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Intellectual property protection and firm risk: How service transition and knowledge intensity mitigate the loss of strategic resources

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ABSTRACT

The inherent rarity and inimitability of intellectual property (IP) has long been recognized as the foundation of its strategic value. These characteristics are compromised in markets with weak IP protection, where IP cannot be leveraged to create sustainable competitive advantage. This presents significant challenges for internationalization, and extant literature provides little guidance on how firms can mitigate this risk. From first principles of resource-based theory, we posit that service transition alleviates this loss of a strategic resource, representing a basis for reliable revenue generation that retains its rarity and inimitability across markets with varying levels of regulatory protection. Combining novel datasets on firms' foreign market activity and countries' IP rights, we find that IP risk increases the volatility of revenues and consequently firm idiosyncratic risk, but that this can be offset by (a) deriving a larger share of revenues from service-based business segments and (b) increasing the knowledge intensity of service offerings. Results from a 12-year panel of 2,716 firms across 223 industries offer new insights into how the regulatory environment can erode the strategic value of resources and practical recommendations to mitigate the detrimental effects on firm-specific risk and market performance.

1. Introduction

Internationalized firms face significant and rising levels of market and institutional instability, leading to a heightened focus among scholars and practitioners on the management of *firm risk* (Boivie et al., 2021; Edeling et al., 2021). Foundational principles of resource-based theory (RBT), longstanding in business research and widely corroborated by empirical studies, propose that firms can attain and sustain superior performance in these turbulent environments through the deployment of *strategic resources*: those that are valuable in responding to opportunities and threats, rare and inimitable among competitors, and have no strategically equivalent substitutes (Barney, 1991). Ownership or control of these resources provides the basis for achieving defensible *firm-specific advantages*, mitigating external sources of risk and thus improving economic performance (Prud'homme & Tong, 2023; Wang & Barney, 2006).

While tangible assets often lack strategic value due to their tradability and imitability, intangible assets are more likely to be heterogenous and imperfectly mobile between firms and thus typically serve as the strategic resources underlying a firm's ability to reliably generate revenues (Bergh et al., 2024; Srivastava et al., 2001). Among these, intellectual property (IP) is particularly distinctive (Magelssen, 2019): its rarity and inimitability are legally protected, meaning that two of the requisite characteristics of a strategic resource are inherent to IP (Peteraf, 1993). This holds insofar as the institutional environment enforces this protection; yet, despite recognition that the strategic value of resources is highly contextual, the RBT literature has not fully addressed how a globalized business environment challenges this widely held assumption (Castaldi et al., 2024; Prud'homme & Tong, 2023).

Variation in the codification and enforcement of IP rights is exemplary of the complex institutional arrangements that create significant uncertainty when deploying strategic resources across markets (Castaldi et al., 2024; Vahlne & Johanson, 2019). Despite recent improvements in the protection of IP in emerging markets, large differences persist between countries (Berry, 2017, 2019) and adherence to regulation is often limited (Brander et al., 2017). For U.S. firms in particular, international operations typically include markets where IP protection is weaker than domestic regulatory arrangements (Sartor & Beamish, 2014). This increases the risk of imitation, leading to a loss of the value of intangible assets and erosion of competitive advantage (Shinkle &

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McCann, 2014). Firm that leverage IP for revenue generation may struggle to do so across regulatory contexts: while the firm maintains ownership of IP as a resource, it ceases to be strategic (c.f., Papanastassiou et al., 2019).

In this study, we examine how firms can continue to generate value when operating across markets where weak regulation and enforcement creates *IP risk:* an external threat to their ability to leverage IP as a source of revenues. We posit that *service transition* represents a reconfiguration of the resource base, away from product-based intangible assets and towards process-based resources that will retain their rarity and inimitability in the face of IP risk (Eggert et al., 2014; Gremler et al., 2019). Accordingly, while service transition ostensibly introduces additional variability into the firm's revenue sources (Fang et al., 2008; Josephson et al., 2016), we hypothesize that this will instead reduce *revenue risk* (i.e., unpredictability in cash flows) when threats to the strategic value of IP are high. Extending this logic (c.f., Contractor et al., 2003; Patel et al., 2019), we further examine whether increasing the *knowledge intensity* of service offerings provides similar benefits for firms with mixed business models. In a 12-year panel of 2,716 firms across 223 industries, we demonstrate that both strategies are effective in alleviating the volatility in revenues that occurs under conditions of high IP risk, ultimately leading to reductions in *idiosyncratic risk* (i.e. unpredictability in market performance) that are indicative of firm-specific advantages in turbulent conditions (Srinivasan & Hanssens, 2009).

Although firms operating internationally are particularly exposed to regulatory inconsistencies, IP risk broadly applies to any context where legal protection of intangible assets is insufficient or unevenly enforced. These findings consequently offer several contributions to the RBT literature with regards to competitive strategy, firm risk, and services, theorizing and demonstrating new insights into managerially relevant contingencies in the strategic value of resources (Posen et al., 2023) and changing bases of sustainable competitive advantage (Krakowski et al., 2023).

Recognizing that novel sources of risk and a heightened attention to risk-based metrics (Bhattacharya et al., 2019; Harrison et al., 2020) are a central driver of recent calls to test, demonstrate, and modernize the foundational framework of RBT to offer more practical insights into value creation in the modern businesses environment (Barney et al., 2021b; Bergh et al., 2024), we contribute to the nascent research explicating the influence of resource allocation decisions on firm risk (Edeling et al., 2021). This has important theoretical implications in light of contemporary challenges to the validity and predictive power of RBT's central tenets (Barney et al., 2021a) and entails practical recommendations, suggesting that managers can utilize first principles of RBT to offset the erosion of strategic resources and maintain firm-specific advantages under novel institutional contingencies (e.g., see Schweiger et al., 2019).

We also contribute to the development of a more nuanced perspective on service transition that incorporates institutional contexts, focusing here on the regulatory environment as a critical contingency in this domain (c.f. Vargo & Lusch, 2016, 2017). This is pertinent given the prevalence of service transition in international firms (Hennart, 2019), the underdeveloped literature on the protection of intangible assets during internationalization (Berry, 2019), and the long-held assumption that firms can exploit resources developed in the home market when expanding overseas (Gupta & Govindarajan, 2000). Our findings challenge this notion, providing actionable insights into why the strategic value of resources differs across markets and which strategies are effective for mitigating these threats, with practical implications for the internationalization and service transition processes. By examining both the extent and nature of service transition and focusing on risk outcomes that are fundamental to all firms (Edeling et al., 2021; Goyal & Santa-Clara, 2003; Srinivasan & Hanssens, 2009), we extend prior research on service transition and offer relevant recommendations for managers in both service and nonservice industries.

2. Conceptual framework and hypotheses

2.1. Intellectual property as a strategic resource

RBT conceptualizes firm performance as the ability to generate greater economic returns than competitors through the control and deployment of firm-specific *strategic resources* (Barney, 1986, 1991; Peteraf, 1993). To be 'strategic', resources must be *valuable* and *non-substitutable* by other resources in achieving a desired objective, and *rare* and *inimitable* among competitors. These central tenets are well-supported (Crook et al., 2008; Karna et al., 2016), underlying RBT's sustained popularity among both scholars and practitioners (Barney et al., 2021a; Foss & Klein, 2024). However, despite evidence that the performance effects of resources differ across environmental contexts (Barney, 2014; Schweiger et al., 2019), contingencies affecting the strategic value of resources remain poorly understood (Sirmon & Hitt, 2009), with these critical characteristics still often assumed to arise from factors intrinsic to the resource itself (c.f., Bergh et al., 2024; Gama & Magistretti, 2023; Posen et al., 2023).

IP exemplifies this gap in the extant literature. IP is distinct among resources in that its rarity and inimitability are legally protected, leading to a longstanding assumption and strong evidence of its strategic value as a basis for business models that are defensible against competitive threats and thus reliably generate revenues (Castaldi et al., 2024; Lerner et al., 2022; Magelssen, 2019). This evidently holds only insofar as the regulation and enforcement of IP rights is sufficient to confer these characteristics, which is often not the case in emerging markets (Peng et al., 2017). This implies differences in the strategic value of IP – and consequently, the ability of firms to reliably generate revenues from this resource – across institutional environments (Berry, 2017; Prud'homme & Tong, 2023).

