### 2.1. Research design, data and measurement

This study uses a provincial panel design to estimate the conditional associations between administrative reform implementation capacity and business-facing governance in Vietnam. The unit of analysis is province-year. Province fixed effects account for time-invariant provincial characteristics, whereas year fixed effects account for shocks common to all provinces. The study design is observational and did not identify causal effects.
The audited balanced panel covers all 63 provinces and centrally governed cities from 2019 to 2024, yielding 378 province-year observations for direct analysis. Moderation analysis used 2020-2024 because DTI is available from 2020 and produces 315 observations. The analysis stops in 2024 because the 2025 administrative restructuring changes provincial units and compromises comparability. PCI measures business-facing governance; PAR is the focal proxy for administrative reform implementation capacity; DTI captures digital transformation; and SIPAS and PAPI are used as alternative governance-related indicators. PII is descriptive only because its 2023-2024 coverage is too short for the same fixed-effects estimand.
Table 1 presents the definitions, operationalisation, and analytical roles of the variables used in this study.

**Table 1. Variable definitions**

| Construct | Indicator | Analytical role | Transformation | Coverage | Source |
|---|---|---|---|---|---|
| Business-facing governance | PCI | Outcome | Level | 2019-2024 | VCCI/USAID PCI reports |
| Administrative-reform implementation capacity | PAR Index | Focal predictor | Level; centred for interaction | 2019-2024 | Ministry of Home Affairs PAR reports |
| Digital transformation | DTI | Moderator | Level; centred for interaction | 2020-2024 | Official provincial DTI reports |
| Economic development | ln(GRDP per capita) | Adjustment variable | Natural logarithm | 2019-2024 | GSO/NSO |
| Population scale | ln(Population) | Adjustment variable | Natural logarithm | 2019-2024 | GSO/NSO |
| Urbanisation | Urbanisation rate | Adjustment variable | Level (%) | 2019-2024 | GSO/NSO |
| Human capital | Trained labour rate | Adjustment variable | Level (%) | 2019-2024 | GSO/NSO |
| FDI exposure | FDI registered capital | Extended adjustment | Inverse hyperbolic sine | 2019-2024 | Provincial FDI statistics |
| Fiscal capacity | Budget expenditure per capita | Extended adjustment | Natural logarithm | 2019-2024 | Ministry of Finance |
| Public-service satisfaction | SIPAS | Alternative indicator | Level | 2019-2024 | Ministry of Home Affairs |
| Citizen-assessed governance | PAPI | Alternative indicator | Level; complete-case | 2019-2024 | UNDP Viet Nam and partners |
| Provincial innovation | PII | Supplementary, time-limited | Level | 2023-2024 | Ministry of Science and Technology |

*Note.* Government capability is a latent multidimensional construct. PAR represents administrative reform implementation capacity. SIPAS and PAPI are alternative governance-related indicators that are not interchangeable proxies for the same latent capability. The control-variable coefficients are adjustment parameters rather than separate theoretical tests.
*Source:* Author's contribution.

PCI is conceptualised as business-facing governance (Vietnam Chamber of Commerce and Industry & USAID, 2025). PAR is used as a bounded proxy for administrative reform implementation capacity, not as the full empirical equivalent of government capability (Ministry of Home Affairs of Vietnam, 2025). DTI is a broad indicator of digital transformation and the proposed moderator (Ministry of Information and Communications of Vietnam, n.d.). PCI totals for 2019-2022 were taken from published workbooks. Because the source files for 2023-2024 do not report the totals for all 63 provinces, they were deterministically reconstructed from component scores using the official formula and weights and are flagged in the audited dataset. GRDP per capita and population are log-transformed; FDI capital uses an inverse hyperbolic sine to accommodate zero and skewed values. Controls were obtained from official statistics (General Statistics Office of Vietnam, n.d.). SIPAS and PAPI provide construct-distinct sensitivity checks (CECODES *et al.*, 2025; Ministry of Home Affairs of Vietnam, 2025).

