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# Coupling Mechanisms in Digital Transformation Systems: A TOE-Based Multi-Level Study of MNE Subsidiary Performance

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**Abstract**

This study explores how headquarters (HQ) digital transformation affects foreign subsidiaries' performance in emerging market multinational enterprises (EMNEs). Based on the Technology–Organization–Environment (TOE) framework, parenting advantage theory, and loose coupling theory, we propose a multi-level contingency model. Using unbalanced panel data from 5543 foreign subsidiaries of Chinese A-share listed firms (2011–2021), we find that HQ digital transformation significantly improves subsidiary performance. However, this effect is shaped by key organizational and environmental factors. At the organizational level, excessive HQ control weakens the positive impact, while business group affiliation strengthens it. At the environmental level, strong intellectual property rights (IPR) protection enhances the benefits of digital transformation, whereas advanced host-country digital infrastructure substitutes internal support, reducing the effect. Robustness checks with alternative measures and instrumental variable estimation confirm our results. Theoretically, this study opens the "black box" of intra-MNE digital value transmission and identifies boundary conditions under which digital parenting is effective. Practically, it offers insights for EMNEs on optimizing digital strategies amid governance complexity and institutional diversity.

**Keywords:** digital transformation; subsidiary performance; digital parenting advantage; Technology–Organization–Environment (TOE) framework; cross-border digital governance; host-country digital infrastructure

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## 1. Introduction

Digital transformation is fundamentally reshaping the global business landscape and has become a core strategic agenda for firms seeking competitive advantage [1,2]. The wave of digital technologies—represented by artificial intelligence, big data, and the Internet of Things—not only drives the emergence of new production paradigms such as Industry 4.0 [3,4] but also compels firms to undertake deep transformations in their operations, innovation, and value creation processes [5]. For multinational enterprises (MNEs), navigating this digital transformation has become a central strategic issue, further intensifying the classic dilemma of balancing global integration with local responsiveness in an increasingly volatile market environment [6]. Consequently, how to coordinate the relationship between headquarters (HQ) and foreign subsidiaries has become a key determinant of MNE success or failure.

At the academic level, existing literature has widely confirmed the positive impact of digital transformation. Studies have shown that digitalization enhances overall firm

performance by improving productivity, optimizing resource allocation, and facilitating innovation [7,8]. In the international business domain, digital technologies are also seen as key enablers of reducing cross-border transaction costs and empowering "born global" firms [9,10]. However, most of these studies focus on the firm level as a whole. The value of HQ-level digital transformation—how it is transmitted through internal mechanisms and ultimately affects the performance of foreign subsidiaries, the core operational units of MNEs—remains largely an underexplored "black box" [11] that urgently needs to be opened.

Unpacking this "black box" requires examining the complex internal governance contexts of MNEs. At the organizational level, two governance mechanisms may profoundly shape the transmission of HQ digital advantage. First, corporate governance research has long focused on agency problems arising from the separation of ownership and control [12]. Under digital transformation, these issues become even more pronounced: digital systems may facilitate decentralization by lowering information costs [13], yet can also be co-opted by self-interested controlling shareholders as tools for excessive control and resource appropriation [14]. Second, business group affiliation constitutes another critical governance context. While internal networks of business groups can provide resource support to subsidiaries, they may also incur coordination costs and internal conflicts of interest [15]. However, research has yet to systematically examine whether these two governance mechanisms amplify or weaken the positive effects of HQ digital transformation on subsidiary performance.

At the environmental level, the host-country institutional environment in which subsidiaries are embedded represents another set of key contingency factors. Institutional theory has long emphasized that host-country institutions are core variables shaping subsidiary strategies and performance [16]. A rich body of literature has examined how intellectual property rights (IPR), as a formal institution, directly influence MNEs' technology transfer and innovation decisions [17,18]. Meanwhile, emerging studies have begun to explore the role of informal institutions such as digital infrastructure [19]. Yet, most existing research treats IPR and digital infrastructure as direct "drivers" of MNE behavior while neglecting their potential roles as dynamic "contextual factors" that moderate (i.e., strengthen or weaken) the effectiveness of internal strategic initiatives such as HQ digital transformation. This oversight limits our understanding of why digital strategies yield heterogeneous performance across different institutional environments.

To address these research gaps, this study develops a multi-level contingency model. We integrate the Technology–Organization–Environment (TOE) framework with insights from parenting advantage theory [20] and loose coupling theory [21]. We argue that HQ digital transformation aims to generate a new type of "digital parenting advantage," but the realization of such an advantage depends on whether MNEs can achieve an "optimal coupling state" between internal governance and external environments. Specifically, we examine the moderating effects of HQ excessive control and business group affiliation (organizational level), as well as host-country digital infrastructure and IPR protection strength (environmental level). We empirically test our theoretical model using unbalanced panel data on 5543 foreign subsidiaries of Chinese A-share listed firms from 2011 to 2021.

This study makes three main theoretical contributions. First, by focusing on the HQ–subsidiary relationship, it opens the "black box" of internal digital value creation within MNEs, thereby enriching our understanding of intra-MNE management and knowledge transfer mechanisms in the digital era [22]. Second, the study identifies and tests key organizational and environmental moderators, systematically revealing the boundary conditions under which HQ digital transformation is effective, and offering new theoretical perspectives for explaining the heterogeneous outcomes of digital strategies. Third, by

using the TOE framework to integrate cross-level factors, and embedding concepts from parenting advantage and loose coupling theories, we offer a more inclusive and explanatory analytical framework for future research while also providing practical guidance for MNE managers implementing digital strategies in complex global environments.

## 2. Theoretical Background and Hypotheses

### *2.1. Theoretical Framework*

The relationship between the headquarters (HQ) of multinational enterprises (MNEs) and their foreign subsidiaries has long been a central topic in international business (IB) research. This relationship essentially constitutes a principal–agent structure, in which the HQ acts as the principal, exerting control over its subsidiaries and their managers (agents) to ensure alignment with the firm's overall strategic objectives [23]. To mitigate agency costs arising from information asymmetry and goal divergence [24], HQs often increase equity ownership and establish hierarchical governance structures to strengthen oversight and resource allocation [25,26]. However, high levels of equity control can be double-edged. On one hand, they may constrain subsidiaries' decision-making autonomy and reduce responsiveness to host-country market conditions, potentially undermining performance [27]. On the other hand, centralized control can enhance subsidiaries' interactions with external financial environments, particularly their access to financing [28].

Digital transformation is increasingly recognized as a key firm-specific advantage (FSA) in IB literature, yet we know little about how the value of such digital capabilities is transmitted—or diluted—within MNEs. Existing studies either emphasize the direct performance effects of technological attributes or focus on external institutional conditions. Both streams, however, tend to overlook the organizational channels and contingency factors that shape the realization of digital value between HQ and subsidiaries, leaving a theoretical gap in understanding how HQ digital strategy interacts with governance and institutional contexts.

To address this gap, we develop a multilevel theoretical framework grounded in the Technology–Organization–Environment (TOE) paradigm, parenting advantage theory, and loose coupling theory. These perspectives collectively highlight how HQ-level digital initiatives, internal governance mechanisms, and external institutional environments jointly influence subsidiary-level outcomes.

From the TOE perspective, digital transformation represents a technology-driven force whose effectiveness depends on organizational and environmental contingencies. Parenting advantage theory conceptualizes HQ digital transformation as a "digital parenting advantage"—a unique capability that enables HQ to create value for subsidiaries through superior coordination, resource allocation, and knowledge transfer. Loose coupling theory, however, cautions that this advantage is not automatically realized; its impact depends on maintaining an optimal balance between HQ oversight and subsidiary autonomy.

We propose that HQ digital transformation enhances foreign subsidiaries' performance by improving internal knowledge flows, reducing transaction costs, and enabling more responsive decision-making. Yet, this positive effect is contingent on both organizational and environmental factors. Excessive HQ control may create a governance misfit, restricting local autonomy and diminishing the benefits of digital empowerment. In contrast, affiliation with a business group provides network-based support that complements digital parenting advantages and strengthens value-creation capability. Externally, advanced host-country digital infrastructure may substitute for HQ digital investments, weakening internal coupling, while strong intellectual property rights (IPR) protection fosters trust and facilitates in-depth digital knowledge transfer.

The conceptual framework is shown in Figure 1.

