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Analysing the Internationalisation Strategies of a Critical Industry

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Abstract

Internationalisation is widely regarded as a central strategic decision for firms seeking to sustain competitiveness, yet the empirical evidence linking internationalisation strategies to firm performance remains inconclusive, often found to be non-linear or contingent on firm characteristics and industry context. This dissertation examines this relationship within the petrochemical industry, focusing on the adhesives and glue manufacturing segment (NACE C20.52), a context not previously examined in this literature.

Drawing on firm-level panel data from the Orbis database, covering 734 firms operating in this segment worldwide between 2019 and 2024, this study evaluates the effect of three internationalisation strategies, Export, International Joint Ventures (IJV) and Cross-border Acquisitions, on firm performance, measured through Return on Assets (ROA) and Return on Equity (ROE). Random Effects panel regression models are employed to test five hypotheses, addressing the direct effect of each strategy, the non-linear relationship between the breadth of internationalisation pursued and performance, and the moderating role of firm size.

None of the three strategies exhibits a significant direct effect on firm performance, nor does the breadth of internationalisation display the hypothesised non-linear relationship. However, firm size significantly moderates the relationship: exporting benefits smaller firms, with this effect weakening as size increases, while international joint ventures show the opposite pattern, harming smaller firms but increasingly benefiting larger ones, a result robust across alternative standard error specifications. No significant effect is found for cross-border acquisitions.

This dissertation contributes to the literature by providing sector-specific evidence, jointly assessing multiple strategies within a single model, and showing that firm size plays a decisive moderating role, reframing the question from whether internationalisation improves performance to for which firms it does so.

Keywords: Internationalisation, Firm Performance, Petrochemical Industry, Adhesives Manufacturing, Firm Size, Panel Data

Resumo

A internacionalização é amplamente reconhecida como uma decisão estratégica central para as empresas, contudo a evidência empírica que relaciona as estratégias de internacionalização com a performance das empresas permanece inconclusiva, sendo frequentemente considerada não-linear ou dependente das características da empresa e do contexto da indústria. Esta dissertação analisa esta relação no contexto da indústria petroquímica, focando-se especificamente no segmento de fabricação de colas e adesivos (NACE C20.52), um contexto ainda não explorado nesta literatura.

Com base em dados em painel ao nível da empresa provenientes da base de dados Orbis, abrangendo 734 empresas a operar neste segmento a nível mundial entre 2019 e 2024, este estudo avalia o efeito de três estratégias de internacionalização, exportação, joint ventures internacionais e aquisições transfronteiriças, na performance das empresas, medida através do Return on Assets (ROA) e do Return on Equity (ROE). São utilizados modelos de regressão em painel de Efeitos Aleatórios para testar cinco hipóteses, relativas ao efeito direto de cada estratégia, à relação não-linear entre a amplitude da internacionalização prosseguida e a performance e ao papel moderador da dimensão da empresa.

Nenhuma das três estratégias apresenta um efeito direto significativo na performance das empresas, nem a amplitude da internacionalização revela a relação não-linear hipotetizada. Contudo, a dimensão da empresa modera significativamente esta relação: a exportação beneficia as empresas de menor dimensão, enfraquecendo esse efeito à medida que a dimensão aumenta, enquanto as joint ventures internacionais apresentam o padrão inverso, prejudicando as empresas de menor dimensão mas beneficiando cada vez mais as de maior dimensão, um resultado robusto a diferentes especificações dos erros-padrão. Não se encontra qualquer efeito significativo para as aquisições transfronteiriças.

Esta dissertação contribui para a literatura ao fornecer evidência específica do setor, ao avaliar conjuntamente múltiplas estratégias num único modelo e ao demonstrar que a dimensão da empresa desempenha um papel moderador decisivo, reformulando a questão de saber se a internacionalização melhora a performance para saber para que empresas é que a melhora.

Palavras-chave: Internacionalização, Performance das Empresas, Indústria Petroquímica, Fabricação de Adesivos, Dimensão da Empresa, Dados em Painel.

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1. Introduction

Internationalisation is widely recognized as one of the central strategic decisions available to firms' seeking competitiveness and growth in an increasingly globalized economy. Firms may internationalise through a variety of strategies, ranging from lower-commitment approaches, such as Export, to higher-commitment modes involving direct investment and ownership abroad, such as International Joint Ventures (IJV), Greenfield Investments and Cross-border Acquisitions (Johanson & Vahlne, 1977; Dunning, 1988; Slangen & Hennart, 2007; Haspeslagh & Jemison, 1991). While the relationship between internationalisation and firm performance has been extensively studied, the empirical evidence remains far from conclusive: a substantial body of research finds internationalisation to be positively associated with firm performance (Wagner, 2012; Grazzi, 2012; Bernard & Jensen, 1999), while another equally established stream of the literature reports non-linear, inconsistent, or even negative relationships, contingent on firm-specific characteristics, the internationalisation strategy pursued and the industry context in which the firm operates (Aggarwal, 2017; Hsu & Boggs, 2003; Lu & Beamish, 2001; Contractor et al., 2007).