## 2.2. Econometric specification

The baseline specification is as follows:

$$PCI_{it} = \alpha + \beta_1 PAR_{it} + X_{it}'\gamma + \mu_i + \lambda_t + \varepsilon_{it}$$

The moderation specification adds DTI and the PAR × DTI interaction:

$$PCI_{it} = \alpha + \beta_1 PAR^{c}_{it} + \beta_2 DTI^{c}_{it} + \beta_3 (PAR^{c}_{it} \times DTI^{c}_{it}) + X_{it}'\gamma + \mu_i + \lambda_t + \varepsilon_{it}$$

where $PCI_{it}$ is the observed Provincial Competitiveness Index score used as a measure of business-facing governance in province i and year t; $PAR_{it}$ is the PAR Index, used as a bounded indicator of administrative reform implementation capacity; $DTI_{it}$ is the Provincial Digital Transformation Index; $X_{it}$ is a vector of time-varying controls; $\mu_i$ and $\lambda_t$ denote province and year fixed effects; and $\varepsilon_{it}$ is the idiosyncratic error term. In the moderation model, $PAR^{c}_{it}$ and $DTI^{c}_{it}$ are grand-mean-centred within the DTI estimation sample. Thus, $\beta_1$ is the conditional PAR–PCI association at mean DTI, $\beta_2$ is the conditional DTI–PCI association at mean PAR, and $\beta_3$ is the interaction coefficient used to test H2. Standard errors are clustered at the province level.

D3 is the preferred baseline model and includes province and year fixed effects plus pre-specified core controls. M3 is the preferred moderation model for the DTI-available sample. D4 and M4 add FDI and budget expenditure as sensitivity specifications.

Two-way fixed-effects models take priority because the analysis concerns within-province change over time, with pooled models as benchmarks and province-clustered standard errors addressing heteroscedasticity and serial correlation. Coefficients are read as conditional associations. Partial within $R^2$ is the proportional reduction in the residual sum of squares relative to the fixed-effects-only benchmark, describing what the observed regressors contribute to within-province variation.

Sensitivity analyses use SIPAS and PAPI as alternative governance-related indicators, one-year lags, alternative FDI measurement, exclusion of flagged budget observations, within-year standardisation, leave-one-province-out estimation, and

exclusion of 2022. The audited dataset flags methodological changes in both PAR and DTI in 2022. Year fixed effects absorb nationwide level shifts but not potentially uneven province-specific sensitivity to redesign. The within-year and year-exclusion checks assess whether the conclusion depends on the flagged measurement regime.

## 3. Research results and discussions

### 3.1. Descriptive evidence and baseline results

The analysis included 378 observations for all 63 provinces over 2019-2024. The DTI moderation sample included 315 observations over 2020-2024.
Mean PCI is 65.74 (SD = 3.03, range = 56.29-75.09); mean PAR is 85.23 (SD = 3.48, range = 73.20-96.17); and mean DTI is 0.53 (SD = 0.17, range = 0.21-0.84). PAR correlates with PCI at r = .550, and DTI correlates with PCI at r = .512. The largest control-variable correlation is between ln(GRDP per capita) and urbanisation (r = .645), and all planned-model VIF values are below 5. These statistics describe the sample and do not test the hypotheses.
Table 2 lists the nested baseline sequence. D0 is a pooled benchmark with year fixed effects. D1–D4 add province and year fixed effects, with D3 retained as the preferred adjusted specification and D4 as an extended sensitivity model.

**Table 2. Baseline regression results (dependent variable: PCI)**

| Variable | D0 Pooled | D1 Unadjusted FE | D2 Core controls | D3 Preferred adjusted | D4 Extended sensitivity |
|---|---|---|---|---|---|
| PAR Index | 0.528*** (0.108) | 0.153* (0.075) | 0.125 (0.080) | 0.106 (0.079) | 0.099 (0.079) |
| ln(GRDP per capita) | -- | -- | 9.193** (2.547) | 8.321*** (2.322) | 7.934*** (2.367) |
| ln(Population) | -- | -- | 3.296 (13.720) | 1.279 (12.729) | 1.514 (13.123) |
| Urbanisation rate | -- | -- | -- | −0.125** (0.041) | −0.130** (0.041) |
| Trained labour rate | -- | -- | -- | 0.165* (0.077) | 0.165* (0.079) |
| IHS(FDI capital) | -- | -- | -- | -- | −0.008 (0.048) |
| ln(Budget per capita) | -- | -- | -- | -- | 0.910 (0.689) |
| Province FE | No | Yes | Yes | Yes | Yes |

| Variable | D0 Pooled | D1 Unadjusted FE | D2 Core controls | D3 Preferred adjusted | D4 Extended sensitivity |
|---|---|---|---|---|---|
| Year FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 378 | 378 | 378 | 378 | 378 |
| Provinces | 63 | 63 | 63 | 63 | 63 |
| $R^2$ | 0.329 | 0.737 | 0.754 | 0.764 | 0.767 |

*Note.* Entries are unstandardised coefficients with province-clustered standard errors in parentheses. * p < .05; ** p < .01; *** p ≤ .001. The coefficients are conditional associations. The reported estimates and $R^2$ values were cross-checked against the supplied analysis dataset and locked result workbooks.