Current research provides little guidance on how to manage this risk (Berry, 2019), with market factors that affect the strategic value of IP only recently receiving empirical attention (Giannetti & Rubera, 2019; Papanastassiou et al., 2019). A central notion in these studies is that operating across regulatory environments where IP protection varies raises the risk of competitive imitation (Berry, 2019; Samiee, 2020). Firms from developed economies are natural targets of imitation, as this can reduce risk, increase legitimacy, and thus improve performance for emerging market competitors (Giannetti & Rubera, 2019). The complex institutional environments that multinational firms must navigate also increases information processing demands, leading to difficulties in detecting competitive or regulatory threats and coordinating responses (Berry & Kaul, 2016; Vahlne & Johanson, 2019). These factors undermine the rarity and inimitability of IP, meaning that it may cease to be a strategic resource as it cannot form the basis of value creation and thus of a sustainable revenue stream (Barney, 1991). Empirically, the preference among U.S. firms to expand into markets with similar IP regulation (Berry, 2017; Brandl et al., 2018) and develop IP domestically (Berry, 2019; Zhao, 2006) supports this.

2.2. Product- versus process-based resources and firm risk

Erosion of strategic resources when operating across markets with varied levels of regulatory protection implies that U.S. firms' performance should suffer when internationalizing, particularly in terms of the ability to sustain cash flows from extant business models. Reflecting this concern, studies of how firms can mitigate IP risk in global markets have focused on efforts to protect the *existing* resource base (Berry, 2017; Brandl et al., 2018; Zhao, 2006). However, the internationalization—performance relationship is mixed (Berry & Kaul, 2016), with considerable firm-level heterogeneity in outcomes. This may be explainable by another key principle of RBT: different environments require different configurations of strategic resources (Barney, 1986; Schweiger et al., 2019; Sirmon et al., 2011). The growing tendency towards U.S. multinationals incorporating service offerings into

their business models (Hennart, 2019) offers tentative corroboration of this premise, implying that internationalization necessitates or encourages shifts in resource development and deployment.

Intangible assets are characteristically more strategic than tangible assets, offering greater opportunities to generate superior and sustainable firm performance (Edeling & Fischer, 2016; Homburg et al., 2020). This is because they are most likely to be firm-specific, and thus provide a basis for value creation that is less vulnerable to environmental threats that affect both a firm and its competitors (Bergh et al., 2024; Srivastava et al., 2001; Srivastava et al., 1998). Deployment of intangible assets in alignment with market demand is consequently regarded as the most effective way to generate predictable revenues (e.g. Fang et al., 2008; Katsikeas et al., 2016; Rego et al., 2009; Srivastava et al., 2001). This improves competitive performance via a reduction in idiosyncratic risk (IR), as investors perceive the firm as better equipped than others to respond to systemic threats (c.f., Bansal & Clelland, 2004; Goyal & Santa-Clara, 2003). When external conditions compromise firms' ability to sustain revenue flows, assessments of firm risk precede other valuation concerns (Harrison et al., 2020) and investors favor those that are better able to manage IR (Chen & Strebulaev, 2019; Herskovic et al., 2016).

While rarity and inimitability may drive the strategic value, revenue generation, and consequent improvements in firm risk and performance that intangible assets provide, specific resources achieve these characteristics in different ways. To explicate this, we conceptualize intangible assets on a continuum that reflects the firm's relative focus on products versus services. We define *product-based* intangible assets as those that relate to a specific innovation, design, or product. These include IP, and their rarity and inimitability is generally protectable by law. In contrast, *process-based* intangible assets refer to those that are not made rare or inimitable through regulation but through tacit knowledge and internal processes, such as distribution agreements, and customer subscriptions, and brand equity.[1] Product-based intangible assets are key to performance in nonservice firms, whereas process-based intangible assets are critical in services (Eggert et al., 2014). However, both can be strategic resources for all firms, their relative importance depending on the degree to which a firm relies on products or services to generate competitively defensible revenues.

When operating across international markets that create IP risk, nonservice business models that rely purely on product-based assets will therefore be most vulnerable, as the reliability and sustainability of revenue streams that depend on regulatory protection of the underlying resources will be under constant and evolving competitive pressure. In contrast, a firm that derives its revenues from services will not face the same level of threat to the strategic value of resources, as the process-based assets that support the generation of recurring revenues remain defensible against competition. As a baseline, we therefore predict an increase in revenue risk (i.e., a reduction in the stability and predictability of revenues) for nonservice firms operating in markets with weak IP protection, whereas service firms are unlikely to experience the same detrimental effects:

> ***Hypothesis 1 (H1):*** *The intangibility of a firm's strategic resources conditions the relationship between intellectual property (IP) risk and revenue risk, such that IP risk has a stronger effect on revenue risk in nonservice firms.*

To ensure a comprehensive examination of the mechanism explicated here, we also the examine the effect of revenue risk on performance in supplementary analyses, with the expectation derived from prior research and theory (see Srivastava et al., 2001; Srivastava et al., 1998) that revenue risk increases idiosyncratic risk across firms, independent of the intangibility of the strategic resource base. We next discuss the risk mitigation strategies implied by this model, which are illustrated in Fig. 1.

2.3. Mitigating intellectual property risk through service transition

The pathway depicted in Fig. 1 suggests a primary mechanism through which nonservice firms can ensure the reliability of revenues when operating in conditions of high IP risk: service transition (Fang et al., 2008; Josephson et al., 2016). This involves augmenting a business model based on product-based assets with auxiliary services (Ulaga & Reinartz, 2011), affording protection against imitation due to the complex, unobservable processes involved in service delivery (Eggert et al., 2014) and reducing revenue risk through customer loyalty (Rego et al., 2009). Effectively, service transition represents a shift in the resource base toward a form of intangible assets of which ownership and control is more defensible when IP risk is high (Gremler et al., 2019).

Service transition poses a degree of risk in itself (Fang et al., 2008), as it implies a gap between the extant resources of the nonservice firm and the process-based intangible assets that are required to compete in these new segments. This gap must be filled by the development of new resources, which requires significant investment (Patel et al., 2019), or by diverting extant resources away from current and proven revenue streams towards new activities with uncertain cash flows (Josephson et al., 2016; Sirmon et al., 2011). Despite these real and opportunity costs, empirical research shows that the prevailing effect of service transition is to *reduce* overall risk and stabilize revenues (Fang et al., 2008; Josephson et al., 2016; Ulaga & Reinartz, 2011). This evidence implies a positive baseline effect of service transition on revenue risk:

> ***Hypothesis 2a (H2a):*** *Service transition reduces revenue risk.*

Our framework conceptualizes why this may be the case, and enables a test of the mechanism presumed to underly the tendency for the benefits of service transition to outweigh its costs. A dominance of positive effects in the literature suggests that environmental conditions *generally* threaten the rarity and inimitability of product-based intangible assets, and thus enable the costs of service transition to be more than offset (c.f. Kraatz & Zajac, 2001; Patel et al., 2019). Identifying and isolating one critical contingency, we expect that the benefits of service transition will primarily accrue via the interaction between the reconfiguration of the firms' internal resources (service transition) and this external influence on the strategic value of resources (IP risk). We therefore hypothesize the following moderation effect:

> ***Hypothesis 2b (H2b):*** *Service transition attenuates the effect of IP risk on revenue risk, such that firm revenues are less volatile when an increasing proportion of revenues are derived from services.*

3. Mitigating intellectual property risk through knowledge intensity

Relying on service transition as a risk mitigation strategy presents an issue: growing numbers of firms have realized the benefits of this approach and incorporated auxiliary services into their business models, diminishing its intrinsic rarity and inimitability and thus the opportunities for easily attainable gains (Josephson et al., 2016; Patel et al., 2019). Increasingly, the strategic value of the resources underlying service provision relies on sustained internal development of these characteristics (Homburg et al., 2020; Srivastava et al., 1998).