The petrochemical industry offers a particularly relevant setting in which to examine this relationship. As a foundational sector of the global economy, the petrochemical industry supplies essential raw materials to a wide range of downstream industries and is characterised by high capital intensity, technological complexity and strong dependence on fossil-fuel feedstocks, alongside growing exposure to sustainability regulatory pressures (IEA, 2018; Ren et al., 2006; Zhang et al., 2024; Bauer & Fontenit, 2021). Within this industry, the adhesives and glue manufacturing segment (NACE C20.52) represents a specific and economically relevant subsector, exposed to the broader structural determinants of the petrochemical value chain while also competing on more specialised dimensions, such as proprietary formulations and customer relationships (Levi & Cullen, 2018). Despite the strategic importance of internationalisation for firms operating in this segment, illustrated by the international expansion strategies pursued by leading adhesives manufacturers such as H.B. Fuller, Henkel, Sika, BASF and Dow, the empirical literature on internationalisation and firm performance has not specifically examined this industry, nor has it typically assessed multiple internationalisation strategies jointly within a single, industry-specific empirical framework.

This dissertation addresses this gap by examining the relationship between internationalisation strategies and firm performance among firms operating in the adhesives and glue manufacturing segment of the petrochemical industry. Specifically, it investigates whether Export, IJV, and Cross-border Acquisitions are associated with firm performance, measured through Return on Assets (ROA) and Return on Equity (ROE) and whether this relationship is shaped by the breadth of internationalisation pursued and by firm size. Using firm-level panel data retrieved from the Orbis database, covering 734 firms observed between 2019 and 2024, the empirical analysis is conducted through Random Effects panel regression models, in line with the methodological approach adopted in comparable studies within the internationalisation-performance literature (Ruigrok & Wagner, 2003; Arbelo et al., 2024).

This study contributes to the literature in three main ways. First, it provides sector-specific empirical evidence for the petrochemical industry and more particularly for the adhesives and glue manufacturing segment, a context that has not been previously examined in the internationalisation-performance literature. Second, it jointly assesses three distinct internationalisation strategies within a single econometric model, rather than examining each strategy in isolation. Third, by testing whether firm size moderates the relationship between internationalisation strategies and performance. This dissertation offers a more nuanced explanation for the frequently inconsistent findings reported in prior research, addressing not only whether internationalisation improves performance, but for which firms it does so.

This dissertation is structured as follows. Chapter 2 develops a comprehensive literature review, covering the main internationalisation strategies considered in this study, the characterisation of the petrochemical and adhesives industry, the theoretical approaches linking internationalisation to firm performance, other determinants of firm performance and the identification of the research gap that motivates this dissertation. Chapter 3 presents the methodology, including the hypotheses tested, the estimation method, the data collection procedure and proxies used for the relevant variables. Chapter 4 presents and discusses the empirical results, including descriptive statistics, estimation results and robustness checks. Finally, Chapter 5 concludes, summarizing the main results, contributions, limitations and avenues for future research.

2. Literature Review

The petrochemical industry occupies a central position in the global economy, being one of the largest industrial consumers of energy and a sector heavily reliant on fossil-fuel feedstocks such as crude oil and natural gas (IEA, 2018). Its operations are embedded in complex global value chains, connecting feedstock extraction to the production of chemical intermediates and their incorporation into a wide range of manufactured goods, which makes the industry highly dependent on international trade and cross-border logistics (Levi & Cullen, 2018). This global interconnection, combined with high capital intensity and energy dependency (Ren et al., 2006), creates strong incentives for petrochemical firms to expand beyond domestic markets, making internationalisation a central strategic concern for the sector. At the same time, the industry is undergoing a period of structural transformation, driven by decarbonization mandates, circular economy targets and the adoption of new technologies, all of which are reshaping the competitive dynamics that firms face when expanding internationally (Zhang et al., 2024). Understanding how different internationalisation strategies affect firm performance is therefore particularly relevant in a sector where global exposure, resource dependency and structural change intersect.

2.1 Main concepts - Internationalisation Strategies

Internationalisation can be broadly understood as the process through which firms increase their involvement in activities outside their domestic market. One of the most influential contributions to this literature is the Uppsala model, which describes internationalisation as an incremental process whereby firms gradually increase their commitment to foreign markets as they accumulate experiential knowledge, typically beginning with direct export activities to nearby or similar markets before advancing to higher-commitment modes such as joint ventures, greenfield investments, or acquisitions (Johanson & Vahlne, 1977). This perspective highlights that internationalisation is not a single, uniform decision, but rather a set of distinct strategic choices, each associated with different levels of resource commitment, risk exposure and control over foreign operations. The following subsections define the four internationalisation strategies considered in this dissertation: Export, International Joint Ventures, Greenfield Investments and Cross-border Acquisitions.

2.1.1 Export

Export is generally regarded as the entry mode involving the lowest level of resource commitment and risk exposure among internationalisation strategies. It has been defined as the entry mode that involves selling products manufactured in the home country or in a third country to customers in the target country (Root, 1994). This strategy allows firms to reach foreign markets without establishing a physical presence abroad, while still generating international revenue. Empirically, exporting has also been operationalized in a straightforward manner, through a binary export participation indicator identifying whether a firm sells its domestically produced goods to foreign buyers (Bernard & Jensen, 1999). Importantly, the same authors show that export is not simply a passive or residual activity, but a deliberate strategy typically pursued by firms that are already more productive and that participation in export markets can itself generate further performance improvements through learning-by-exporting effects (Bernard & Jensen, 1999). This suggests a potential bidirectional relationship between exporting and firm performance.

2.1.2 International Joint Venture

International Joint Ventures represent a higher-commitment internationalisation strategy, involving the creation of a shared entity, jointly owned by two or more independent firms from different countries, through a separate legal entity with shared equity, governance, and operational responsibility (Kogut, 1988; Beamish & Banks, 1987). This arrangement allows partners to combine complementary resources and share risk in a foreign market, gaining access to local knowledge, distribution networks and institutional relationships that would not be easily replicated independently (Beamish & Banks, 1987).