*Source:* Author's contribution.

The pooled benchmark D0 shows a positive PAR–PCI association (b = 0.528, SE = 0.108, p < .001), but it combines persistent cross-provincial differences with within-province change. After province fixed effects are added to D1, the coefficient falls to 0.153 (SE = 0.075, p = .045), less than one-third of the pooled estimate. This difference suggests that stable cross-provincial characteristics account for a substantial share of the pooled association.

With time-varying controls, the PAR coefficient is 0.125 (SE = 0.080, p = .122) in D2 and 0.106 (SE = 0.079, 95% CI [−0.051, 0.264], p = .183) in the preferred model D3. A one-point within-province increase in PAR is associated with an estimated 0.106-point increase in PCI, but the confidence interval includes zero. The adjustment coefficients in D3 are not interpreted as separate theoretical tests.

D4 adds registered FDI capital and budget expenditure per capita. The PAR coefficient remains similar at 0.099 (SE = 0.079, p = .216), and neither added variable is statistically discernible. As the preferred D3 estimate is positive but imprecise, H1 is not supported. This finding does not demonstrate that the true association is zero.

### 3.2. Moderation analysis

Table 3 reports the moderation models that examine whether digital transformation conditions the within-province association between administrative reform implementation capacity and business-facing governance. Because the DTI series is available from 2020 onwards, Models M1–M4 were estimated using a balanced panel of 315 province-year observations. PAR and DTI are grand-mean-centred before constructing the interaction term.

In M1, the PAR × DTI estimate is effectively zero (b = −0.000, SE = 0.303). In the preferred model M3, the interaction is 0.167 (SE = 0.315, 95% CI [−0.463, 0.797], p = .599). At mean DTI, the conditional PAR coefficient is 0.073 (SE = 0.083); at

mean PAR, the conditional DTI coefficient is 3.662 (SE = 3.467). M4 leaves the interaction similar at 0.158.

**Table 3. Moderation regression results (dependent variable: PCI)**

| Variable | M1 Baseline moderation | M2 Core controls | M3 Preferred adjusted | M4 Extended sensitivity |
|---|---|---|---|---|
| PAR (at mean DTI) | 0.105 (0.081) | 0.090 (0.085) | 0.073 (0.083) | 0.068 (0.082) |
| DTI (at mean PAR) | 4.115 (3.743) | 3.553 (3.503) | 3.662 (3.467) | 3.581 (3.569) |
| PAR × DTI | −0.000 (0.303) | 0.140 (0.308) | 0.167 (0.315) | 0.158 (0.327) |
| Core structural controls | No | Yes | Yes | Yes |
| Urbanisation & trained labour | No | No | Yes | Yes |
| IHS(FDI) & ln(Budget) | No | No | No | Yes |
| Province FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Observations | 315 | 315 | 315 | 315 |
| $R^2$ | 0.762 | 0.778 | 0.785 | 0.788 |
| Partial within $R^2$ | 0.023 | 0.089 | 0.116 | 0.128 |

*Note.* PAR and DTI are grand-mean centred. Entries are unstandardised coefficients with province-clustered standard errors in parentheses. The PAR × DTI coefficient is a confirmatory moderation test. No focal coefficient was statistically discernible at $p < .05$.

*Source:* Author's contribution.

Table 4 sets out the conditional association across the observed DTI support. The estimate rises from 0.019 at the minimum to 0.123 at the maximum, but every 95% confidence interval includes zero and no Johnson–Neyman significance region appears. The upward pattern is descriptive; it does not establish moderation.

**Table 4. Conditional association of PAR with PCI across the observed DTI distribution**

| DTI point | DTI value | Marginal PAR association | Clustered SE | 95% CI | p |
|---|---|---|---|---|---|
| Minimum | 0.211 | 0.019 | 0.109 | [−0.199, 0.237] | .863 |
| Q1 | 0.357 | 0.043 | 0.084 | [−0.124, 0.211] | .606 |
| Median | 0.563 | 0.077 | 0.086 | [−0.095, 0.250] | .372 |

| DTI point | DTI value | Marginal PAR association | Clustered SE | 95% CI | p |
|---|---|---|---|---|---|
| Mean | 0.533 | 0.073 | 0.083 | [−0.093, 0.238] | .384 |
| Q3 | 0.678 | 0.097 | 0.106 | [−0.116, 0.309] | .367 |
| Maximum | 0.837 | 0.123 | 0.145 | [−0.167, 0.414] | .399 |

*Note.* Conditional associations were calculated from M3. Every 95% confidence interval included zero, and no Johnson–Neyman significance region existed within the observed DTI support.