Accordingly, it is not only shifts in the *extent* to which a firm relies upon process-based resources to generate revenues, but also the *nature* of these resources, that should be considered when seeking to mitigate IP risk. One dimension that is commonly used to examine this is the *knowledge intensity* of services: the degree to which sophisticated human resources are required in their delivery (Grant, 1996; Wiklund & Shepherd, 2003). On the continuum from IP as a product-based resource these represent the opposing end, where rarity and inimitability arise

[1] For this classification, we draw on the U.S. and Canadian GAAP definition of intangible assets.

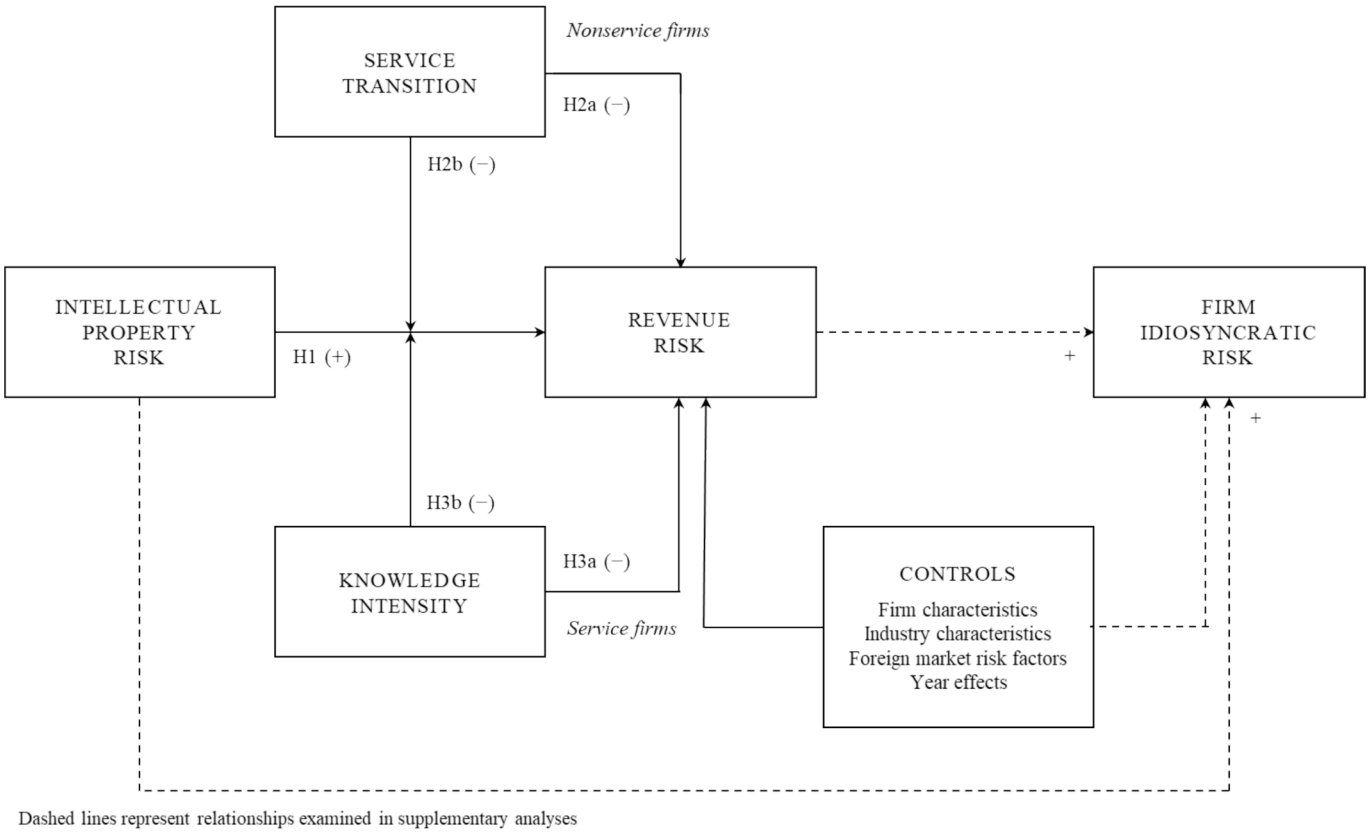

Fig. 1. Hypothesized effects of risk and risk mitigation strategies.

from tacit skills, accumulated experience, and interpersonal relationships rather than regulatory enforcement (Consoli & Elche-Hortelano, 2010; Von Nordenflycht, 2010). The complexity and firm-specificity of these resources increases the likelihood that they will retain their strategic value as external conditions change (Bergh et al., 2024; Srivastava et al., 2001). Resultantly, knowledge-intensive services are widely regarded as the most competitively defensible source of revenues, particularly when operating across international markets (Contractor et al., 2003; Hennart, 2019). Examining the effects of knowledge intensity in addition to service transition thus provides additional insight into the theoretical mechanism underlying our central premise,

Increasing knowledge intensity poses similar challenges to service transition in terms of developing and redeploying resources. However, preexisting processes for service delivery and organizational learning from prior experience with service transition alleviates much risk, requiring less initial disruption and buffering against future uncertainty in revenues (Contractor et al., 2003; Patel et al., 2019). Unlike the transition from nonservice to service business models, increasing the knowledge intensity of extant service offerings may therefore stabilize revenues without requiring overextension and investment that can outweigh these benefits. We therefore predict a positive baseline effect in terms of reducing revenue risk:

Hypothesis 3a (H3a): *Knowledge intensity reduces revenue risk.*

As for service transition, we also expect knowledge intensity will reduce the negative effect of IP risk on firm risk:

Hypothesis 3b (H3b): *Knowledge intensity attenuates the effect of IP risk on revenue risk, such that firm revenues are less volatile when an increasing proportion of revenues are derived from knowledge-intensive industries.*

H2 and H3 therefore posit service transition and knowledge intensity as mechanistically similar and complementary strategies for mitigating the risks of operating across markets with weak IP protection. Combined, these imply that both nonservice and service firms, relying respectively to a greater extent on product- and process-based assets, may benefit from a risk-reducing approach centered on shifting the resource base towards those that are likely to retain their strategic value. The critical distinction, underlying the documented differences in the performance of knowledge-intensive firms as a subset of service firms (Bergh et al., 2024; Von Nordenflycht, 2010), is whether the shift occurs in the *extent* of reliance on process-based resources as a basis for revenue generation or changing the *nature* of these resources toward those that have the highest strategic value.

This nuance points to a further area of empirical interest. The literature and our hypotheses recognize the costs of service transition, postulating risk-reducing effects when the environment is likely to undermine the strategic value of product-based resources. Absent such threats, the investments and opportunity costs incurred in developing or diverting resources may not produce a more stable and competitively defensible revenue stream (Fang et al., 2008). Conversely, the contingent effects of increasing knowledge intensity of services may be less diametric, as prior experience of developing and deploying process-based resources substantially alleviates this risk (Josephson et al., 2016; Patel et al., 2019). While we do not formally hypothesize this comparative effect due a lack of prior examination in the context of multinational firms (see Consoli & Elche-Hortelano, 2010; Schwens et al., 2018), we may observe this in empirical tests if the baseline effect of service transition ceases to significantly reduce revenue risk, while the positive effects of knowledge intensity persist, once the interaction with IP risk is accounted for.

4. Method

4.1. Data and sample

We obtained financial and business segment data for publicly listed U.S. firms from the Compustat Fundamentals, Compustat Segments, and CRSP databases. To develop an index of firms' IP risk, we combined two sources. First, the International Property Rights Index (IPRI) has since 2007 published a score quantifying the protection of IP rights in 129 countries, representing 98 % of world GDP (Property Rights Alliance, 2019). Presently, this is the only dedicated index of IP protection. We combined this country-level information with the Offshoring Activity Index (OAI) developed by Hoberg and Moon (2017). The OAI uses text analysis of annual reports to identify the scope and intensity of a firm's foreign activity by identifying co-occurrences of country—activity word pairs. Activities are categorized as 'output' (identified by words such as *sales, customer* and *revenues*), 'external input' (e.g. *supplier, import*) and 'internal input' (e.g. *subsidiary, factory*) (see Hoberg & Moon, 2017, Appendix A).