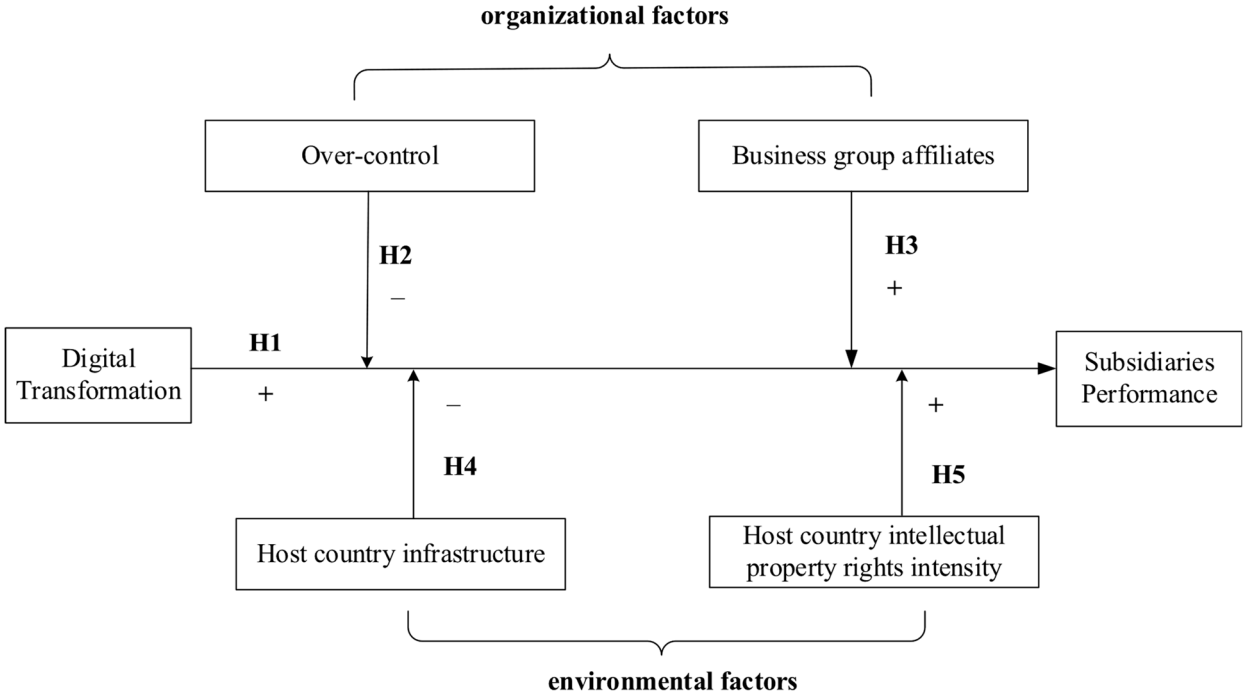



**Figure 1.** Conceptual framework.

### *2.2. Hypothesis Development*

#### 2.2.1. The Direct Effect of HQ Digital Transformation on Foreign Subsidiaries Performance

Drawing on loose coupling theory and parenting advantage theory, we argue that HQ digital transformation constitutes a powerful "digital parenting advantage" in the new era, enabling multinational enterprises (MNEs) to achieve an optimal balance between global integration and local responsiveness [6]. Digital platforms can establish tighter couplings by standardizing data and processes to ensure strategic consistency across the entire MNE (tight coupling); at the same time, by providing foreign subsidiaries with rich, real-time information, these platforms also enable the looser coupling necessary for autonomous and adaptive responses to local market dynamics (loose coupling) [13,29].

First, this digital parenting advantage is reflected in the promotion of cross-border information and knowledge sharing. Digital transformation enables MNEs to more effectively collect data and information from their global foreign subsidiaries, facilitating cross-border information transfer and knowledge sharing [10]. This reduces information asymmetry and enhances global resource coordination capabilities [30]. Specifically, digital technologies create "internal markets" that allow HQ and foreign subsidiaries to efficiently share critical information such as knowledge, technology, and customer feedback [31]. With the widespread adoption of digital technologies, information transmission becomes more real-time and transparent [32], reducing decision-making uncertainty and enhancing HQ's ability to monitor and support subsidiary operations. For example, HQ can use cloud platforms, data visualization tools, and artificial intelligence to build internal digital systems or programs [3]. These systems allow real-time access to and sharing of subsidiaries' operational data [10], enabling more accurate assessments of market performance, identification of potential customer segments [5], and provision of more targeted support. Meanwhile, digital transformation enhances knowledge management capabilities and promotes global knowledge flow and transfer [33,34]. Through digital platforms, HQ can leverage technology to mine market intelligence [4], disseminating the latest market insights, technological innovations, and managerial practices to its foreign subsidiaries. This not only reduces

strategic decision-making uncertainty but also helps optimize operations, strengthens HQ support, and ultimately improves performance [5,30].

Second, HQ digital transformation reduces costs related to resource coordination and external information search [4,35], thereby improving resource utilization efficiency and enhancing internal communication within subsidiaries [36]. Traditionally, time zone differences and geographic distance have posed major challenges [9]. However, digital transformation enables more efficient and effective communication, alleviating geographic constraints and reducing transaction costs [9]. For example, through collaborative office systems, instant messaging tools, and automated management platforms, communication between HQ and subsidiaries becomes more streamlined, reducing communication costs and management complexity [35]. HQ can allocate financial capital, technology, and human resources more effectively [37] thereby supporting subsidiaries in achieving greater innovation and competitiveness. These saved resources can be reinvested into strategic planning to further promote subsidiary growth and enhance their competitiveness in local markets [4]. Therefore, we propose the following:

**Hypothesis 1:** *HQ's digital transformation is positively related to foreign subsidiaries performance.*

#### 2.2.2. The Moderating Role of Organizational Factors: Over Control and Business Groups

However, the realization of digital parenting advantages depends on the "parenting approach" adopted by the HQ and the organizational context in which it operates. We argue that excessive control by the HQ constitutes a form of "parenting disadvantage" that pushes the organizational system into an overly rigid and harmful tightly coupled state, thereby negatively moderating the effects of digital transformation.

First, such excessive tight coupling distorts the empowering nature of digital tools and impedes effective knowledge sharing. Under a governance logic characterized by severe separation between ownership and control, controlling shareholders tend to exploit the transparency brought by digitalization to strengthen micro-level bureaucratic control, rather than granting the necessary decision-making autonomy [38,39]. This distortion turns digital platforms from empowerment tools into surveillance tools. Once subsidiary managers perceive this shift, their behavior tends to shift from value creation to risk avoidance, thereby undermining the subsidiary's innovation dynamism in the local market [11]. More importantly, this rigid control model transforms knowledge delivered via digital platforms into top-down "rigid instructions" rather than flexible, actionable resources [40]. Even when subsidiaries gain access to knowledge, their ability to absorb and utilize it is significantly weakened due to a lack of autonomy to adapt such knowledge to local market needs [41,42]. As a result, the value of knowledge cannot be effectively transformed into a competitive advantage.

Second, excessive control by the HQ offsets the efficiency gains brought by digital transformation through increased agency costs and distorted resource allocation. While digital transformation is expected to significantly reduce the management and transaction costs of cross-border operations [36], in environments characterized by high separation between ownership and control, controlling shareholders are incentivized to leverage their position to allocate the efficiency gains and saved resources resulting from digitalization through internal capital markets in ways that benefit themselves, rather than optimizing resource distribution based on the market potential and performance of subsidiaries [43]. Prior studies have shown that excessive control may lead to performance deterioration due to resource expropriation [44]. For example, controlling shareholders may engage in related-party transactions to tunnel resources or withhold dividends from high-performing subsidiaries for private purposes [45]. In such contexts, the accurate data and efficient coor-

dination made possible by digital systems may instead be instrumentalized for tunneling behavior, ultimately undermining the long-term development of the subsidiary.

**Hypothesis 2:** *HQ overcontrol (i.e., separation of ownership and control) negatively moderates the relationship between HQ digital transformation and foreign subsidiaries' performance.*

In contrast to over-control, we argue that business group (BG) affiliation can foster a healthier and more resilient loosely coupled state by providing a supportive network and resource environment, thus positively moderating the effects of digital parenting advantage.