From a theoretical standpoint, the eclectic paradigm helps explain why firms may choose joint ventures over full ownership: IJV tend to emerge when firms possess ownership and location advantages, but internalisation advantages are constrained by market uncertainty, institutional barriers, or host-country requirements, making shared equity arrangements preferable to full ownership (Dunning, 1988). This is further supported by three complementary rationales for joint venture formation: transaction cost minimization, through the reduction of market contracting hazards; strategic behaviour, aimed at deterring rivals or establishing market presence; and organisational learning, through the acquisition of partner knowledge and capabilities (Kogut, 1988). These rationales are particularly

relevant for capital-intensive, technology-dependent industries such as petrochemicals, where access to local knowledge and institutional legitimacy can be critical for successful market entry.

2.1.3 Greenfield Investment

Greenfield Investment is one of the highest-commitment modes of foreign direct investment (FDI), involving the creation of an entirely new operation abroad, built from scratch under the full ownership of the investing firm, rather than the acquisition of an existing entity (Slangen & Hennart, 2007; Harzing, 2002). This mode of entry allows firms to build operations according to their own standards, transfer proprietary technologies and retain full control over the design, technology, culture and operational systems of the new entity, avoiding the integration challenges typically associated with acquisitions (Slangen & Hennart, 2007; Harzing, 2002).

This high degree of control comes at a cost, however, greenfield investment provides maximum control over strategy and operations, but requires the longest time horizon to achieve profitability, reflecting a fundamental trade-off between control and speed that is inherent to this strategy (Hill, 2014). Precisely because of this trade-off, greenfield investment tends to be the preferred entry mode for firms with high R&D intensity and strong needs for operational standardization, where transferring proprietary technologies and organisational routines to a new market is central to sustaining competitive advantage (Harzing, 2002).

2.1.4 Cross-border Acquisitions

Cross-border Acquisitions constitute an internationalisation strategy in which a firm gains control of an already established company in a foreign market, rather than building new operations from scratch. This entry mode is generally defined as a transaction in which one firm purchases another firm's assets or equity with the intent to assume control, either through the acquisition of the target's assets or equity, consolidating its operations into a single organisational entity (Haspeslagh & Jemison, 1991; Healy et al., 1992). This form of control enables the rapid integration of strategic capabilities, market positions and competitive resources that would otherwise take years to build organically (Haspeslagh & Jemison, 1991).

Compared to greenfield investments, acquisitions offer firms a faster route to market entry, since they provide immediate access to existing assets, customer bases and local market knowledge. This is consistent with the view that Mergers and Acquisitions (M&A) activity is primarily motivated by the pursuit of operating synergies, particularly improvements in asset productivity and cash flow performance, that are not easily achievable through organic growth alone (Healy et al., 1992). This performance-oriented rationale makes cross-border acquisitions a particularly relevant strategy to examine in this dissertation, given their its direct link to the dependent variable of firm performance.

2.2 Portrayal of Petrochemical Industry – Adhesives and Glue Manufactures

The petrochemical industry holds a strategic position in the global economy, acting as a foundational sector that supplies essential raw materials to a wide range of downstream industries, including packaging, automotive, construction, textiles and consumer goods (IEA, 2018; Zhang et al., 2024). This central role means that the competitiveness and strategic decisions of petrochemical firms have effects that extend well beyond the sector itself, influencing global manufacturing systems and international trade more broadly.

Structurally, the industry is deeply dependent on fossil-fuel feedstocks, such as crude oil and natural gas derivatives, which remain the primary input for chemical production despite growing sustainability pressures (Ren et al., 2006; Bauer & Fontenit, 2021). This dependency, often described as a form of carbon lock-in, means that existing infrastructure, capital allocation decisions and production systems continue to reinforce reliance on oil and gas feedstocks, making the transition toward greener alternatives both costly and slow (Bauer & Fontenit, 2021). At the same time, the sector operates through a complex and highly integrated global value chain, connecting upstream feedstock extraction, midstream chemical conversion and downstream manufacturing of final products such as plastics, solvents, fibres, coatings and adhesives (Levi & Cullen, 2018; Ren et al., 2006). Production also tends to be geographically concentrated in regions with favourable feedstock availability and strong industrial infrastructure, particularly North America, the Middle East, Europe and Asia (Zhang et al., 2024; IEA, 2018; Verbeke & Mah, 2020).

Two additional structural features are particularly relevant for understanding firm-level strategic behaviour in this sector. First, the petrochemical industry is characterised by high capital intensity, given the significant fixed investment required in refineries, chemical plants,

storage systems and logistics infrastructure, which contributes to high entry barriers and industry concentration (IEA, 2018; Clews, 2016; Zhang et al., 2024). Second, the industry is technologically complex, as efficient production relies on sophisticated chemical engineering processes, requiring continuous innovation to reduce costs, improve yields and meet increasingly demanding sustainability requirements (Ren et al., 2006; Zhang et al., 2024).

Within this broader industrial landscape, the adhesives and glue manufacturing segment represents a specific, economically relevant subsector of the petrochemical industry. As part of the downstream chemical value chain, adhesives production is directly connected to feedstock costs, technological innovation and global demand from industries such as packaging, automotive, and construction (Levi & Cullen, 2018; Ren et al., 2006). Because of this downstream position, adhesives manufacturers are particularly exposed to fluctuations in upstream feedstock prices and to the broader interdependencies that characterise the petrochemical value chain, where supply disruptions or price shocks in one stage can propagate rapidly through the rest of the chain (Levi & Cullen, 2018; IEA, 2018; Galambos et al., 2007). This structural exposure, combined with the segment's reliance on specialty chemical formulations and continuous product innovation, makes adhesives manufacturers a particularly relevant empirical setting for analysing how internationalisation strategies relate to firm performance within the petrochemical industry.