Potential biases resulting from using frequency measures derived from reports are acknowledged by Hoberg and Moon (2017) and partially remediated by a demonstration of robustness across model specifications and samples. This does not address the inherent limitation that the index might reflect an increase in mentions due to firms highlighting new market entries in their reporting; however, this is a lesser concern in our context, as we employ the OAI to provide a broad indicator of the *breadth* and *variety* in a firm's engagement in foreign markets rather than a proxy for the financial contribution of these activities[2] (for similar uses of the OAI see, for example, Bai et al., 2022; Campello et al., 2022; Hoberg & Moon, 2018). Accordingly, we employ the OAI as a more comprehensive measure of the forms of foreign market involvement that may contribute to firm risk than traditional metrics (such as export sales).

After removing missing data, the sample covers the period 2007 to 2019 and consists of 11,530 firm-year observations of 2,716 firms, representing 223 industries by 4-digit SIC code.

4.2. Measures

Dependent variables: Firm risk For our primary measure of firm risk examined in H1, H3 and H4, we calculate *revenue risk* as the standard deviation of a firm's revenues over the preceding four years, scaled by the mean of firm revenues over those four years (c.f. Rego et al., 2009). Controlling for revenue growth (see below) ensures that this measure does not capture increases in revenue during the period of interest.

In supplementary analyses, we estimate the effects of revenue risk on *idiosyncratic risk,* which we operationalize as the standard deviation of the residuals from the Carhart (1997) four-factor model of abnormal returns. The abnormal return for firm i in month m is calculated as:

$$R_{im} = \alpha_i + \beta_{iMKR} MKR_m + \beta_{iHML} HML_m + \beta_{iSMB} SMB_m + \beta_{iUMD} UMD_m + \varepsilon_{im} \quad (1)$$

Where R_{im} represents the firm-specific monthly returns in excess of the one-month Treasury bill risk-free rate; MKR_m is the difference between the value-weighted market return and the risk-free rate, HML_m is the book-to-market risk premium factor, SMB_m the size-based factor, and UMD_m the momentum factor. The abnormal return is represented by the intercept α_i. From this, we then derive IR at the firm-year level (in accordance with the measurement frequency for all other variables in our model) as:

$$IR_{it} = \left[\frac{1}{12} \sum_{m=1}^{12} (\varepsilon_{im} - \bar{\varepsilon}_{it})^2 \right]^{\frac{1}{2}} \quad (2)$$

Independent variables: IP risk We measure IP risk by combining IPRI scores with data from the Hoberg and Moon (2017) OAI. We take the inverse of the IPRI score, such that higher values represent high-risk markets, and calculate the average inverse IPRI score for each firm-year weighted by the level of activity in each market (i.e. the number of country—activity word co-occurrences for that market in that firm's annual report). We then scale the weighted average IPRI score by the total level of foreign activity for each firm-year (i.e. the total number of country-activity word co-occurrences)[3] to derive a measure of IP risk. This measure differs in important ways from IP-related variables utilized in prior research. First, we measure IP risk as a continuum. Unlike dichotomous measures based on specific IP regulations (e.g. Brandl et al., 2018), this allows fine-grained differentiation between levels of protection. Second, the IPRI score accounts for multiple forms of IP regulation and, importantly, their enforcement. Other studies have focused on patent protection (e.g. Berry, 2019; Zhao, 2006). As patents represent only one form of potentially valuable IP (Demmou et al., 2019), we argue that this provides a more appropriate measure (for further discussion of patent-based measures, see below and the Online Appendix).

Moderators: Service transition and knowledge intensity We quantify the degree of service transition as the year-on-year change in revenues derived from service segments. Knowledge intensity is analogously operationalized as the year-on-year change in revenues from knowledge-intensive service segments. Industries were identified as either nonservice or service and, within the latter category, as knowledge-intensive service by two independent coders assigning these classifications to each 4-digit SIC code based on industry descriptions. From 1,207 SIC codes, 12 discrepancies (1 %) between nonservice and service and 57 (4.7 %) inconsistencies in the identification of services as knowledge-intensive were identified and reconciled, indicating 0.99 and 0.95 inter-rater reliability for the respective measures.[4] The agreed classifications were then applied to the Compustat data based on the primary SIC code of each firm and business segment. Each coder then manually checked 100 randomly selected segments, ensuring that the classification accurately reflected the firm-assigned segment description. This closely follows prior research (Fang et al., 2008) but adds the subcategory of knowledge-based services based on the sector lists provided in Contractor et al. (2003).[5] Of 11,530 firm-year observations, 7,064 are nonservice and 4,466 service firms, with 8,175 deriving some revenues from service segments and 1,834 from knowledge-intensive service segments.

Control variables In all models, we control for *firm size* and *return on*

[2] We thank an anonymous reviewer for raising an important limitation of the OAI with regards to the financial contribution of international activities: mentions of countries that represent a small percentage of the firm's business should arguably not receive the same weight as countries with equal mentions that comprise a greater proportion of the firm's revenues. In terms of financial contribution, the weighting employed by the OAI may therefore be incomplete, suggesting an avenue for future research that combines this measure with, for example, export sales data.highlighting the importance of accounting for the relative significance of different international markets when assessing country-level risks. While our current dataset does not allow for such granularity, we recognize the need for future studies to incorporate sales percentages or other measures of market importance to provide a more nuanced analysis.

[3] This is necessary to account for the full extent of foreign market activity as some of the entries in the OAI do not specifically identify country or region markets but refer simply to 'foreign' sales, imports, ventures, etc.

[4] The full coded list of SIC classifications is provided as online Supplementary Material.

[5] Broadly, the sectors identified in Contractor et al. (2003) include: accounting; advertising, legal services, market research, publishing, and financial services (see also Consoli & Elche-Hortelano, 2010; Grant, 1996; Von Nordenflycht, 2010; Wiklund & Shepherd, 2003).

assets (ROA). We also control for *revenue growth* to ensure that our measure of revenue risk captures variability rather than increases in revenues. Following prior service transition research we also control for *industry growth* and *industry turbulence* (Fang et al., 2008). Together, these variables also serve as a proxy for the stage of the industry life cycle and therefore the intensity of competition (Stieglitz & Heine, 2007). This is necessary as the relative importance of IP differs across each stage of an industry's development (Tripsas, 1997). *Service relatedness* was included in models examining service transition, following prior research demonstrating its moderating effects (Fang et al., 2008; Josephson et al., 2016). *Strategic emphasis,* representing a firm's relative investment in marketing versus R&D (Feng et al., 2017), is included as an additional control in all models examining knowledge intensity. This is necessary to account for differences in the nature of knowledge resources employed, the strategic value of which may also be affected by IP risk (i.e., if an increase in knowledge intensity is directed towards developing and patenting new products, this may not be effective in mitigating this risk).

In addition to these firm- and industry-level controls, we include two variables that account for national market-level factors that may confound the impact of IP risk. First, we include *market GDP*, which measures GDP per capita across the firms' international markets. This ensures that we do not attribute to IP risk the difficulties in generating stable cash flows that may arise from operating across less developed markets. Second, *market WGI* is a composite measure representing the six World Bank Governance Indicators (Voice and Accountability; Political Stability and Absence of Violence/Terrorism; Rule of Law; Regulatory Quality; Government Effectiveness; and Control of Corruption). These indices of institutional stability are highly correlated with each other and with GDP per capita ($r = 0.850$) but capture aspects of political and legal risk that are not accounted for with economic indicators (Kaufmann & Kraay, 2023), thus ensuring that we isolate threats to IP as a distinct form of risk. Both measures are weighted by market exposure using the same procedure as our focal variable of IP risk.

Table 1 provides procedures for calculating controls and summaries of other variables. Table 2 presents descriptive statistics and correlations.

Table 1
Variable descriptions.