From the perspective of information and knowledge sharing, HQs within BGs are typically embedded in structured internal networks [46] BGs integrate the resources of their member firms [15], creating an efficient network for information flow and knowledge exchange [47]. This networked organizational structure supplements formal digital coupling between HQ and foreign subsidiaries with informal, trust-based mechanisms, making the coupling relationship more resilient. Such an embedded structure enables the digital technologies and management experience accumulated during HQ digital transformation to more rapidly spill over to foreign subsidiaries [48]. This, in turn, enhances HQ's ability to share information and provide strategic guidance to its foreign subsidiaries [33]. Through this mechanism, foreign subsidiaries are more likely to understand HQ's digital strategy and engage in localized innovation based on it—for example, using big data analytics to identify high-value customer segments [5]—ultimately improving their operational efficiency and performance [49].

From the perspective of resource coordination and cost reduction, BGs are often capable of centrally deploying IT infrastructure, technical talent, and digital platforms [50], which significantly lowers the barriers for foreign subsidiaries to access key digital resources such as AI and big data technologies. HQs within BGs can extend their digital transformation resources to foreign subsidiaries more economically and efficiently [51], thereby reducing transaction costs related to information search, decision-making, and business coordination [35]. This enhances subsidiaries' ability to integrate local resources, reduces redundancy and waste, and ultimately improves their market responsiveness and performance [48] (Zeng et al., 2022). Moreover, the internal markets and social capital networks built by BGs help mitigate information asymmetries in the knowledge transfer process between HQ and foreign subsidiaries, further improving the effectiveness of digital strategy dissemination at the subsidiary level [52]. Therefore, we propose the following:

**Hypothesis 3:** *Business group affiliation positively moderates the relationship between HQ digital transformation and foreign subsidiaries' performance.*

#### 2.2.3. The Moderating Role of Environmental Factors: Host Country Digital Infrastructure (HDI) and IPR

We argue that advanced digital infrastructure in host countries enhances the "external coupling" between subsidiaries and the local ecosystem, thereby substituting the "internal coupling" between HQ and subsidiaries and, consequently, weakening the relative value of the digital parenting advantage.

In countries with advanced digital infrastructure (e.g., high-speed networks, local data service providers, and cloud platform support), subsidiaries can obtain high-quality market intelligence and customer data directly from the external environment at a lower cost [53,54]. For example, subsidiaries can leverage local data analytics firms or engage directly with local consumers through open digital platforms and social media channels [55]. Many tasks that previously depended heavily on HQ's internal coordination and information

systems can now be managed via these externalized digital networks and locally accessible tools [33,37]. This enhanced capability of local information acquisition essentially reduces subsidiaries' dependence on HQ's internal information channels, thereby diminishing the positive impact of HQ digital transformation on foreign subsidiaries' performance [32].

Second, advanced digital infrastructure in the host country facilitates local knowledge acquisition and spillovers, reducing the need for HQ-led knowledge transfer. In regions with national-level digital infrastructure, there often exist active knowledge clusters and entrepreneurial ecosystems, enabling subsidiaries to access new knowledge and innovation resources through diversified channels [56]. For instance, subsidiaries can participate in local online seminars, tech forums, or industrial exchange events to acquire cutting-edge technologies and managerial know-how [55], thus supporting product innovation and technological upgrading [57]. In this process, subsidiaries gain knowledge through local embeddedness, thereby reducing their reliance on HQ support and further weakening the value of HQ digital transformation in knowledge sharing and management.

Finally, advanced host-country digital infrastructure also reduces communication and coordination costs, thus diminishing the marginal cost-saving advantages brought by HQ digitalization [32]. Technologies such as cloud computing and high-speed internet allow MNEs to use globally accessible resources as substitutes for HQ-exclusive systems [33]. Subsidiaries can treat these digital networks as new governance mechanisms and collaborate more autonomously with both HQ and external partners in resource control and cost management [37]. Under such circumstances, the marginal value of the digital parenting advantage in reducing transaction and communication costs gradually declines. Therefore, we propose the following:

**Hypothesis 4:** *Host-country digital infrastructure negatively moderates the relationship between HQ digital transformation and foreign subsidiaries' performance.*

The "quality" and "depth" of the coupling relationship between HQ and subsidiaries depend heavily on the level of trust and security within that relationship. We argue that the strength of intellectual property rights (IPR) protection in the host country, as a key formal institution, directly determines the quality of digital coupling between HQ and foreign subsidiaries.

Digital transformation relies heavily on the transfer and sharing of intangible knowledge and information, such as data, algorithms, processes, and platforms. When host countries possess strong IPR protection, they typically have robust legal frameworks that effectively safeguard the digital assets transferred from HQ against infringement or illegal imitation [58]. This reduces HQ's concerns about knowledge leakage, making it more willing to engage in deeper and higher-value coupling by sharing its core digital technologies and managerial expertise with foreign subsidiaries [17]. In such environments, subsidiaries benefit from improved access to advanced knowledge and technologies, which in turn enhances their performance [18,59]. In contrast, in countries with weak IPR protection, concerns over patent infringement and lack of legal enforcement may prompt HQ to maintain shallow, low-trust coupling relationships. This makes it difficult for subsidiaries to effectively utilize proprietary technologies from HQ, thereby complicating digital knowledge sharing [60].

Second, in weak IPR environments, the risk of knowledge leakage and intellectual property theft rises significantly. In such cases, HQs, out of concern for the protection of core digital assets (e.g., proprietary algorithms, critical data), are more likely to maintain shallow, low-trust coupling relationships. HQs may restrict core digital investments in subsidiaries and avoid sharing the most critical technologies, which weakens the breadth and efficiency of internal resource integration [61]. As a result, HQ's most valuable digital

advantages cannot be effectively transferred, leading to stagnation in subsidiary performance improvement. In contrast, when IPR protection is strong, a sound legal system provides secure protection for HQ's digital assets, greatly reducing the risk of appropriation and legal disputes [62]. This institutional foundation of trust encourages HQ to establish a deeper and higher-value coupling relationship with subsidiaries. HQ is, thus, more willing to fully leverage its parenting advantage by providing subsidiaries with necessary technical support, funding, talent, and other critical resources. Such high-quality resource sharing not only reduces uncertainty in resource allocation at the subsidiary level but also helps lower operational costs, enhance resource coordination efficiency, and ultimately boost subsidiary performance while supporting the implementation of global strategic goals [63,64]. Therefore, we propose the following:

**Hypothesis 5:** *Host-country intellectual property rights (IPR) protection positively moderates the relationship between HQ digital transformation and foreign subsidiaries' performance.*

## 3. Materials and Methods

### *3.1. Sample*

Our sample is Chinese A-share listed companies with foreign subsidiaries from 2011 to 2021. The data sources are mainly from corporate annual reports, CSMAR Database, and World Bank database. To ensure the accuracy of the results, first, we exclude firms with foreign subsidiaries registered in tax havens such as British Virgin Islands and Bermuda, and second, we exclude "ST" and "ST*" firms. Finally, to avoid the interference of extreme outliers, we winsorize all continuous variables at the 1% level. After matching HQs data with foreign subsidiary data, we obtain unbalanced panel data for 818 listed firms, analyzing a total of 5543 firm/country/year observations. The final sample includes subsidiaries located across 76 host countries, a detailed list of which is available in the Appendix A (Table A1).

### *3.2. Measures*

#### 3.2.1. Dependent Variable

All variables used in this study, along with their detailed measurements and data sources, are consolidated in Appendix A (Table A2). The dependent variable, subsidiary performance, is measured by the subsidiary's return on assets (ROA), a commonly used proxy for firm performance in the existing literature [65–68]. ROA evaluates the profitability of a firm relative to its total assets, and it is measured by the ratio of net profits divided by the total assets of an MNE subsidiary.

#### 3.2.2. Independent Variable

The independent variable in this study, digital transformation, is constructed by following the methodology developed by [7,69]. To systematically capture the extent of digital transformation across firms, we compiled and analyzed the annual reports of all A-share listed companies from the Shanghai and Shenzhen stock exchanges. Using Python 3.13 for web scraping and Java's PDF Box library for text extraction, we created a comprehensive text database of these reports, which served as the foundation for subsequent keyword identification and analysis.

In line with Wu et al. (2020)'s [69] structured approach, relevant keywords were categorized into two primary dimensions: foundational digital technologies and practical digital applications. Foundational technologies include artificial intelligence, blockchain, cloud computing, and big data (often referred to as the "ABCD" technologies), which emphasize internal technological transformation. Meanwhile, practical applications span the integration of digital technologies in business and market scenarios. To maintain

consistency and focus on the digital transformation of each firm, phrases with negations or references to non-company entities (e.g., shareholders or clients) were excluded from the final word count.