2.2.1 Critical Factors of the Industry

The petrochemical industry is shaped by a set of structural determinants that condition how firms compete, invest and expand internationally. Table 1 summarizes the main factors identified in the literature.

Table 1:Critical Factors of Petrochemical Industry

Determinant	Meaning	Author(s)
Dependence on Fossil-Based Feedstocks and Energy Intensity	The industry is highly energy-intensive and structurally dependent on fossil-fuel feedstocks (crude oil, natural gas derivatives). Feedstock availability and cost are primary competitive determinants.	Ren et al. (2006); IEA (2018); Bauer & Fontenit (2021)
Complex and Integrated Value Chain	Production is organised through a multi-stage value chain, from upstream extraction/refining to midstream chemical conversion and downstream manufacturing of final products such as adhesives.	Levi & Cullen (2018); Ren et al. (2006)
High Capital Intensity	Production requires significant fixed investment in refineries, plants, storage, and logistics infrastructure, creating high entry barriers and industry concentration.	IEA (2018); Clews (2016); Zhang et al. (2024)
Global Value Chain	The industry operates through complex, multi-stage	Levi & Cullen

Integration	global value chains, linking feedstock extraction, chemical conversion, and downstream manufacturing across countries.	(2018); IEA (2018); Galambos et al. (2007)
Geographic Concentration in Industrial Hubs	Production tends to cluster in regions with feedstock availability and strong industrial infrastructure, particularly North America, the Middle East, Europe, and Asia.	Zhang et al. (2024); IEA (2018); Verbeke & Mah (2020)
Downstream Industry Interdependence	Petrochemical output underpins multiple manufacturing sectors (packaging, automotive, construction, adhesives). Disruptions or price shocks propagate rapidly through downstream value chains.	Levi & Cullen (2018); IEA (2018); Galambos et al. (2007)
Sustainability and Regulatory Pressure	Carbon emissions regulation and circular economy mandates impose growing costs and strategic uncertainty, while carbon lock-in complicates the transition to cleaner production.	IEA (2018); Bauer & Fontenit (2021); Zhang et al. (2024)

2.2.2 Internationalisation Strategies in the Petrochemical firms

The prevalence of specific internationalisation strategies in the petrochemical industry is closely linked to the structural determinants discussed in the previous section, particularly capital intensity, technological complexity, feedstock dependency and regulatory exposure. As a result, certain entry modes tend to dominate depending on the specific competitive pressures firms face.

International Joint Ventures are particularly common in the sector because they allow firms to share the very high infrastructure costs associated with the industry, while also gaining access to local feedstock resources, institutional legitimacy and risk-sharing arrangements in highly regulated markets (Dunning, 1988; Beamish & Banks, 1987; Kogut, 1988). Given the scale of investment required to build integrated petrochemical complexes, IJV offer firms a way to internationalise without bearing the full financial and regulatory burden alone, which is especially relevant in markets where feedstock access is controlled by local institutions or state-owned entities (Geringer & Hebert, 1991; Ren et al., 2009).

Greenfield Investment is also widely used in the petrochemical industry, mainly because the sector relies heavily on proprietary technology and highly standardised production processes. Firms operating in this industry often prefer to build entirely new facilities rather than acquire existing ones, as this allows them to replicate their own integrated production systems, maintain full control over technology transfer and ensure consistent operational standards across different markets (Slangen & Hennart, 2007; Harzing, 2002). This strategy tends to be particularly attractive when suitable acquisition targets are scarce or when institutional and

cultural distance would make post-acquisition integration especially difficult (Chang & Chang, 2012; Dikova & van Witteloostuijn, 2007).

Within the more specific segment of specialty chemicals and adhesives, cross-border acquisitions become especially relevant. Unlike bulk petrochemical production, the adhesives industry competes strongly on intangible assets, such as proprietary formulations, brands and established customer relationships. Acquisitions allow firms to gain rapid access to these assets, as well as to new geographic markets and product portfolios, without the long development time required by greenfield projects (Haspeslagh & Jemison, 1991; Aybar & Ficici, 2009). This pattern is consistent with the view that M&A activity is primarily motivated by the pursuit of operational synergies and performance improvements that are difficult to achieve through organic growth alone (Healy et al., 1992; Sudarsanam & Mahate, 2003). Given that speed of entry, access to specialised know-how and competitive consolidation are particularly important in this segment, cross-border acquisitions have become one of the most frequently used internationalisation strategies among adhesives manufacturers.

Finally, export continues to play a relevant role, particularly for firms seeking to test foreign demand or establish an initial presence in a market before committing further resources. Because export involves comparatively lower resource commitment and risk exposure, it is often used as a preliminary step in the internationalisation process, consistent with the incremental logic described by Johanson and Vahlne (1977), before firms progress toward higher-commitment strategies.

Table 2 illustrates these patterns with real cases of internationalisation strategies adopted by leading companies in the petrochemical and adhesives sector.