*Source:* Author's contribution.

The moderation models provide no statistically discernible evidence that digital transformation strengthens the within-province PAR–PCI association, so H2 is not supported. This conclusion denotes imprecise evidence, not proof, that the true interaction equals zero.

### 3.3. Robustness analyses

Table 5 shows whether the conclusions from D3 and M3 depend on alternative indicators, timing, control measurement, sample treatment, or scaling.

**Table 5. Robustness checks**

| Category | Specification | Focal term | Estimate | SE | 95% CI | p | N |
|---|---|---|---|---|---|---|---|
| Timing | One-year-lagged PAR, D3 specification | L1 PAR | 0.138 | 0.093 | [−0.047, 0.323] | .142 | 315 |
| Timing | One-year-lagged PAR × DTI, M3 specification | L1 PAR × DTI | −0.412 | 0.338 | [−1.087, 0.263] | .227 | 252 |
| FDI measurement | D4 using FDI project count | PAR | 0.100 | 0.079 | [−0.057, 0.257] | .209 | 378 |
| FDI measurement | M4 using FDI project count | PAR × DTI | 0.178 | 0.319 | [−0.460, 0.816] | .579 | 315 |
| Budget measurement | D4 excluding mixed-basis records | PAR | 0.086 | 0.078 | [−0.070, 0.241] | .274 | 374 |

| Category | Specification | Focal term | Estimate | SE | 95% CI | p | N |
|---|---|---|---|---|---|---|---|
| Budget measurement | M4 excluding mixed-basis records | PAR × DTI | 0.116 | 0.331 | [−0.546, 0.778] | .727 | 311 |
| Scale sensitivity | M3 with within-year standardised PAR and DTI | zPAR × zDTI | 0.090 | 0.169 | [−0.248, 0.428] | .597 | 315 |
| Revision check | D3 excluding 2022 method-change year | PAR | 0.136 | 0.095 | [−0.054, 0.327] | .157 | 315 |
| Revision check | M3 excluding 2022 method-change year | PAR × DTI | 0.172 | 0.334 | [−0.497, 0.840] | .609 | 252 |
| Revision check | D3 with within-year standardised PAR | zPAR | 0.289 | 0.204 | [−0.118, 0.696] | .161 | 378 |

*Note.* Unless indicated otherwise, the models include province and year fixed effects with province-clustered standard errors. Every reported confidence interval included zero. SIPAS and PAPI are construct-distinct governance-related indicators. PII is omitted because its 2023-2024 panel (N = 126) does not support the same fixed-effects estimand. Rows labelled 'Revision check' were recomputed from the supplied analysis dataset during the manuscript revision.

*Source:* Author's contribution.

Alternative governance-related indicators. Replacing PAR with SIPAS produces a negative, imprecise direct coefficient (b = −0.056, p = .342) and a near-zero interaction (b = 0.020, p = .943). PAPI produces a positive, imprecise direct coefficient (b = 0.124, p = .117) and a negative, imprecise interaction (b = −0.578, p = .273). The differing signs underline that administrative reform, service satisfaction, and citizen-assessed governance are related but non-equivalent constructs.

Temporal and measurement regime sensitivity. With a one-year lag, the direct PAR estimate remains positive (b = 0.138, p = .142), while the interaction changes sign and remains imprecise (b = −0.412, p = .227). A one-year lag did not change the substantive conclusion. Excluding the flagged method-change year 2022 also leaves the inference unchanged: the D3 PAR coefficient is 0.136 (SE = 0.095, p = .157), and the M3 interaction is 0.172 (SE = 0.334, p = .609).

FDI and budget sensitivity. Replacing FDI capital with project count (PAR: b = 0.100, p = .209; interaction: b = 0.178, p = .579) and excluding four flagged

mixed-basis budget observations (PAR: b = 0.086, p = .274; interaction: b = 0.116, p = .727) leaves the focal estimates substantively similar.

Scale sensitivity. Standardising PAR within each year produces a positive but imprecise direct coefficient (b = 0.289, SE = 0.204, p = .161). Standardising both PAR and DTI within each year produced an imprecise interaction (b = 0.090, p = .597), consistent with M3. These checks reduce sensitivity to common annual scale shifts but do not fully resolve the potential province-specific effects of index redesign.