This count was subsequently log-transformed to address skewness, producing a comprehensive measure that captures the intensity of digital transformation efforts. Wu et al. (2020)'s [69] method serves as the guiding framework for this process, providing both validity and rigor to our variable construction.

#### 3.2.3. Moderator Variable

Our first moderating variable is excess control (separation of control and cash flow rights), which we calculate by measuring the difference between the ultimate owner's control rights and cash flow rights. Control rights refer to the smallest ownership stake within the ownership chain, while cash flow rights are the product of ownership stakes at each level in the chain. The formula for excess control is as follows:

$$Excess\ Control_i = \sum_j \left[ \min\left( C_{ij1}, C_{ij2}, \ldots, C_{ijk} \right) - C_{ij1} \times C_{ij2} \times \ldots \times C_{ijk} \right]$$

where $C_{ijk}$ represents the ownership stake of the $k$-th link in the $j$-th ownership chain of the ultimate owner of firm $i$.

Excess control reflects the separation between control rights and economic interests. When control rights significantly exceed cash flow rights, it indicates that the owner has gained greater control with relatively lower economic investment.

Our second moderating variable is corporate group affiliation. According to the "Interim Regulations on the Registration and Administration of Corporate Groups" issued by the State Administration for Industry and Commerce in 1998 (SAMR, 2021), a corporate group is defined in emerging market economies as having a registered capital of at least $7.5 million and a minimum of five subsidiaries. We obtain the ultimate owners of the sampled companies from the OSIRIS database, requiring a minimum ownership stake of 25.01%. We then check whether these owners meet the legal definition of a corporate group using secondary sources such as company websites and media reports. Finally, we create a binary variable indicating whether a company's ultimate owner belongs to a corporate group, assigning a value of 1 for affiliation and 0 otherwise [70].

The third moderating variable is the host country's digital infrastructure, which we measure as the number of fixed broadband Internet subscribers per 100 people, as published by the World Bank Group [71]. Fixed broadband subscribers are defined as fixed subscribers with high-speed access to the public Internet (TCP/IP connection) with downstream speeds equal to or greater than 256 kbit/s. This includes cable modems, digital subscriber lines, fiber-to-the-home/building, other fixed (wired) broadband subscribers, satellite broadband, and terrestrial fixed wireless broadband. This aggregate measure is independent of payment method. It does not include subscribers accessing data communications (including the Internet) via mobile cellular networks. It should include fixed WiMAX and any other fixed wireless technology. It includes both residential subscriptions and subscriptions for organizations.

The last moderating variable is the strength of international intellectual property protection, measured using the International Property Rights Index (IPRI), based on the work of [72]. The IPRI has been published annually by the Property Rights Alliance (PRA) since 2007, providing a comprehensive assessment of property rights protection worldwide. The index consists of three key dimensions: Legal and Political Environment (LP), Physical Property Rights (PPR), and Intellectual Property Rights (IPR). These dimensions collectively reflect a country's overall institutional framework performance and the effectiveness of its enforcement of property rights protections.

#### 3.2.4. Control Variables

To account for other factors potentially influencing subsidiary performance, we include a series of control variables. Entry Mode (EM): This study uses the commonly used 100% cutoff criterion to construct dummy variables to measure whether overseas entry mode of whether the subsidiary is wholly owned or a joint venture [73]. If the multinational firm's parent owns 100% of the overseas subsidiary, it is defined as a wholly owned subsidiary and assigned a value of 1; otherwise, it is a joint venture and assigned a value of 0. Subsidiary's Age (SAGE): Measured as the number of years from the subsidiary's establishment to the observation year. Subsidiary Size (SS): Measured by the natural logarithm of the subsidiary's total assets [74]. Host Country's Market Potential (HMP): Measured by the GDP growth rate of the host country [75]. HQ's Age (HAGE): Measured as the number of years from the parent company's establishment to the observation year [76]. HQ's Size (HS): Measured by the natural logarithm of the number of employees in the HQs [76]. HQ's Profitability (HP): Measured by the net income of the HQs. HQ's Debt Ratio (HDR): Calculated as the ratio of total debt to total assets of the HQs [77]. HQ's Current Ratio (HCR): Measured as the ratio of the HQs' current assets to current liabilities [74]. Formal Institutional Distance (FID): Measured by the formal institutional gap between the home and host countries [78].

### *3.3. Regression Model*

We used the Hausman test to determine the estimated model for the unbalanced panel data. The results show that the Hausman test has a *p*-value of 0.0000, which means that the random effects model is rejected at the 1% level. Therefore, we choose to use a fixed effects model for estimation and centralize and normalize the moderating variables associated with the interaction. Our unit of analysis is the subsidiary-year, and the fixed effects are specified at the HQs level to control for all time-invariant parent-firm characteristics. Each subsidiary is treated as a distinct observation in our panel, even when multiple subsidiaries from the same parent operate in the same host country and year.

## 4. Results

### *4.1. Hypothesis Testing Results*

Our analysis was conducted in STATA17, and Table 1 presents descriptive statistics and correlation coefficients for all variables. Most correlations between variables are below 0.5, suggesting a minimal risk of multicollinearity. The highest correlation coefficient, 0.868, is between IPR (intellectual property rights) and FID (foreign institutional development), which is expected as both variables capture host country institutional quality, though from different aspects. Another strong correlation is observed between HDI and FID (0.749), as these metrics likely align in well-developed markets.

Table 2 presents the results of the regression analysis. We build the models sequentially. Model 1 serves as a baseline with only the control variables. Model 2 introduces the main independent variable, digital transformation (DT), to test our primary hypothesis. The coefficient for DT is positive and significant ($\beta = 0.130$, $p < 0.01$), providing initial support for Hypothesis 1, which posits that HQ's digital transformation is positively related to foreign subsidiary performance. Models 3 to 6 sequentially add the interaction terms to test the moderating hypotheses (H2–H5). Finally, Model 7 includes all variables simultaneously as a robustness check, and our main findings remain consistent. The discussion below focuses on the key moderating effects shown in Models 3 through 6.

**Table 1.** Descriptive statistics and correlations.

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 ROA | 1 | | | | | | | | | | | | | | | |
| 2 DT | 0.102 *** | 1 | | | | | | | | | | | | | | |
| 3 HDI | 0.117 *** | 0.066 *** | 1 | | | | | | | | | | | | | |
| 4 IPR | 0.124 *** | 0.054 *** | 0.781 *** | 1 | | | | | | | | | | | | |
| 5 OC | 0.016 | −0.022 | 0.030 ** | 0.021 | 1 | | | | | | | | | | | |
| 6 BGA | −0.067 *** | −0.146 *** | −0.134 *** | −0.086 *** | 0.262 *** | 1 | | | | | | | | | | |
| 7 EM | −0.069 *** | 0.021 | 0.115 *** | 0.106 *** | −0.025 * | −0.072 *** | 1 | | | | | | | | | |
| 8 SAGE | −0.010 | 0.058 *** | 0.034 ** | 0.051 *** | 0.013 | 0.165 *** | 0.063 *** | 1 | | | | | | | | |
| 9 HAGE | −0.084 *** | 0.075 *** | −0.033 ** | −0.046 *** | 0.083 *** | 0.211 *** | −0.053 *** | 0.230 *** | 1 | | | | | | | |
| 10 SS | 0.015 | 0.047 *** | 0.023 * | 0.021 | 0.113 *** | 0.148 *** | −0.092 *** | 0.142 *** | 0.169 *** | 1 | | | | | | |
| 11 HS | 0.008 | 0.039 *** | −0.057 *** | −0.073 *** | 0.118 *** | 0.328 *** | −0.027 ** | 0.179 *** | 0.149 *** | 0.301 *** | 1 | | | | | |
| 12 HP | 0.029 ** | −0.018 | 0.015 | −0.000 | −0.005 | −0.087 *** | 0.044 *** | −0.146 *** | −0.072 *** | −0.100 *** | 0.019 | 1 | | | | |
| 13 HDR | 0.005 | −0.063 *** | −0.094 *** | −0.058 *** | 0.121 *** | 0.303 *** | −0.102 *** | 0.097 *** | 0.147 *** | 0.284 *** | 0.413 *** | −0.364 *** | 1 | | | |
| 14 HCR | 0.017 | 0.069 *** | 0.084 *** | 0.086 *** | −0.099 *** | −0.257 *** | 0.073 *** | −0.132 *** | −0.182 *** | −0.226 *** | −0.401 *** | 0.321 *** | −0.779 *** | 1 | | |
| 15 FID | 0.120 *** | −0.028 ** | 0.749 *** | 0.868 *** | 0.016 | −0.036 *** | 0.078 *** | 0.003 | −0.149 *** | 0.004 | −0.060 *** | −0.012 | −0.044 *** | 0.074 *** | 1 | |
| 16 HMP | −0.009 | −0.103 *** | −0.355 *** | −0.230 *** | −0.014 | 0.072 *** | −0.035 *** | −0.065 *** | −0.122 *** | −0.031 ** | 0.028 ** | 0.019 | 0.046 *** | −0.055 *** | −0.151 *** | 1 |
| Mean | 0.74 | 1.23 | 26.86 | 7.14 | 4.08 | 0.42 | 0.72 | 3.2 | 16.76 | 18.01 | 7.94 | 0.04 | 0.42 | 2.24 | 3.8 | 1.85 |
| S.D. | 0.889 | 1.242 | 12.558 | 1.279 | 7.043 | 0.493 | 0.447 | 3.107 | 5.46 | 2.502 | 1.078 | 0.053 | 0.183 | 1.593 | 1.379 | 2.954 |