Table 2: Real cases of internationalisation strategies in the petrochemical and adhesives industry

Company	Strategy	Explanation	Reference/Link
H.B. Fuller	**Exporting**	Expanded its specialty adhesive lines internationally through export channels before committing to deeper local investment.	H.B. Fuller Company (n.d.)
Dow + Saudi Aramco	**International Joint Venture**	Established Sadara Chemical Company in Saudi Arabia, one of the world's largest integrated chemical joint ventures, combining capital, feedstock access and local institutional knowledge.	Aramco (n.d.)
BASF	**Greenfield Investment**	Built an integrated Verbund petrochemical complex in Zhanjiang, China, replicating its proprietary	BASF SE (2026)

		integrated production system in a new market.	
Sika	**Greenfield Investment**	Built new plants in China and India to establish local production capacity in strategically important adhesives and construction chemicals markets.	Sika AG (2025)
H.B. Fuller	**Acquisition**	Acquired Royal Adhesives & Sealants in 2017, expanding its specialty adhesives portfolio and market reach.	H.B. Fuller Company (2017)
Henkel	**Acquisition**	Acquired Darex Packaging Technologies and Sonderhoff Group in 2017, strengthening its adhesives and sealants business.	Henkel AG & Co. KGaA (2017)
Sika	**Acquisition**	Acquired MBCC Group in 2023, significantly expanding its global adhesives and specialty chemicals business.	Sika AG (2023)

These cases confirm the theoretical pattern described above: acquisitions appear as the most recurrent strategy among specialty adhesives manufacturers, reflecting the segment's need for rapid access to proprietary technology, brands and market position, while joint ventures and greenfield investments are more common in capital-intensive, technology-driven petrochemical projects, where cost-sharing and full operational control are the dominant strategic concerns.

2.3 Theoretical approaches establishing the impact of internationalisation strategies on firms' performance

The relationship between internationalisation and firm performance has long been a central concern in international business research, yet the literature does not converge on a single, unambiguous conclusion. While many studies confirm a positive association between the two, an increasing number of contributions suggest that this relationship is more complex than a simple linear effect. Aggarwal (2017) synthesizes this debate, showing that the internationalisation-performance relationship is often non-linear and depends heavily on firm capabilities, industry conditions and the degree of geographic diversification. This complexity is echoed by Contractor, Kumar and Kundu (2007), who find that moderate levels of internationalisation tend to improve performance, whereas excessive international diversification may reduce efficiency due to rising coordination and management costs. A similar pattern is identified by Lu and Beamish (2001), who describe an S-shaped relationship between internationalisation and performance in SMEs, in which early stages of expansion may temporarily reduce performance, followed by gains at moderate levels of commitment

and a possible decline again at very high levels of international involvement. Pangarkar (2008) reaches a comparable conclusion, showing that internationalisation generally benefits SME performance, but that excessive diversification can increase operational complexity and erode returns.

These non-linear patterns suggest that the internationalisation-performance relationship is contingent on how well firms are equipped to manage the added complexity of operating across borders. Ruigrok and Wagner (2003) argue, from an organisational learning perspective, that internationalisation contributes positively to performance mainly when firms can develop the organisational learning capabilities and international experience needed to absorb and apply knowledge gained abroad. This resource-oriented explanation is reinforced by Arbelo, Arbelo-Pérez and Pérez-Gómez (2024), who adopt a resource-based view to show that firm-specific resources and capabilities ultimately determine whether internationalisation translates into improved performance, with firms holding stronger strategic resources benefiting more from international expansion. Similarly, Hojnik and Ruzzier (2018) and Hojnik, Ruzzier and Manolova (2018) find that internationalisation positively affects firm performance and competitive advantage, particularly when internationalisation is accompanied by the development of eco-innovation capabilities, which act as a mediating factor strengthening the relationship between global expansion and economic performance. Finally, Hsu and Boggs (2003) caution that the strength and direction of the internationalisation-performance relationship also depend on how internationalisation itself is measured, highlighting the importance of decomposing internationalisation indicators to obtain a more accurate understanding of its effects.

Taken together, this body of literature indicates that internationalisation does not affect firm performance uniformly, but rather through mechanisms that are shaped by the specific strategy adopted, the resources and capabilities of the firm and the industry context in which it operates. Building on this general understanding, the following paragraphs examine how each of the four internationalisation strategies considered in this dissertation has been theoretically and empirically linked to firm performance.

2.3.1 Export and Firms Performance

Export is the internationalisation strategy most consistently associated with positive performance outcomes in the literature, largely due to its lower resource commitment and risk exposure relative to other entry modes. Wagner (2012) and Grazzi (2012) show that

exporting firms systematically exhibit higher productivity and profitability than firms operating only domestically, a pattern that holds across national contexts. Bernard and Jensen (1999) provide an important nuance to this relationship, demonstrating that the causality between exporting and performance runs in both directions: more productive firms self-select into exporting, but exporting itself further improves firm growth and survival through learning-by-exporting effects. This bidirectional dynamic is also supported at the SME level by Calheiros-Lobo, Ferreira and Au-Yong-Oliveira (2023) and Aliyyah et al. (2020), who find that export intensity and export activity generally improve SME performance, sales growth and competitiveness, although the magnitude of these effects depends on firm capabilities and market conditions. Ganotakis and Love (2012) add a further layer of nuance, showing that the positive relationship between export propensity, export intensity and firm performance is moderated by the entrepreneurial experience of the founding team, meaning that the benefits of exporting are not automatic but depend on managerial competence. Complementing this, Katsikeas, Leonidou and Morgan (2000) and Shoham (1998) emphasize that export performance itself is a multidimensional construct, influenced simultaneously by financial, strategic and managerial factors, which explains why its relationship with overall firm performance can vary considerably across studies.