Variable	Operationalization	Data source
Idiosyncratic risk	Standard deviation of residuals from the Carhart (1997) four-factor model of abnormal returns.	CRSP
Revenue risk	Variability of firm revenues, calculated as the standard deviation of total revenues over the preceding four years.	Compustat Fundamentals
IP risk	Average of the (inverse) International Property Rights Index (IPRI) score for each country market in which the firm operates weighted by the level of activity in each market, scaled by the firm's total level of foreign activity (includes sales and distribution, export, import and manufacturing).	Property Rights Alliance; Offshoring Activity Database (Hoberg and Moon, 2017, 2018).
Service transition	Year-on-year change in revenues from service business segments.	Compustat Segments
Knowledge intensity	Year-on-year change in revenues from knowledge-based service business segments	Compustat Segments
Service relatedness	Average difference between the primary 4-digit SIC code of a firm's core business and each business segment, weighted by sales in each segment.	Compustat Fundamentals; Compustat Segments
Strategic emphasis	A firm's emphasis towards marketing (high values) versus R&D (low values), calculated as the difference between marketing and R&D expenses scaled by total assets.	Compustat Fundamentals
Firm size	Natural log of a firm's total assets.	Compustat Fundamentals
ROA	Net income scaled by total assets.	Compustat Fundamentals
Revenue growth	Year-on-year change in a firm's total revenues.	Compustat Fundamentals
Industry turbulence	Variability in revenues in a firm's primary 4-digit SIC code over four years, scaled by industry size. Calculated as the standard deviation of industry revenues over four years, divided by mean industry revenues over those four years.	Compustat Fundamentals
Industry growth	Revenue growth in a firm's primary 4-digit SIC code over four years, scaled by industry size. Calculated as the slope coefficient of industry revenues regressed over four years, divided by mean industry revenues over those four years.	Compustat Fundamentals
Market GDP	Annual GDP per capita for each country market in which the firm operates weighted by the level of activity in each market, scaled by the firm's total level of foreign activity.	World Bank; Offshoring Activity Database (Hoberg and Moon, 2017, 2018).
Market WGI	Average of the six World Bank Governance Indicators in each country market in which the firm operates weighted by the level of activity in each market, scaled by the firm's total level of foreign activity.	World Bank; Offshoring Activity Database (Hoberg and Moon, 2017, 2018).

4.3. Model estimation

To determine the appropriate estimation approach, we conducted several diagnostic tests (using the baseline models for testing H1), which indicated several econometric concerns with the panel data. For parsimony, results are reported here for models including all firms. The necessary corrections were applied to all models to ensure comparability.

First, a Hausman test showed covariance between firm-specific error and the independent variables ($\chi^2_{(5)} = 13.02$, $p = 0.023$), and consequently that fixed effects estimation was required to ensure consistency (Greene, 2008). Second, a significant Wald test indicated that inclusion of year dummies was necessary ($F_{(8,27249)} = 2.47$, $p = 0.011$). Third, a modified Wald statistic indicated strong heteroskedasticity ($\chi^2_{(5725)} = 3.4e+43$, $p < 0.001$) requiring robust standard errors to correct for bias and allow accurate inference (Stock & Watson, 2008). Fourth, as the dataset comprised an unbalanced panel (firms entering and leaving the dataset over time), a unit root test for heterogeneous panels was required to test for stationarity. A Fisher test using an augmented Dickey-Fuller statistic (Maddala & Wu, 1999) indicated that variables were stationary across panels ($\chi^2_{(4434)} = 1520.00$, $p < 0.001$), requiring no further correction. Finally, a Wooldridge test for serially correlated errors (Wooldridge, 2010) indicated first-order autocorrelation ($F_{1,4519} = 700.93$, $p < 0.001$; GP) and therefore the need for robust standard errors.

To address issues of reverse causality, IR was measured at time $t + 2$ and revenue risk at time $t + 1$, ensuring that changes in revenue risk were not attributable to contemporaneous or preceding changes in IR. However, this does not address the possibility of self-selection, where service transition decisions may be influenced by *predicted* performance: if a firm's managers expect stable revenues, they may be more likely to

Table 2
Descriptive statistics and correlations.

	Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Idiosyncratic risk	12.27	3.58													
2	Revenue risk	915.25	1582.63	−0.043												
3	IP risk	2.46	1.22	−0.179	−0.023											
4	Knowledge intensity	1951.16	11965.22	−0.070	0.130	−0.012										
5	Service transition	2549.34	15509.81	−0.075	0.250	−0.020	0.877									
6	Service relatedness	−1856.97	33012.93	0.023	0.000	−0.046	0.007	0.008								
7	Strategic emphasis	0.30	0.15	0.349	−0.057	−0.174	−0.033	−0.038	0.042							
8	Firm size	5.10	1.44	−0.470	0.208	0.345	0.184	0.199	−0.005	−0.494						
9	ROA	−0.06	0.16	−0.441	0.033	0.125	0.035	0.038	−0.001	−0.565	0.356					
10	Industry turbulence	0.06	0.04	0.130	0.021	−0.003	0.008	0.017	0.023	−0.004	−0.052	0.026				
11	Industry growth	0.06	0.07	0.070	−0.003	−0.021	−0.004	−0.004	0.001	−0.025	−0.020	0.002	0.254			
12	Revenue growth	10.00	16.41	−0.055	0.537	−0.019	0.303	0.466	0.006	−0.050	0.245	0.035	0.034	−0.004		
13	Market GDP	10589.27	2010.58	0.057	−0.009	−0.397	0.065	0.054	0.022	0.015	−0.089	−0.043	0.041	−0.008	0.029	
14	Market WGI	0.34	0.06	0.059	−0.004	−0.342	0.066	0.059	0.019	0.072	−0.126	−0.056	0.047	−0.020	0.024	0.850

All variables are standardized in analyses to aid interpretation of coefficients.

pursue uncertain (service transition) or expensive (increasing knowledge intensity) activities. These omitted variables pertaining to managerial expectations may influence both the level of our independent variables and their performance effects. Including firm fixed effects removes between-firm variation in such unobserved factors, alleviating endogeneity concerns (c.f. Aral et al., 2012).

In sum, we estimated all models using fixed effects panel regression with robust standard errors and year dummies. For revenue risk we use the following model, where β' is a vector of coefficients of the independent variables, X'_{it} is a vector of the independent variables and interaction effects, μ_i represents firm-specific effects, υ_t year-specific effects and ε_{it} i.i.d. errors:

$$RR_{it+1} = \alpha + \beta' X'_{it} + \mu_i + \upsilon_t + \varepsilon_{it} \tag{3}$$

For IR, we measure the dependent variable at time $t + 2$ and utilize revenue risk in period $t + 1$ as an independent variable. All other variables are measured at time t:

$$IR_{it+2} = \alpha + \beta_0 RR_{it+1} + \beta' X'_{it} + \mu_i + \upsilon_t + \varepsilon_{it} \tag{4}$$

In estimating the effects of revenue risk on IR, the vector X'_{it} comprises all other independent variables as controls.

5. Results

Table 3 presents results for H1. The effects of IP risk on revenue risk support the hypothesized relationship, whereby this is conditional on the intangibility of a firm's strategic resources such that IP risk has a stronger effect on revenue risk in nonservice firms: IP risk increases revenue risk in nonservice firms (Model 2: 0.062, $p < 0.001$) and has no significant effect in service firms (Model 3: 0.003, $p = 0.397$).[6]

Models 4 to 6 (Table 4) provide a test of H2, which predicted that service transition (a) reduces revenue risk and (b) negatively moderates the effects of IP risk on revenue risk. Both sub-hypotheses are supported: we observe a decrease in revenue risk from service transition (Model 5: −0.200, $p < 0.001$) and a negative interaction effect with IP risk (Model 6: −0.070, $p = 0.003$). This interaction is illustrated in Fig. 2, which shows that a 1 standard deviation increase in service transition leads to a reduction in revenue risk of approximately 24.3 % when IP risk is high (around 5). This positive moderation effect occurs even at low levels of IP risk but becomes practically meaningful when IP risk reaches around 1.062. Given that the mean IP risk in our data is 2.46 with a standard deviation of 1.22, this implies that the benefits of service transition as a strategy to mitigate threats to IP protection are applicable to the majority of firms in our sample.