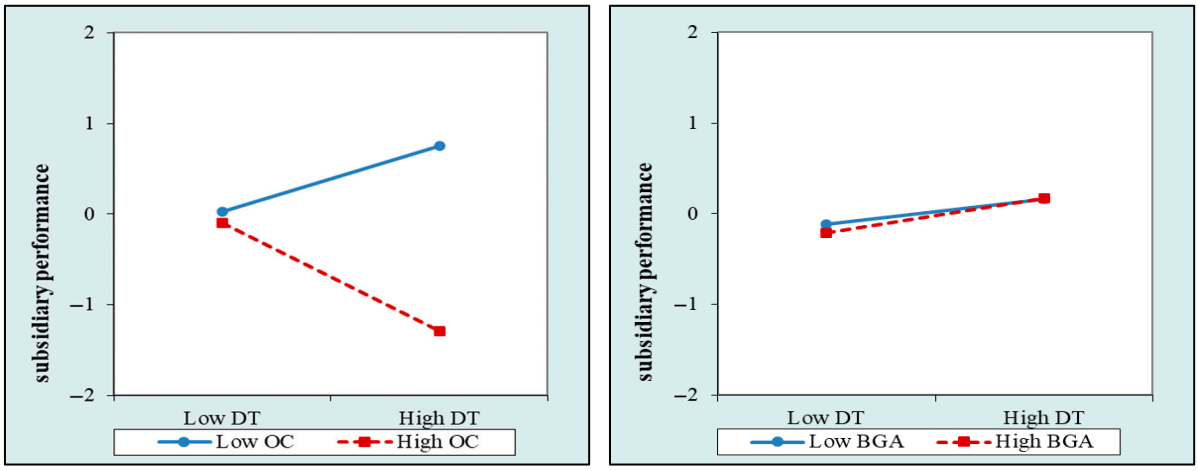
Note: Subsidiary performance (ROA); Digital Transformation (DT); Host country digital infrastructure (HDI); Intellectual property rights intensity (IPR); Over-control (OC); Business group affiliates (BGA); Entry Mode (EM); Subsidiary's age (SAGE); HQ's age (HAGE); Subsidiary size (SS); HQ's size (HS); HQs profitability (HP); HQ's debt ratio (HDR); HQs current ratio (HCR); Formal institutional distance (FID); Host country's market potential (HMP). * $p < 0.1$. ** $p < 0.05$.*** $p < 0.01$.

**Table 2.** The results of regression analysis.

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|---|---|---|
| Control variables | | | | | | | |
| EM | −0.111 *** | −0.113 *** | −0.114 *** | −0.114 *** | −0.113 *** | −0.114 *** | −0.116 *** |
| | (0.029) | (0.028) | (−0.028) | (−0.028) | (−0.028) | −0.028 | (0.028) |
| SAGE | 0.006 | 0.004 | 0.000 | 0.009 | 0.003 | 0.004 | 0.005 |
| | (0.004) | (0.004) | (−0.004) | (−0.004 | (−0.004 | (−0.004 | (0.004) |
| HAGE | −0.066 *** | −0.059 *** | −0.055 *** | −0.054 *** | −0.058 *** | −0.059 *** | −0.052 *** |
| | (0.003) | (0.003) | (−0.003) | (−0.003) | (−0.003 | (−0.003) | (0.003) |
| SS | 0.028 * | 0.028 * | 0.030 * | 0.027 * | 0.029 * | 0.027 * | 0.032 ** |
| | (0.006) | (0.006) | (−0.006) | (−0.006) | (−0.006) | (−0.006) | (0.006) |
| HS | 0.015 | 0.001 | 0 | 0.01 | 0.001 | −0.001 | 0.007 |
| | (0.013) | (0.013) | (−0.013) | (−0.013) | (−0.013) | (−0.013) | (0.013) |
| HP | 0.027 * | 0.037 ** | 0.036 ** | 0.035 ** | 0.036 ** | 0.037 ** | 0.032 ** |
| | (0.252) | (0.251) | (−0.25) | (−0.252) | (−0.251) | (−0.251) | (0.251) |
| HDR | 0.046 * | 0.052 ** | 0.054 ** | 0.061 *** | 0.051 ** | 0.052 ** | 0.061 *** |
| | (0.116) | (0.115) | (−0.115) | (−0.115) | (−0.115) | (−0.115) | (0.114) |
| HCR | 0.016 | 0.002 | 0.005 | 0.003 | 0.002 | 0.002 | 0.003 |
| | (0.012) | (0.012) | (−0.012) | (−0.012) | (−0.012) | (−0.012) | (0.012) |
| FID | −0.013 | 0.007 | −0.004 | −0.014 | −0.004 | 0.041 | 0.011 |
| | (0.068) | (0.068) | (−0.068) | (−0.068) | (−0.07 | (−0.069) | (0.070) |
| HMP | 0.050 * | 0.049 * | 0.046 * | 0.049 * | 0.048 * | 0.048 * | 0.045 * |
| | (0.008) | (0.008) | (−0.008) | (−0.008) | (−0.008) | (−0.008) | (0.008) |
| Independent variables | | | | | | | |
| DT | | 0.130 *** | 0.129 *** | 0.100 *** | 0.133 *** | 0.124 *** | 0.081 *** |
| | | (0.010) | (−0.01) | (−0.013) | (−0.01) | (−0.01) | (0.013) |
| Moderator variables | | | | | | | |
| OC | | | −0.009 | | | | 0.001 |
| | | | (−0.002) | | | | (−0.002) |
| BGA | | | | −0.042 *** | | | −0.043 *** |
| | | | | (−0.028) | | | (−0.029) |
| HDI | | | | | 0.086 | | 0.147 |
| | | | | | (−0.007) | | −0.007) |
| IPR | | | | | | −0.096 | −0.069 |
| | | | | | | (−0.064) | (−0.066) |
| Interactions | | | | | | | |
| DT × OC | | | −0.055 *** | | | | −0.066 *** |
| | | | (−0.002) | | | | (−0.002) |
| DT × BGA | | | | 0.042 ** | | | 0.059 *** |
| | | | | (−0.021) | | | (−0.022) |
| DT × HDI | | | | | −0.024 ** | | −0.108 *** |
| | | | | | (−0.001) | | (−0.001) |
| DT × IPR | | | | | | 0.036 *** | 0.122 *** |
| | | | | | | (−0.007) | (−0.012) |
| Model fit | | | | | | | |
| $R^2$ | 0.083 | 0.097 | 0.100 | 0.099 | 0.097 | 0.098 | 0.110 |
| Adj-R2 | 0.067 | 0.081 | 0.083 | 0.083 | 0.081 | 0.082 | 0.092 |
| F-value | 9.464 | 15.325 | 14.406 | 14.486 | 13.948 | 13.192 | 13.326 |
| Obs. | 5543.000 | 5543.000 | 5543.000 | 5543.000 | 5543.000 | 5543.000 | 5543.000 |

Note: Subsidiary performance (ROA); Digital Transformation (DT); Host country digital infrastructure (HDI); Intellectual property rights intensity (IPR); Over-control (OC); Business group affiliates (BGA); Entry Mode(EM); Subsidiary's age (SAGE); HQ's age (HAGE); Subsidiary size (SS); HQ's size (HS); HQs profitability (HP); HQ's debt ratio (HDR); HQs current ratio (HCR); Formal institutional distance (FID); Host country's market potential (HMP). * $p < 0.1$. ** $p < 0.05$ *** $p < 0.01$.