2.3.2 International Joint Venture and Firms' Performance

The relationship between International Joint Ventures and firm performance is more conditional than that of Export, as it depends heavily on the quality of the partnership and the compatibility between partner firms. Kogut (1988) argues that joint ventures can improve performance through shared risk, resource complementarity, and mutual learning between partners, but these benefits are only consolidated when partners are able to combine complementary capabilities effectively. This conditionality is reinforced by Beamish and Killing (1997), who find that IJV performance improves specifically when partner firms contribute complementary strategic resources and managerial capabilities, rather than overlapping or redundant ones. Ren, Gray and Kim (2009) extend this view, showing that IJV success depends on a broader set of relational factors, including strategic fit, partner cooperation, trust, governance structure and the presence of effective conflict resolution mechanisms. Similarly, Larimo, Nguyen and Ali (2016) demonstrate that the way firms measure and evaluate IJV performance varies with trust levels, ownership structure, cultural distance and the stage of the IJV life cycle, suggesting that performance outcomes are highly

context-dependent. From a measurement standpoint, Geringer and Hebert (1991) stress that assessing IJV performance requires incorporating both financial and strategic dimensions, since a narrow focus on financial returns alone may fail to capture the broader value that joint ventures generate, such as market access, knowledge transfer and institutional legitimacy. Collectively, this literature suggests that IJV can enhance firm performance, but that this outcome is contingent on relational and governance factors rather than being an automatic consequence of the entry mode itself.

2.3.3 Greenfield and Firms' Performance

The performance implications of Greenfield Investment are closely tied to the strategy's defining characteristic: full operational control. Harzing (2002) and Slangen and Hennart (2007) show that greenfield investments provide firms with greater operational control and stronger integration capabilities than acquisitions, since the investing firm builds the new subsidiary according to its own standards from the outset. This control advantage tends to translate into stronger long-term performance outcomes, particularly for firms with high technological intensity or standardized operational requirements. Chang and Chang (2012) provide direct empirical support for this relationship, finding that international greenfield investments generate positive abnormal returns and improve long-run operating and stock performance, an effect that is especially pronounced in developing countries and in first-time entries into a host country. Doukas and Lang (2003) reach a similar conclusion from a diversification perspective, showing that geographic diversification through core-related greenfield investments increases shareholder value and long-term performance, whereas expansion into unrelated business areas tends to reduce it. This suggests that the performance benefits of greenfield investment depend not only on the mode of entry but also on whether the international expansion remains aligned with the firm's core competencies. Regarding the strategic conditions under which greenfield investment is chosen, Dikova and van Witteloostuijn (2007) find that firms tend to select greenfield entry specifically when stronger operational control and technological integration are required, while Du, Lu and Tao (2008) show that institutional quality in the host country strongly influences greenfield location decisions, since weaker institutional environments increase the value of retaining full control over operations. At a broader level, Jindra, Giroud and Scott-Kennel (2009) find that greenfield subsidiaries can contribute positively not only to firm-level performance but also to industrial upgrading and economic development in the host

economy, reflecting the depth of integration that greenfield investment typically requires.

2.3.4 Cross-border Acquisitions and Firms' Performance

Acquisitions occupy a distinctive position in the internationalisation-performance literature, as their effect on performance depends heavily on execution factors such as integration quality and payment method, rather than on the entry mode itself. Healy, Palepu and Ruback (1992) find that M&A improve operational performance primarily through efficiency gains and the realization of operating synergies, particularly improvements in asset productivity and cash flow performance. However, Sudarsanam and Mahate (2003) qualify this positive view, showing that acquisition performance is highly contingent on the method of payment used, the degree of strategic fit between acquirer and target and the quality of post-acquisition integration, meaning that acquisitions do not automatically generate superior performance. Aybar and Ficici (2009) provide further nuance from the perspective of emerging-market multinationals, finding that cross-border acquisitions positively influence firm value specifically when the acquiring firm possesses strong international capabilities, suggesting that the benefits of acquisitions are conditional on the acquirer's prior international experience. Bertrand and Betschinger (2012) reinforce this conditionality, showing that cross-border acquisitions tend to generate stronger international expansion than domestic acquisitions but also involve greater integration challenges, which can offset some of the performance gains if not properly managed. Finally, Harzing's (2002) comparative analysis situates acquisitions within the broader entry-mode literature, showing that while acquisitions offer faster market access than greenfield investment, this speed advantage often comes at the cost of lower operational control, which can constrain the extent to which performance gains are effective in the post-acquisition period.

Overall, this theoretical review reveals a recurring pattern across all four internationalisation strategies: internationalisation tends to improve firm performance, but the strength and even the direction of this relationship depend on strategy-specific conditions, such as firm capabilities and learning capacity (exportation), partner compatibility and governance quality (joint ventures), the degree of strategic and technological control retained (greenfield investment), and the quality of post-entry integration (acquisitions). This conditional and multidimensional understanding of the internationalisation-performance relationship provides the theoretical foundation for the empirical model developed in Chapter 3, where firm performance is examined as a function of the specific internationalisation strategies

adopted by petrochemical and adhesives manufacturing firms.

2.4 Other determinants of firm performance

Besides the internationalisation strategy adopted, the literature reviewed throughout this chapter also considers a set of firm-specific and structural characteristics that influence firm performance. These variables are organised here into three groups: firm structural characteristics, financial and innovation characteristics, and industry and relational characteristics.