Models 8 to 9 (Table 5) report the results for H3, which predicted that knowledge intensity (a) reduces revenue risk and (b) negatively moderates the effects of IP risk on revenue risk. H3a is supported, though the main effect of knowledge intensity is marginally significant when only main effects are included (Model 8: −0.020, $p = 0.078$). H3b is supported in the negative interaction effect (Model 9: −0.030, $p = 0.008$), which is illustrated in Fig. 3. As shown, a one standard deviation increase in knowledge intensity leads to a reduction in revenue risk of approximately 29.8 % when IP risk is high. This effect occurs at higher levels of IP risk than the moderating effects of service transition, suggesting that increasing the knowledge intensity of services may only be an effective mitigation strategy in high-risk environments. However, the positive main effect of increases in knowledge intensity is greater in magnitude and more statistically significant when accounting for this interaction (Model 9: −0.062, $p < 0.001$). This implies that increasingly

[6] For comparison, we also estimate the model for all firms in the sample and find a significant, positive effect (0.053, $p < 0.001$). This is of smaller magnitude than the effect in nonservice firms and is likely attributable to the composition of the sample (7,064 nonservice and 4,466 service firms).

Table 3
Effects of IP risk on revenue risk in nonservice and service firms.

Dependent variable: *Revenue risk*	(1) All firms				(2) Nonservice firms				(3) Service firms			
	β	S.E.	*p*		*β*	S.E.	*p*		*β*	S.E.	*p*	
IP risk	0.053	0.006	0.000	(***)	0.062	0.010	0.000	(***)	0.003	0.004	0.397	
Firm size	0.158	0.013	0.000	(***)	0.190	0.021	0.000	(***)	0.051	0.006	0.000	(***)
ROA	−2.316	1.271	0.068	(*)	−2.589	1.629	0.112		−1.692	1.363	0.215	
Revenue growth	−0.197	0.008	0.000	(***)	−0.275	0.011	0.000	(***)	0.248	0.006	0.000	(***)
Industry turbulence	0.069	0.026	0.008	(***)	0.081	0.045	0.071	(*)	0.026	0.012	0.027	(**)
Industry growth	0.022	0.217	0.920		0.106	0.607	0.862		0.009	0.074	0.905	
Market GDP	0.017	0.020	0.411		0.082	0.053	0.120		−0.004	0.007	0.536	
Market WGI	0.002	0.020	0.923		−0.037	0.048	0.446		0.006	0.007	0.433	
Intercept	−0.163	0.052	0.002	(***)	−0.188	0.108	0.083	(*)	−0.038	0.030	0.206	
Year fixed effects	Included				Included				Included			
Observations	11,530				7,064				4,466			
R^2	0.077				0.117				0.295			
F	68.300		0.000	(***)	66.470		0.000	(***)	132.900		0.000	(***)

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Table 4
Effects of service transition and IP risk on revenue risk.

Dependent variable: *Revenue risk*	(4) Controls				(5) Main effects				(6) Interactions			
	β	S.E.	*p*		*β*	S.E.	*p*		*β*	S.E.	*p*	
IP risk	0.062	0.010	0.000	(***)	−0.002	0.036	0.961		0.010	0.036	0.775	
Service transition					−0.200	0.044	0.000	(***)	0.113	0.112	0.317	
IP risk x Service transition									−0.070	0.023	0.003	(**)
Service relatedness					0.783	2.447	0.749		0.649	2.436	0.790	
Firm size	0.190	0.021	0.000	(***)	0.340	0.075	0.000	(***)	0.324	0.075	0.000	(***)
ROA	−2.589	1.629	0.112		5.993	38.024	0.875		2.238	37.865	0.953	
Revenue growth	−0.275	0.011	0.000	(***)	−0.809	0.035	0.000	(***)	−0.823	0.036	0.000	(***)
Industry turbulence	0.081	0.045	0.071	(*)	−0.061	0.152	0.690		−0.051	0.152	0.736	
Industry growth	0.106	0.607	0.862		−1.257	5.841	0.830		−0.815	5.816	0.889	
Market GDP	0.082	0.053	0.120		0.035	0.147	0.813		0.040	0.146	0.786	
Market WGI	−0.037	0.048	0.446		−0.061	0.159	0.700		−0.057	0.158	0.718	
Intercept	−0.188	0.108	0.083	(*)	−0.227	1.024	0.825		−0.143	1.020	0.889	
Year fixed effects	Included				Included				Included			
Observations	7,064				7,064				7,064			
R^2	0.117				0.498				0.503			
F	66.470		0.000	(***)	64.800		0.000	(***)	61.400		0.000	(***)

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.
Service transition = year-to-year change in proportion of revenues derived from service business segments

the knowledge intensity of services may be a positive strategy for firms to pursue to reduce revenue risk, with or without threats to IP. Combined with the results presented in the following supplementary analyses (Table 6), which demonstrate that both forms of risk are less consequential in terms of firm-specific risk for service firms, this provides further support for the general premise that increasing the extent and intensity of service offerings is a practical strategy for mitigating threats to the strategic value of IP.

5.1. Supplementary analyses

Table 6 reports the results for our supplementary analyses, examining the effect of revenue risk on IR for all firms, nonservice firms, and service firms. Across all models, we observe a positive effect, supporting the prediction that revenue risk increases IR. However, while this is significant at the 5 % level at the sample-level (Model 10) and in nonservice firms (Model 11), this is only marginally significant in service firms (Model 12: $p = 0.080$). This pattern of results is also evident in the effect of IP risk on IR, being significant in Models 10 and 11 and nonsignificant in Model 12. Combined with the effects of revenue risk, these effects thus corroborate the underlying premise of our framework: services appear to mitigate the effects of external and operational risks on firm-specific risk.

6. Discussion and conclusions

This study provides new insights based on a foundational premise of RBT: strategic resources enable firms to mitigate unfavorable environmental conditions to generate and sustain reliable sources of revenues, improving their performance vis-à-vis competitors by reducing firm-specific risk (Barney, 1991; Wang & Barney, 2006). We demonstrate this relationship in the context of IP protection across international markets; an issue of growing concern that present research has not adequately addressed (Castaldi et al., 2024; Vahlne & Johanson, 2019) and that threatens the strategic value of the resources upon which many firms are dependent for revenue generation (Papanastassiou et al., 2019; Probert et al., 2013). Consistent with our hypotheses, IP risk increases revenue risk and consequently firm-specific risk (IR).

Corroborating the proposed mechanism through which a loss of rarity and inimitably undermines the ability to deploy IP as a strategic resource we find that service transition ameliorates this effect, offering an alternative source of revenues that retains its strategic value when business models that are reliant on product-based assets are no longer defensible (Eggert et al., 2014; Gremler et al., 2019). Increasing the knowledge intensity of service offerings also mitigates the risks associated with exposure to markets with weak IP protection, further supporting this core logic of RBT and demonstrating that the performance of both nonservice and service firms may be augmented by focusing on

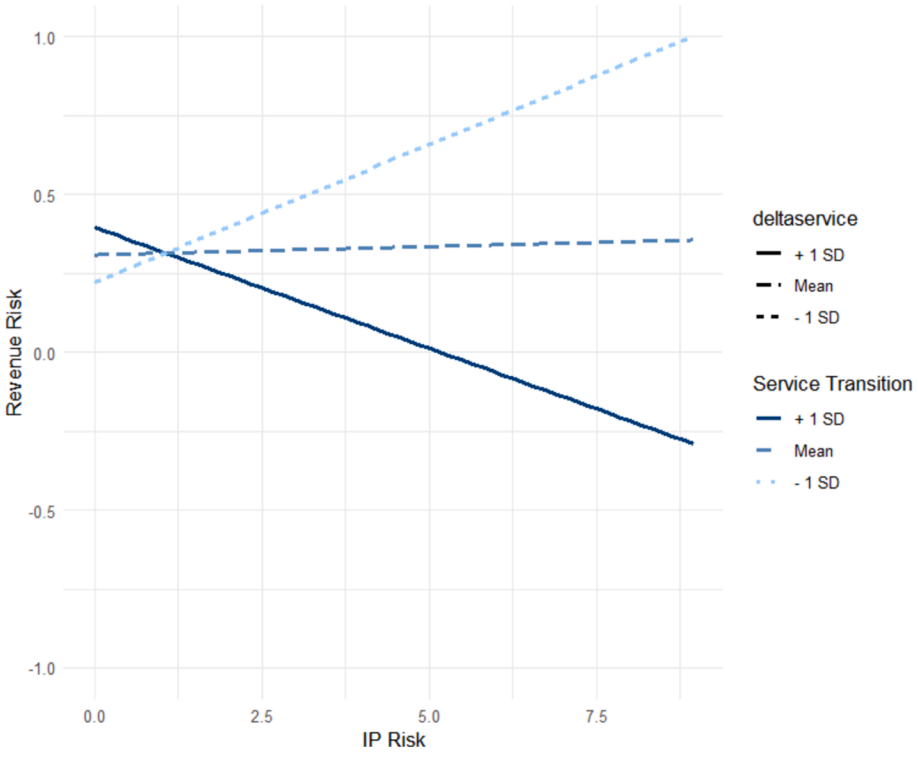

Fig. 2. Effect of service transition and IP risk on revenue risk in nonservice firms.