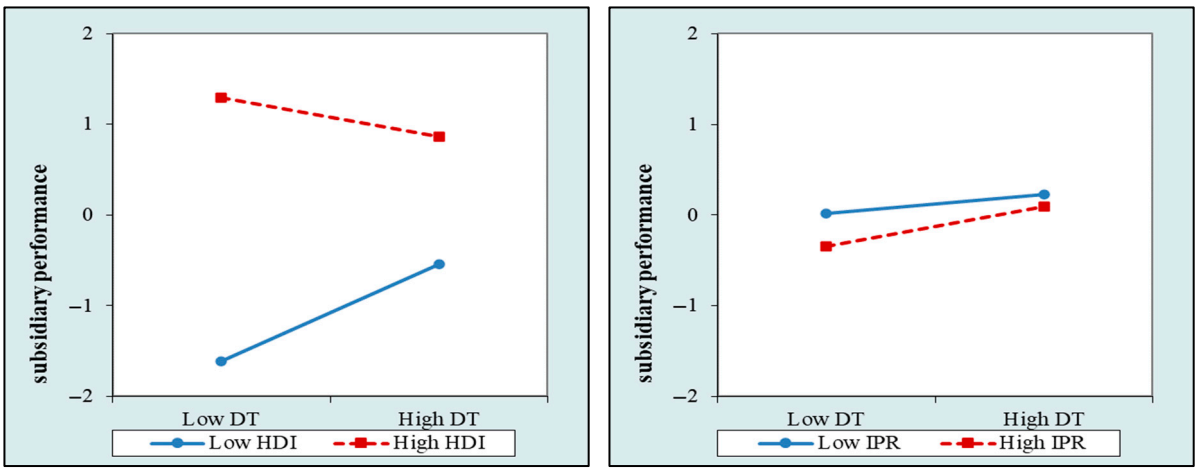
In Model 3, DT × OC exhibits a significant negative interaction effect (β = −0.055, $p < 0.01$), implying that excessive control from HQs reduces the positive impact of digital transformation on subsidiary performance. In Model 4, DT × BGA has a significant positive effect (β = 0.042, $p < 0.05$), indicating that business group affiliation amplifies the positive impact of digital transformation on subsidiary performance. These results are consistent with H2 and H3, further supported by Figure 2.




(**a**) Interaction effect of DT × OC (**b**) Interaction effect of DT × BGA

**Figure 2.** Moderating effect of Over-control (OC) and Business group affiliates (BGA) on digital transformation and foreign subsidiary performance.

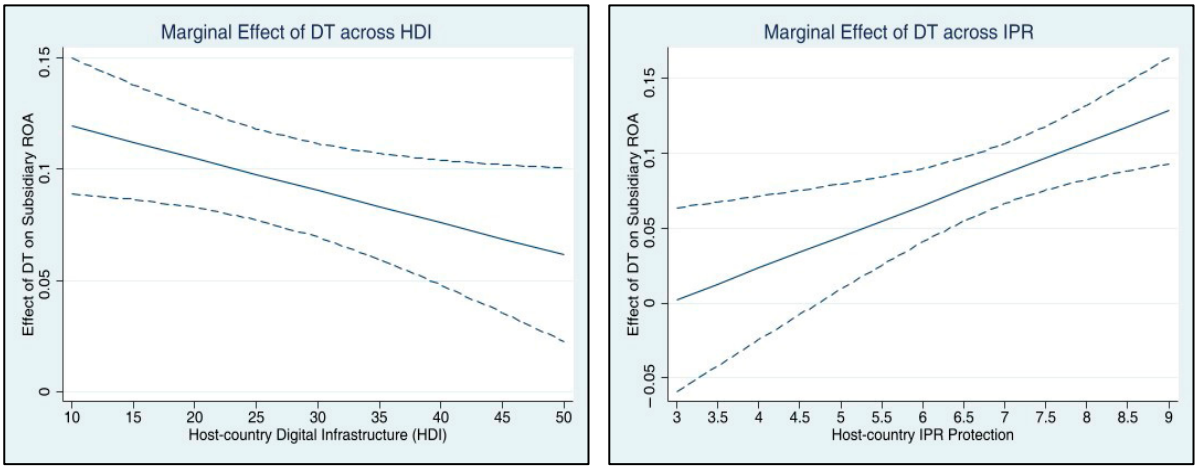
In Model 5, the interaction DT × HDI shows a significantly negative effect on subsidiary performance (β = −0.024, $p < 0.01$), indicating that host country digital infrastructure mitigates the positive impact of digital transformation on subsidiary outcomes, supporting H4. Model 6 presents a positive and significant effect of DT × IPR on performance (β = 0.036, $p < 0.01$), suggesting that intellectual property rights regimes enhance the positive relationship between digital transformation and subsidiary performance, thus supporting H5. Figure 3 provides a visual depiction of these moderating effects, offering further support for H4 and H5.




(**a**) Interaction effect of DT × IPR (**b**) Interaction effect of DT × IPR

**Figure 3.** Moderating effect of Host country digital infrastructure (HDI) and Intellectual property rights intensity (IPR) on digital transformation and foreign subsidiary performance.

To better illustrate these moderating effects and report their economic magnitude, we visualize the marginal effects of HQ DT. The marginal effect of HQ DT on foreign subsidiaries' performance decreases with HDI, from 11.93% at HDI = 10 to 6.15% at HDI = 50 (all $p < 0.01$), indicating that HQ DT yields higher performance gains in countries with less developed digital infrastructure. These patterns are visually illustrated in Figure 4a.




(**a**) Marginal effect across HDI (**b**) Marginal effect across host country IPR

**Figure 4.** HQ DT and foreign subsidiaries' performance: Marginal effects across HDI and IPR.

The marginal effect of HQ DT on foreign subsidiaries' performance increases with host country IPR. Based on our margins analysis, the effect is a statistically insignificant 0.22% at IPR = 3 ($p = 0.943$), but it becomes both statistically and economically significant as IPR strengthens. The effect grows from 4.43% at IPR = 5 to 8.65% at IPR = 7, and reaches a substantial 12.86% at IPR = 9 ($p < 0.001$). This indicates that HQ DT generates far greater performance gains in countries with stronger intellectual property protection. These patterns are visually illustrated in Figure 4b.

### *4.2. Robustness Checks*

To ensure the robustness of our findings, we conducted a robustness test by substituting the original independent variable, Digital Transformation (DT), with an alternative measure, the Digital Transformation Index (DTI). This index, sourced from the CSMAR (China Stock Market & Accounting Research) database, provides a composite score that evaluates a company's digital transformation based on six key components: strategic leadership, technology-driven innovation, organizational enablement, environmental support, digital outputs, and digital application. Each component is weighted to construct a comprehensive index of digital transformation, with data availability beginning in 2010.The results of the robustness test are presented in Table 3. Upon substituting DT with the DTI, the findings remained consistent with the initial analysis, and the model demonstrated a high degree of fit. This alignment in results suggests that our conclusions are robust and dependable, even when employing alternative measures of digital transformation.