Regarding firm structural characteristics, firm size and firm age are the two most commonly used variables. Firm size, typically measured by total assets or number of employees, is controlled for in most studies reviewed (e.g., Hojnik & Ruzzier, 2018; Pangarkar, 2008; Ruigrok & Wagner, 2003; Arbelo et al., 2024; Aliyyah et al., 2020; Beamish & Killing, 1997; Harzing, 2002; Santos & Castanho, 2022), since larger firms tend to have more resources available to manage the complexity and risks associated with internationalisation, although Santos and Castanho (2022), studying foreign-owned transnational corporations in Portugal, find that smaller affiliates can outperform larger ones during periods of economic disruption, due to the lower fixed-cost burden faced by smaller operations. Firm age, or accumulated international experience, is also frequently included (e.g., Hojnik et al., 2018; Hsu & Boggs, 2003; Ganotakis & Love, 2012; Slangen & Hennart, 2007; Santos & Castanho, 2022), reflecting the idea that more experienced firms are better equipped to convert international activity into performance gains. The measurement and econometric treatment of these two variables, particularly given their limited within-firm variation over the sample period, is discussed in further detail in Section 3.1.2.

Concerning financial and innovation characteristics, financial leverage and R&D intensity are the two determinants most consistently used. Leverage, generally measured as total debt relative total assets, is included as a control by Arbelo et al. (2024) and Lu and Beamish (2001), reflecting a firm's capital structure and financing strategy. A closely related approach is adopted by Santos and Castanho (2022), who assess the financial soundness of internationalized firms operating in Portugal through solvency ratios, extracted directly from Orbis, as an indicator of firms' capacity to meet their financial obligations and sustain performance over time. R&D intensity, typically measured as R&D expenditure over sales, is controlled for by Ruigrok and Wagner (2003), Wagner (2012), Ganotakis and Love (2012),

Slangen and Hennart (2007), and Harzing (2002), since firms that invest more in R&D tend to have stronger technological capabilities that can independently affect performance.

Finally, industry and relational characteristics are particularly relevant given the specific sectoral context of this dissertation. Industry effects, typically captured through SIC or NACE sector dummies, are controlled for in nearly all studies reviewed (e.g., Ruigrok & Wagner, 2003; Contractor et al., 2007; Grazzi, 2012; Bernard & Jensen, 1999; Harzing, 2002), since firm performance varies systematically across sectors with different capital intensity and competitive dynamics, a pattern especially relevant for the petrochemical industry. For internationalisation strategies that involve closer integration with foreign partners, such as joint ventures, greenfield investments, and acquisitions, cultural distance between the home and host country (e.g., Ren et al., 2009; Larimo et al., 2016; Slangen & Hennart, 2007) and ownership structure (e.g., Geringer & Hebert, 1991; Bertrand & Betschinger, 2012) are also controlled for, since they directly affect governance and integration outcomes.

Table 3 summarizes these determinants, following the structure used throughout the studies reviewed. As further discussed in Section 3.4, the empirical model adopts the solvency ratio, following Santos and Castanho (2022), rather than leverage directly, as the proxy for firms' capital structure, reflecting the inverse of the same underlying construct and its greater availability in the Orbis database for the firms under analysis.

Table 3: Other determinants of firm performance

Group of variables	**Variable**	**Description**	**Relationship with performance**	**Studies**
Firm structural characteristics	Firm Size	Number of employees or total assets.	+	Hojnik & Ruzzier (2018); Pangarkar (2008); Arbelo et al. (2024); Beamish & Killing (1997); Harzing (2002); Santos & Castanho (2022)
	Firm Age	Years since the firm's founding, or years of international experience.	+	Hojnik et al. (2018); Hsu & Boggs (2003); Ganotakis & Love (2012); Slangen & Hennart (2007); Santos & Castanho (2022)
Firms' financial and innovation characteristics	Leverage / Solvency	Total debt divided by total assets; or, alternatively, the solvency ratio, capturing firms' capacity to meet their	+/–	Arbelo et al. (2024); Lu & Beamish (2001); Santos & Castanho (2022)

		financial obligations.		
	R&D Intensity	R&D expenditure divided by sales or total assets.	+	Ruigrok & Wagner (2003); Wagner (2012); Ganotakis & Love (2012); Slangen & Hennart (2007)
Industry and relational characteristics	Industry / Sector	The sector in which the firm operates (SIC/NACE classification).	+/–	Ruigrok & Wagner (2003); Contractor et al. (2007); Grazzi (2012); Bernard & Jensen (1999)
	Cultural Distance	Cultural distance between home and host country (Kogut-Singh index).	–	Ren et al. (2009); Larimo et al. (2016); Slangen & Hennart (2007)
	Ownership Structure	Equity share held by each partner, or state ownership share.	+/–	Geringer & Hebert (1991); Bertrand & Betschinger (2012)

2.5 Identifying the gap

The literature reviewed throughout this chapter reveals a clear pattern: internationalisation strategies have been extensively studied in relation to firm performance, but this research has developed along two largely separate tracks. On one side, the international business literature offers well-established theoretical explanations for why firms choose Export, Joint Ventures, Greenfield Investments or Acquisitions (Johanson & Vahlne, 1977; Dunning, 1988; Slangen & Hennart, 2007; Haspeslagh & Jemison, 1991), together with substantial empirical evidence linking each of these strategies to firm performance (Wagner, 2012; Ren et al., 2009; Chang & Chang, 2012; Healy et al., 1992). On the other side, a separate body of literature characterises the petrochemical industry as a distinct economic sector, shaped by high capital intensity, technological complexity, and fossil-feedstock dependency (IEA, 2018; Ren et al., 2006; Zhang et al., 2024). However, these two literatures rarely intersect: the empirical studies on internationalisation and performance reviewed in Section 2.3 draw on samples of manufacturing firms in general or on specific national contexts (e.g., Germany, Spain, Italy, Indonesia), without isolating the petrochemical sector and even less the adhesives and glue manufacturing segment specifically.