Table 5
Effects of knowledge intensity and IP risk on revenue risk.

Dependent variable: *Revenue risk*	(7) Controls				(8) Main effects				(9) Interactions			
	β	S.E.	*p*		*β*	S.E.	*p*		*β*	S.E.	*p*	
IP risk	0.065	0.013	0.000	(***)	0.028	0.011	0.009	(**)	0.022	0.013	0.101	
Knowledge intensity					−0.020	0.012	0.078	(*)	−0.062	0.016	0.000	(***)
IP risk x Knowledge intensity									−0.030	0.011	0.008	(***)
Service relatedness	0.583	2.122	0.784		−0.005	0.657	0.994		−0.012	0.077	0.876	
Strategic emphasis	−1.111	1.494	0.457		−1.116	2.419	0.645		0.214	1.161	0.854	
Firm size	0.284	0.027	0.000	(***)	0.105	0.025	0.000	(***)	0.049	0.013	0.000	(***)
ROA	−11.902	5.863	0.042	(**)	−10.834	11.717	0.356		−3.818	4.675	0.414	
Revenue growth	−0.270	0.012	0.000	(***)	0.435	0.020	0.000	(***)	0.450	0.013	0.000	(***)
Industry turbulence	0.115	0.054	0.035	(**)	−0.010	0.053	0.849		0.001	0.025	0.983	
Industry growth	0.016	0.303	0.957		0.018	0.143	0.899		0.010	0.101	0.923	
Market GDP	0.178	0.077	0.020	(**)	−0.080	0.075	0.285		−0.022	0.017	0.182	
Market WGI	−0.088	0.067	0.189		0.035	0.062	0.570		0.010	0.020	0.602	
Intercept	−0.094	0.109	0.387		0.068	0.211	0.749		0.045	0.082	0.586	
Year fixed effects	Included				Included				Included			
Observations	11,530				11,530				11,530			
R^2	0.116				0.540				0.569			
F	48.08		0.000	(***)	41.92		0.000	(***)	89.05		0.000	(***)

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.
Knowledge intensity = year-to-year change in proportion of revenues derived from knowledge-based business segments.

resources that are most strategically valuable in different market conditions. Combined with evidence that service transition can *increase* risk by shifting resource deployment toward new and uncertain revenue streams (Fang et al., 2008; Josephson et al., 2016; Neely, 2008), this implies that the degree to which a firm's basis of value creation fulfils the characteristics of a strategic resource under different environmental contingencies is a critical consideration in both service transition and internationalization. Accordingly, our findings have several implications for both theoretical development in RBT and managerial practice.

6.1. Implications for research: Strategic resources and firm risk

Recent and unprecedented changes in economic globalization, technological development, and sociopolitical instability have led to numerous calls for research that reexamines the first principles of extant theory in business research (Amis et al., 2020; Barney et al., 2021b; Foss & Klein, 2024), with the aim of assessing and, where appropriate, reformulating the core assumptions of scholarship and practice (Barney et al., 2021a). RBT has been central to these commentaries, which highlight three major areas in need of development to account for contemporary conditions (1) the range of environmental contingencies affecting the strategic value and deployment of resources (Posen et al.,

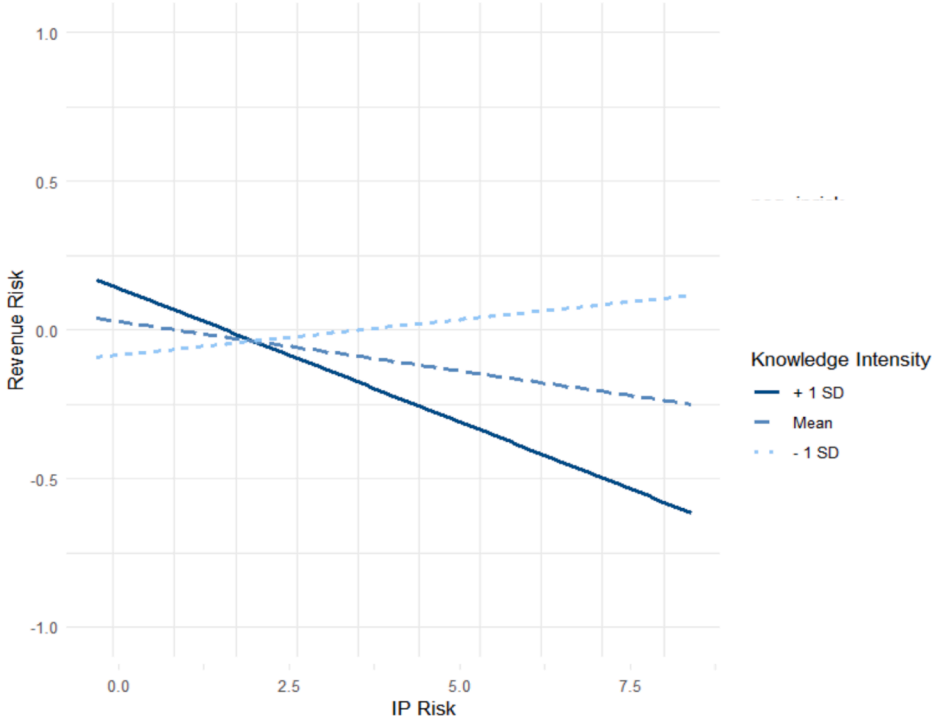

Fig. 3. Effect of knowledge intensity and IP risk on revenue risk.

Table 6
Effects of revenue risk on firm idiosyncratic risk in nonservice and service firms.

Dependent variable: *Idiosyncratic risk*	(10) All firms				(11) Nonservice firms				(12) Service firms			
	β	S.E.	*p*		*β*	S.E.	*p*		*β*	S.E.	*p*	
Revenue risk	0.000	0.000	0.025	(**)	0.000	0.000	0.022	(**)	0.001	0.000	0.080	(*)
IP risk	0.000	0.000	0.034	(**)	0.001	0.000	0.000	(***)	0.000	0.000	0.893	
Firm size	−0.004	0.000	0.000	(***)	−0.002	0.000	0.000	(***)	−0.003	0.000	0.000	(***)
ROA	−0.113	0.008	0.000	(***)	−0.144	0.009	0.000	(***)	−0.245	0.032	0.000	(***)
Revenue growth	0.000	0.000	0.021	(**)	0.000	0.000	0.184		0.000	0.000	0.365	
Industry turbulence	0.001	0.000	0.014	(**)	0.000	0.000	0.914		0.001	0.000	0.005	(***)
Industry growth	0.000	0.001	0.753		0.001	0.003	0.719		0.001	0.002	0.569	
Market GDP	0.000	0.000	0.349		0.001	0.000	0.027	(**)	0.000	0.000	0.115	
Market WGI	0.000	0.000	0.498		−0.001	0.000	0.031	(**)	0.000	0.000	0.093	(*)
Intercept	−0.004	0.000	0.000	(***)	−0.004	0.000	0.000	(***)	−0.002	0.001	0.007	(***)
Year fixed effects	Included				Included				Included			
Observations	11,530				7,064				4,466			
R^2	0.187				0.100				0.165			
F	161.300		0.000	(***)	47.680		0.000	(***)	54.090		0.000	(***)

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

2023), (2) the shifting bases of sustainable competitive advantage (Krakowski et al., 2023), and (3) the increasing centrality of firm risk as a priority among directors, managers, and investors (Boivie et al., 2021).