**Table 3.** Robustness test.

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|---|---|---|
| Control variables | | | | | | | |
| EM | −0.111 *** | −0.112 *** | −0.112 *** | −0.113 *** | −0.113 *** | −0.115 *** | −0.115 ** |
| | (0.029) | (0.029) | (0.029) | (0.029) | (0.029) | (0.029) | (0.029) |
| SAGE | 0.006 | 0.000 | 0.001 | −0.001 | −0.002 | 0.005 | 0.002 |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| HAGE | −0.066 *** | −0.063 *** | −0.063 *** | −0.063 *** | −0.061 *** | −0.056 *** | −0.054 ** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| SS | 0.028 * | 0.031 ** | 0.032 ** | 0.030 * | 0.033 ** | 0.031 ** | 0.036 * |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) |
| HS | 0.015 | 0.000 | 0.001 | 0.000 | −0.002 | 0.010 | 0.008 |
| | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) | (0.014) | (0.014) |
| HP | 0.027 * | 0.034 ** | 0.034 ** | 0.034 ** | 0.033 ** | 0.031 ** | 0.027 * |
| | (0.252) | (0.252) | (0.252) | (0.252) | (0.252) | (0.254) | (0.254) |
| HDR | 0.046 * | 0.051 ** | 0.051 ** | 0.050 ** | 0.054 ** | 0.062 *** | 0.068 ** |
| | (0.116) | (0.115) | (0.115) | (0.115) | (0.115) | (0.115) | (0.115) |
| HCR | 0.016 | 0.010 | 0.011 | 0.008 | 0.012 | 0.012 | 0.014 |
| | (0.012) | (0.012) | (0.012) | (0.012) | (0.012) | (0.012) | (0.012) |
| FID | −0.013 | −0.018 | −0.011 | −0.019 | −0.020 | −0.037 | −0.041 |
| | (0.068) | (0.068) | (0.069) | (0.068) | (0.068) | (0.068) | (0.069) |
| HMP | 0.050 * | 0.046 * | 0.042 | 0.048 * | 0.045 * | 0.047 * | 0.040 |
| | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) |
| Independent variables | | | | | | | |
| DTI | | 0.078 *** | 0.081 *** | 0.074 *** | 0.072 *** | 0.020 | −0.003 |
| | | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Moderator variables | | | | | | | |
| OC | | | (0.006) | | | | 0.005 |
| | | | (0.002) | | | | (0.002) |
| BGA | | | | −0.050 *** | | | −0.054 *** |
| | | | | (0.028) | | | (0.029) |
| HDI | | | | | 0.084 | | 0.077 |
| | | | | | (0.007) | | (0.007) |
| IPR | | | | | | (0.103) | (0.110) |
| | | | | | | (0.064) | (0.066) |
| Interactions | | | | | | | |
| DTI × HDI | | | −0.047 *** | | | | −0.065 *** |
| | | | (0.000) | | | | (0.000) |
| DTI × IPR | | | | 0.084 *** | | | 0.100 *** |
| | | | | (0.002) | | | (0.002) |
| DTI × HDI | | | | | −0.024 ** | | −0.091 *** |
| | | | | | (0.000) | | (0.000) |
| DTI×IPR | | | | | | 0.022 * | 0.099 *** |
| | | | | | | (0.001) | (0.001) |
| Model fit | | | | | | | |
| $R^2$ | 0.083 | 0.088 | 0.090 | 0.094 | 0.088 | 0.088 | 0.101 |
| Adj-R2 | 0.067 | 0.072 | 0.073 | 0.077 | 0.072 | 0.072 | 0.084 |
| F-value | 9.464 | 11.246 | 10.454 | 12.277 | 10.482 | 9.658 | 11.127 |
| Obs. | 5543.000 | 5543.000 | 5543.000 | 5543.000 | 5543.000 | 5543.000 | 5543.000 |

Note: Subsidiary performance (ROA); Digital Transformation Index (DTI); Host country digital infrastructure (HDI); Intellectual property rights intensity (IPR); Over-control (OC); Business group affiliates (BGA); Entry Mode (EM); Subsidiary's age (SAGE); HQ's age (HAGE); Subsidiary size (SS); HQ's size (HS); HQs profitability (HP); HQ's debt ratio (HDR); HQs current ratio (HCR); Formal institutional distance (FID); Host country's market potential (HMP). * $p < 0.1$. ** $p < 0.05$ *** $p < 0.01$.

### *4.3. Endogeneity Analysis*

To mitigate potential reverse causality between digital transformation (DT) and overseas subsidiary performance—where lower performance may prompt headquarters to increase DT for enhanced control—this study employs a two-stage least squares (2SLS) method. Drawing from [7], we use the average DT level of firms within the same province, industry, and year as an instrumental variable (IV). This variable leverages DT's regional demonstration effect, which correlates with a firm's DT level but is less likely to directly affect individual subsidiary performance.

The 2SLS results are shown in Table 4. In the first stage, the IV coefficient is 0.801 ($p < 0.01$), showing a strong positive association between the IV and the endogenous DT variable. The Kleibergen–Paap rk LM statistic of 619.80 ($p < 0.01$) rejects the null hypothesis of underidentification, and the Kleibergen–Paap rk Wald and Cragg–Donald Wald F statistics (2334.46 and 1649.94, respectively) exceed the critical threshold of 16.38, thus rejecting the weak instrument hypothesis. The Anderson–Rubin Wald test further confirms IV relevance, with a value of 74.08 ($p < 0.01$).

**Table 4.** Results of the endogeneity test.

| **Panel A: 2SLS** | | |
|---|---|---|
| Variables | First Stage (1) Digital | Second Stage (2) ROA |
| Digital | | 0.190 *** (0.023) |
| IV | 0.801 *** (0.017) | |
| Controls | Yes | Yes |
| Year FE | Yes | Yes |
| Firm FE | Yes | Yes |
| Kleibergen–Paap rk LM | 619.80 *** | |
| Kleibergen–Paap rk Wald | 2334.46 *** 1649.94 *** | |
| FCragg–Donald Wald F | [16.38] | |
| Anderson-Rubin Wald | 74.08 *** | |
| Observations | 5543 | 5543 |

*** $p < 0.01$.

In the second stage, the DT coefficient on ROA is 0.190 ($p < 0.01$), indicating a significant positive effect of DT on overseas subsidiary performance after accounting for endogeneity. Both stages include firm and year fixed effects and control variables, covering 5543 observations in total. These findings support the robustness of the positive DT impact on subsidiary performance after addressing endogeneity concerns.

## 5. Discussion

### *5.1. Theoretical Implications*

First, this study addresses the "black box" in the digital transformation literature of multinational enterprises (MNEs) by examining how HQ digital transformation enhances foreign subsidiaries' performance through the mechanism of "digital parenting advantage," which facilitates cross-border knowledge sharing and resource coordination. While digital technologies are widely recognized as effective tools for MNEs to optimize global innovation resources and strengthen competitiveness [31–33], some studies argue that EMNEs face limitations in fully leveraging these technologies. Our findings demonstrate a positive association between EMNEs' digital transformation and foreign subsidiary performance, enriching the literature on MNE digitalization and providing new insights into internal management and knowledge transfer in the digital era.

Second, we identify and empirically test the moderating roles of key organizational governance factors in shaping the performance effect of HQ digital transformation, thereby extending the literature on EMNE HQ characteristics. Prior research has largely empha-

sized HQ resource support and power allocation [79,80]. Our study shows that excessive HQ control can weaken the enabling effect of digital tools on subsidiaries and increase agency costs, highlighting the negative consequences of governance imbalance. In contrast, business group affiliation, as a form of network-based support, significantly enhances the effectiveness of digital parenting advantage. These findings deepen understanding of how organizational features shape HQ–subsidiary interactions and offer practical guidance for optimizing governance structures during digital transformation [81].

Third, this study integrates the Technology–Organization–Environment (TOE) framework with parenting advantage and loose coupling theory to develop a multilevel framework encompassing both internal governance and external institutional environments. We further reveal that host-country digital infrastructure and intellectual property (IP) protection exert asymmetric moderating effects—namely, a "substitution effect" and a "complementary effect." Specifically, prior research emphasizes that host-country digital infrastructure is a critical enabler for MNEs to leverage digital technologies across borders [82,83]. Our findings, for the first time in the context of EMNEs, uncover a "substitution effect": when host-country digital infrastructure is highly developed, foreign subsidiaries rely less on HQ's digital parenting, reducing the marginal returns of HQ's digital investments. Conversely, strong IP protection provides institutional safeguards that enhance incentives for HQs to transfer high-value digital knowledge. This dual finding of substitution–complementarity offers a novel perspective on how external institutions asymmetrically shape the strategic value of internal initiatives.

### *5.2. Managerial Implications*

First, MNEs should treat digital transformation not only as a technology upgrade but as a strategic parenting initiative. HQs that develop robust digital platforms can effectively enhance information sharing, decision-making support, and operational transparency across borders. However, the mere adoption of digital technologies is insufficient; value is realized only when such technologies are embedded in coherent HQ–subsidiary coordination processes.