Influence sensitivity. Re-estimating D3 and M3 while omitting one province at a time yielded D3 PAR coefficients from 0.076 to 0.131 (median = 0.106; all positive; p = .093-.314) and M3 interactions from 0.069 to 0.329 (median = 0.166; all positive; p = .236-.831). No single province drove the preferred estimates.

Overall Robustness Assessment. The positive but imprecise PAR coefficient is stable across timing, FDI, budget, scaling, measurement regime, and influence checks. Construct-distinct alternative indicators produce varying directions, but none supports H1 or H2. The evidence remains imprecise rather than establishing null effects.

### 3.4. Discussions

Higher PAR goes with more favourable PCI across provinces. Narrowing the lens to within-province change and the association shrinks and blurs. On the CCP reading, PAR is a bounded indicator of administrative reform implementation capacity and PCI is the governance firms experience. Hence the relevant question is whether a year's movement in one administrative indicator shows up contemporaneously in an external outcome — not whether government capability matters in the abstract.

H1 was not supported, but the PAR coefficient remained positive across the preferred sequence. The contrast between pooled and fixed-effects estimates suggests that persistent provincial characteristics, such as durable leadership practices, institutional quality, or business–government relationships, may underpin much of the cross-sectional association. Annual PAR changes may also be too narrow or recent to alter firm perceptions. Because PAR does not capture government capability as a whole and PCI is a stakeholder assessment, imperfect construct alignment is another plausible explanation. These interpretations remain propositions for future research.

H2 is also not supported. DTI may track broad digital development more closely than the particular services and regulatory encounters that matter to firms, and complementary assets — staff skills, data quality, process redesign, interagency coordination — may have to be in place before digital systems change what stakeholders experience (Mergel et al., 2019; Vial, 2019). The bounded conclusion: in this panel DTI does not discernibly strengthen the within-province PAR–PCI association, which is not evidence that digital transformation is ineffective.

Theoretically, the analysis does four things. It separates capability possession from capability realisation and names conversion as an organisational process; it holds

persistent cross-provincial configurations apart from short-run within-province change; it argues for a conditional rather than automatic view of digital transformation; and it shows how a single national reform programme can coexist with markedly uneven local economic governance in a post-socialist setting.

None of this argues for abandoning reform indices. It argues for tying them more closely to what firms actually encounter. Provincial monitoring works better when compliance indicators sit alongside evidence on implementation depth, service use, and business experience. Digital transformation, likewise, is best managed as organisational reform — platforms linked to process redesign, staff capability, interoperability, and user-oriented delivery. Agencies can map PAR and DTI initiatives onto the concrete bottlenecks firms report, while keeping in view that PAR, DTI, and PCI measure related but distinct domains. Nothing in these estimates implies that moving any single index will mechanically move PCI.

Several limitations qualify these findings. The design is observational and identifies no causal effects. Six years may be too short a window for capability accumulation and digital integration to register in firm perceptions. Aggregate indices measure neither coordination, nor implementation depth, nor the administrative encounters of individual firms. The audited dataset flags methodological changes in PAR and DTI in 2022; year fixed effects, within-year standardisation, and exclusion of 2022 reduce the resulting comparability concerns without eliminating them. PCI totals for 2023-2024 are reconstructed from official components and weights rather than copied from a complete published series. CCP, finally, is an interpretive framework, not an estimated mediator. Extending the period, testing measurement invariance or linked index series, and pairing panel data with organisational, process, and firm-level evidence are all worth pursuing.

## 4. Conclusions

PAR was positively associated with PCI in the pooled models, but the coefficient became smaller and statistically imprecise in the preferred two-way fixed-effects model. The PAR × DTI interaction was also positive and imprecise in the preferred specification, with no statistically discernible conditional regions. Thus, H1 and H2 were not supported.

A capability conversion gap fits these results, though nothing here measures that mechanism directly. Before firms can experience administrative capacity, it has to be embedded — in routines, in coordination, in digital integration, in what reaches the counter. That is much of why one national reform programme coexists with provincial economic governance of very uneven quality.

Movements in policy indices mean more when they can be tied to something firms would notice in their dealings with the administration. Testing when conversion actually happens, and whether digital transformation supplies the complementary conditions it needs, will take longer panels and process-level measurement.

What the paper offers, then, is a conditional account of subnational governance in a post-socialist economy. Administrative reform and digital transformation may well

support modernisation. Neither, on its own, guarantees that the business environment improves quickly or evenly.

## Conflict of interest

The author has no commercial or financial interest that could be construed as a conflict.

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