This study contributes to theoretical development in these three areas. Through a novel operationalization and empirical examination of IP risk, our results show that the first principles of RBT – specifically, the characteristics and importance of strategic resources (Barney, 1991) – remain a conceptually and practically informative guide to understanding competitive advantage under current differences in national regulatory regimes: a key challenge for firms managing resource deployment across heterogeneous institutional contexts (e.g., see Hennart, 2019; Schweiger et al., 2019). Conversely, our examination of strategies for mitigating the loss of strategic resources runs counter to the notion that increasing a firm's reliance on process- versus product-based assets is risky (see Fang et al., 2008; Josephson et al., 2016). While expansion of the extent and nature of service provision may introduce cash flow uncertainty and increase the potential for resource diversion and misallocation away from extant sources of revenue, our findings shows that external conditions are a key determinant of what constitutes a 'strategic' resource that can be deployed to reduce revenue volatility. This provides new insights into why these risks appear to be generally offset by the benefits of service transition, particularly when this involves increasing the knowledge intensity of services (Patel et al., 2019).

This implies novel questions for the future development of RBT, with a need for greater understanding of the managerial capabilities and decision-making processes that enable firms to detect and respond to contingencies in the ability to profitability deploy intangible assets, and thus mitigate the risks of resource reallocation—or misallocation (Posen et al., 2023). Similarly, in challenging the widely held view that the strategic value of intangible assets is most consistent and defensible (Bergh et al., 2024; Srivastava et al., 2001), our findings imply a need for further investigation of the forms of intangible assets that are most adaptable to the continually evolving and increasingly complex

contemporary institutional environment (e.g., see Beugelsdijk & Luo, 2024; Dhanaraj, 2024).

Accordingly, our findings contribute to both confirming and 'revitalizing' RBT (Barney et al., 2011; Bergh et al., 2024) and questioning conventional assumptions regarding the value of resources as a function of their intrinsic characteristics (Barney et al., 2021a; Peteraf, 1993). In doing so, we also contribute to the underdeveloped literature examining the antecedents of firm risk (Edeling et al., 2021). Research in this area has been guided by a focus on firms' interactions with financial markets (Bansal & Clelland, 2004; Bhattacharya et al., 2019; Goyal & Santa-Clara, 2003), predominantly drawing upon frameworks such as signaling theory (Bergh et al., 2014; Connelly et al., 2011) rather than internal, resource-based factors. Little is known about how the internal development and deployment of resources ultimately affects IR at the market-level (Edeling et al., 2021), despite longstanding recognition that IR is largely determined by the ability to predictably generate revenues in the face of external, systematic threats (Srinivasan & Hanssens, 2009). Our findings explicate RBT as a valuable lens through which a nuanced understanding of the relationship between resources, revenues, and IR may be advanced, offering a substantive and practically important contribution in the empirical context of service transition and internationalization.

6.2. Implications for practice: Service transition and internationalization

Our theoretical contributions imply a broad recommendation for managers seeking to sustain competitive performance in the modern business environment: evaluate the strategic value of the core resources that are leveraged for revenue generation from first principles of RBT, and reconfigure the business models to ensure that this resource base retains its *rarity* and *inimitability* as external conditions change (whether through deliberate market entry or uncontrollable environmental forces). The empirical context of our analysis allows for more specific and actionable guidance with regards to two major decisions facing many firms today: determining the extent and nature of service provision that optimally exploits extant resources yet is also sustainable in turbulent environments (Fang et al., 2008; Josephson et al., 2016), and navigating complex institutional arrangements when operating across numerous international markets (Peng et al., 2017; Prud'homme & Tong, 2023). These issues are increasingly inextricable, as service transition and internationalization are both becoming a necessity for modern firms to maintain competitiveness and often occur simultaneously (Dhanaraj, 2024; Hennart, 2019).

Our results indicate that the risks of service transition may be more than offset by their potential to buffer against the erosion of the product-based strategic resources underlying a nonservice business model. As service transition becomes increasingly common (Patel et al., 2019), these findings suggest the need for managers to adopt a nuanced perspective on commencing or increasing activities in service segments, balancing the temporary disruption from new and uncertain revenue streams against the longer-term reductions in revenue risk (and consequently, IR) that can be achieved when the rarity and inimitability of the current resource base is under threat. This recommendation extends beyond nonservice firms, as we find similar beneficial effects of increasing the knowledge intensity of extant service offerings. Although higher levels of IP risk are required before firms can realize the risk mitigation benefits, this strategy also decreases revenue risk independently of IP risk within our sample. While the initial transition from a focus on product- to process-based assets remains somewhat risky contingent upon the environment, a large majority of firms may therefore benefit from reconfiguring their service offers towards rarer, more inimitable, and consequently more strategic and defensible, knowledge resources (see Bergh et al., 2024; Grant, 1996; Wiklund & Shepherd, 2003).

Our findings also imply how market selection and resource configuration decisions can benefit from viewing the implications of institutional contingencies through the lens of strategic resources. Two common recommendations in the international business literature are that (1) firms can transfer and exploit domestically developed resources when expanding overseas (Gupta & Govindarajan, 2000) and (2) breadth of international exposure is a form of market diversification that can mitigate firm-level risk (Vahlne & Johanson, 2017). We demonstrate that these assumptions may not hold when resources cannot be leveraged in the foreign market (c.f. Brandl et al., 2018) due to institutional conditions that alter their strategic value. Contrary to popular prescription, managers may therefore need to consider whether strategies such as local development of market-specific resources or diversification in terms of products or business activities provide a superior pathway to sustainable advantage, despite the demonstrably greater risks of these approaches under alternative conditions (e.g., see Beugelsdijk & Luo, 2024; Hitt et al., 1997).

Collectively, these implications highlight how ostensibly 'risk-reducing' strategies may have opposite and detrimental effects when applied across heterogeneous varying regulatory contexts. Working from the first principles of RBT, managers can ensure that the characteristics and deployment of resources are suitably aligned with the environment before evaluating whether these approaches are necessary or appropriate.

6.3. Limitations and directions for future research

The theoretical implications of this study point to further investigation of the value of IP and service transition as strategic resources, with ample opportunities for future research to explore how their characteristics and potential as a source of competitive advantage differ across institutional contexts. Some limitations of our analysis indicate clear avenues for empirical and theoretical development. First, we used the classification of firms as nonservice or service and the knowledge intensity of services as proxies for the likely significance of product-based intangible assets and thus the importance of IP protection. However, we acknowledge that service- and knowledge-based business models may still rely on the inimitability and rarity of IP as a source of value creation (Consoli & Elche-Hortelano, 2010; Mizik & Jacobson, 2003). We opt to control for this variation via a firm's strategic emphasis (see Table 6). A deeper understanding of how firms value and deploy IP as a strategic resource would require an alternative approach and additional primary data sources in order to directly measure these factors (for example, through surveys of key decision-makers).

Similar methods may also explicate the role of managerial agency. As in previous studies, we infer alignment between resources, strategy, and environment from firm-level indicators (Aral et al., 2012; Sirmon & Hitt, 2009). Further examination of the strategy process would facilitate understanding of *how* effective resource orchestration and service transition is achieved. Surveys, interviews, or analyses of a firms' communications with stakeholders during strategy-making and implementation activities may provide valuable insight. We therefore encourage further research to seek novel data sources to examine the role of decision-making in identifying and configuring strategic resources, and explore a broader range of contingencies that may challenge and refine conventional assumptions about the strategic value of IP, service transition, and other resources and strategies.

CRediT authorship contribution statement

Kerry Hudson: Writing – review & editing, Writing – original draft, Visualization, Validation, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Robert E. Morgan:** Writing – review & editing, Supervision, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jbusres.2024.115118.

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