Second, HQ managers should avoid over-centralization and excessive control. While digital tools enable real-time monitoring, their misuse for micromanagement can undermine subsidiary autonomy and suppress innovation. Instead, HQs should foster a balanced coupling relationship—tight where integration is needed, and loose where local adaptation is crucial.

Third, managers should recognize the enabling role of business group networks in digital strategy implementation. Group-level platforms and shared resources can ease the diffusion of digital capabilities and lower the cost of subsidiary digitalization. MNEs within such groups should proactively leverage internal synergies to support digital parenting efforts.

Finally, the host-country environment must be carefully considered. In countries with strong IPR protection, MNEs should feel more confident in transferring core digital assets. Conversely, in markets with robust digital infrastructure, HQs may need to reconfigure their roles and value-add to subsidiaries, emphasizing complementary rather than duplicative digital functions.

### *5.3. Limitations*

First, our measure of digital transformation is based on text-mining from annual reports, which may not fully capture the depth, scope, or quality of firms' digitalization efforts. Therefore, it is important to note that our measure reflects a firm's strategic digital attention or orientation rather than its fully realized digital capabilities. Future studies

could utilize survey data or direct indicators of IT investment and system usage to enhance measurement precision.

Second, our findings may be specific to the Chinese context, limiting their generalizability. Key features of China's market, such as the prevalence of business groups and a high separation of ownership and control, may have amplified the positive and negative moderating effects we identified. These effects might be less pronounced in markets with different governance structures, like the US or UK. Therefore, future comparative studies are needed to validate our framework in other institutional settings.

Third, our measurement of key control variables presents limitations. The study uses different proxies for subsidiary size (total assets) and HQ size (number of employees). Furthermore, HQ profitability is measured by net income rather than a standardized ratio like return on assets (ROA). Future research could test the robustness of our findings by employing consistent size measures and using ROA to capture HQ profitability.

Fourth, our econometric model, while employing firm and year fixed effects, could be further enhanced. Future research could adopt a more stringent specification, such as including host-country-year fixed effects to better control for unobserved, time-varying institutional trends within each country. Additionally, employing two-way clustered standard errors (e.g., by firm and host country) could provide more robust inferences. We acknowledge these as limitations and suggest them as avenues for future inquiry.

Finally, while our study adopts a static panel design, digital transformation is inherently dynamic. Longitudinal case studies or event-history analyses could help uncover the temporal evolution of digital parenting strategies and their impact on foreign subsidiary development. We also acknowledge that our large-sample analysis does not capture important firm-specific factors. As recent research highlights, an MNE's specific technology strategy is a critical factor that influences its subsidiaries' capabilities [84]. These unobserved factors, among others, represent an important limitation and a fruitful area for future qualitative research.

## 6. Conclusions

This study investigated how the digital transformation of headquarters (HQ) in emerging market multinational enterprises (EMNEs) influences the performance of their foreign subsidiaries. By developing a multi-level contingency model based on the Technology–Organization–Environment (TOE) framework, we empirically tested our hypotheses using panel data from 5543 Chinese MNE subsidiaries.

Our findings confirm that HQ digital transformation significantly improves subsidiary performance, demonstrating the existence of a "digital parenting advantage". However, the realization of this advantage is contingent upon both internal governance and external institutional factors. At the organizational level, excessive HQ control negatively moderates this effect, whereas affiliation with a business group strengthens it. At the environmental level, we uncovered an asymmetric relationship: strong host-country intellectual property rights (IPR) protection acts as a complement, enhancing the benefits of digital transformation, while advanced host-country digital infrastructure serves as a substitute, diminishing the performance gains.

Theoretically, this research contributes by opening the "black box" of intra-MNE digital value creation and identifying the key boundary conditions that shape the effectiveness of digital strategies. Practically, our findings offer guidance for EMNE managers on how to optimize digital governance and adapt their strategies to diverse institutional environments to maximize subsidiary performance.

**Author Contributions:** Conceptualization, L.L. and L.W.; methodology, L.L.; software, L.L.; validation, L.L. and D.R.; formal analysis, L.L.; resources, L.W.; data curation, L.L. and D.R.; writing—original draft preparation, L.L.; writing—review and editing, L.L., D.R. and L.W.; supervision, L.W.; funding acquisition, L.W. All authors have read and agreed to the published version of the manuscript.

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**Data Availability Statement:** The original contributions presented in the study are included in the article; further inquiries can be directed to the corresponding author.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## Appendix A

**Table A1.** List of host countries used in the study.

| **Developed Countries (33)** | | **Developing Countries (43)** | |
|---|---|---|---|
| Australia | Norway | Argentina | Nepal |
| Austria | Poland | Bolivia | Republic of Nigeria |
| Belgium | Portugal | Brazil | Oman |
| Brunei Darussalam | Singapore | Chile | Pakistan |
| Bulgaria | Slovakia | Colombia | Peru |
| Canada | Spain | Republic of (Congo) | Philippines |
| Cyprus | Sweden | Cote d'Ivoire | Romania |
| Czech Republic | Switzerland | Croatia | Russia |
| Denmark | United Arab Emirates | Egypt | Rwanda |
| Finland | United Kingdom | Ethiopia | Saudi Arabia |
| France | United States | Ghana | Senegal |
| Germany | | India | Serbia |
| Hungary | | Indonesia | South Africa |
| Ireland | | Iran | Sri Lanka |
| Israel | | Kazakhstan | Thailand |
| Italy | | Kenya | Turkey |
| Japan | | Malaysia | Uganda |
| Korea, Rep. | | Mali | Ukraine |
| Luxembourg | | Mauritania | Vietnam |
| Malta | | Mauritius | Zambia |
| Netherlands | | Mexico | Zimbabwe |
| New Zealand | | Morocco | |

**Table A2.** Data Appendix: Variable Definitions, Measurements, and Sources.

| **Variable** | **Measurement** | **Source (Period)** |
|---|---|---|
| Dependent variable: | | |
| Subsidiary performance (ROA) | The ratio of net profits divided by the total assets of an MNE subsidiary. | Corporate annual reports (2011–2021) |
| Independent variables: | | |
| HQ Digital Transformation (DT) | The log-transformed frequency count of keywords related to digital transformation (foundational technologies and practical applications) from corporate annual reports, obtained through text analysis. | Corporate annual reports (2011–2021) |

**Table A2.** *Cont.*

| Variable | Measurement | Source (Period) |
| --- | --- | --- |
| Moderator variables: | | |
| HQ Overcontrol (OC) | The difference between the ultimate owner's control rights and cash flow rights. | CSMAR Database (2011–2021) |
| Business Group Affiliation (BGA) | A dummy variable, coded 1 if the company's ultimate owner is part of a corporate group, and 0 otherwise. | OSIRIS database, company websites, and media reports (2011–2021) |
| Host-country Digital Infrastructure (HDI) | The number of fixed broadband Internet subscribers per 100 people in the host country. | World Bank database (2011–2021) |
| Intellectual Property Rights Protection (IPR) | The International Property Rights Index (IPRI). | Property Rights Alliance (PRA) (2011–2021) |
| Control variables: | | |
| Entry Mode (EM) | A dummy variable; 1 if the parent company owns 100% of the subsidiary (wholly owned), and 0 otherwise (joint venture). | Corporate annual reports, CSMAR Database (2011–2021) |
| Subsidiary's Age (SAGE) | The number of years from the subsidiary's establishment to the observation year. | Corporate annual reports, CSMAR Database (2011–2021) |
| HQ's age (HAGE) | The number of years since the HQ was established | Corporate annual reports (2011–2021) |
| Subsidiary size (SS) | The natural logarithm of the subsidiary's total assets | Corporate annual reports (2011–2021) |
| HQ's size (HS) | The natural logarithm of the number of employees in the HQ | Corporate annual reports (2011–2021) |
| HQ's profitability (HP) | Net income of the HQ | Corporate annual reports (2011–2021) |
| HQ's debt ratio (HDR) | The ratio of the HQ's total debt to total assets | CSMAR Database (2011–2021) |
| HQ's current ratio (HCR) | Current assets divided by current liabilities of the HQ | CSMAR Database (2011–2021) |
| Host country market potential (HMP) | GDP growth rate of the host country | World Bank Database (2011–2021) |
| Formal institutional distance (FID) | Kogut and Singh index based on home–host country institutional differences | World Governance Indicators (WGI) (2011–2021) |

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