This lack of intersection is not merely a matter of sectoral coverage, it also reflects the fact that the petrochemical industry possesses structural singularities that plausibly affect how internationalisation relates to performance, limiting the extent to which findings from general manufacturing or single-country studies can be extrapolated to this context. As discussed in Section 2.2.1, the industry is defined by a combination of high capital intensity,

technological complexity and deep dependence on fossil-fuel feedstocks, integrated through complex global value chains that link upstream extraction to downstream manufacturing (IEA, 2018; Ren et al., 2006; Levi & Cullen, 2018). Firms operating under these conditions face cost structures, risk profiles and coordination requirements that differ from those typically assumed in the broader internationalisation-performance literature, where the reviewed studies are generally set in less feedstock-dependent and less capital-intensive industries (Bernard & Jensen, 1999; Ganotakis & Love, 2012; Grazzi, 2012). Moreover, the pronounced geographic concentration of petrochemical production in a small number of industrial hubs and the interconnected network-based structure of ownership across the industry (Verbeke & Mah, 2020; Galambos et al., 2007), imply that the mechanisms linking internationalisation strategies to performance in this sector may follow a distinct logic from that observed in more geographically dispersed and less structurally interdependent industries.

This sectoral distinctiveness is reinforced by the regulatory and competitive environment in which petrochemical firms operate. As a sector closely associated with fossil-fuel dependency and carbon-intensive production processes, the industry has increasingly become a target of public policy aimed at reducing emissions and promoting the transition toward more sustainable production models, including carbon pricing, circular economy mandates and stricter environmental standards (IEA, 2018; Bauer & Fontenit, 2021; Zhang et al., 2024). Compliance with these evolving requirements imposes additional costs and strategic uncertainty on firms in the sector, constraining the profitability that can be generated from any given internationalisation strategy and further distinguishing the sector from the less regulation-intensive contexts typically examined in the literature reviewed in Section 2.3. At the same time, the characteristics that expose the industry to such regulatory pressure, its high capital intensity and technological complexity, also constitute natural barriers to entry, given the scale of investment and specialised know-how required to compete effectively (IEA, 2018; Clews, 2016; Ren et al., 2006). These barriers shape not only which firms are able to pursue internationalisation, but also which specific strategies are within reach for firms of different sizes and resource endowments, reinforcing the relevance of examining internationalisation strategies within this specific sectoral setting rather than assuming that patterns identified elsewhere apply uniformly to petrochemical firms.

A second gap concerns the scope of internationalisation strategies considered

simultaneously. Most empirical studies reviewed focus on a single entry mode in isolation, examining either export (Bernard & Jensen, 1999; Grazzi, 2012), joint ventures (Geringer & Hebert, 1991; Larimo et al., 2016), greenfield investments (Harzing, 2002; Dikova & van Witteloostuijn, 2007), or acquisitions (Sudarsanam & Mahate, 2003; Aybar & Ficici, 2009). Comparative studies that assess the performance effects of multiple internationalisation strategies within the same industry and using a consistent methodological framework remain scarce, which limits the ability to determine which strategies are more strongly associated with performance within a specific sectoral context, petrochemicals.

This dissertation addresses these gaps by empirically examining the relationship between internationalisation strategies and firm performance, using Orbis data for firms operating in the petrochemical sector, with a specific focus on adhesives and glue manufacturers (NACE C20.52). While the four internationalisation strategies discussed in Section 2.1 are all theoretically relevant to this industry, the empirical analysis focuses on exportation, international joint ventures, and cross-border acquisitions. Greenfield investment, although conceptually important, could not be reliably isolated using the ownership and corporate structure data available in Orbis and was therefore excluded from the empirical model, as further explained in Section 3.3. Similarly, while exportation is conceptually defined in Section 2.1.1 in terms of foreign sales activity (Root, 1994; Bernard & Jensen, 1999), the empirical measurement of this strategy relies on a structural proxy, the presence of foreign subsidiaries, given the unavailability of firm-level export intensity data in Orbis for the large majority of non-listed firms in this sector. This methodological adaptation is discussed in detail in Section 3.3. By jointly assessing multiple internationalisation strategies within a single, industry-specific empirical model, this study aims to provide evidence that complements the broader, cross-industry findings discussed throughout this chapter and to determine whether the performance patterns identified in the general internationalisation literature also hold within this particular segment of the petrochemical industry.

3. Methodology

3.1 Main hypothesis and Estimation method

3.1.1 Hypothesis

Building on the theoretical and empirical evidence discussed in Chapter 2, this dissertation

tests a set of hypotheses regarding the relationship between internationalisation strategies and firm performance within the petrochemical industry, specifically the adhesives and glue manufacturing segment (NACE C20.52).

As discussed in Section 2.3, the relationship between internationalisation and firm performance is frequently found to be non-linear and contingent on firm-specific characteristics, rather than following a simple, universally positive pattern (Aggarwal, 2017; Contractor et al., 2007; Lu & Beamish, 2001). Building on this understanding and on the strategy-specific evidence reviewed for exportation, international joint ventures, and cross-border acquisitions, the following hypotheses are proposed:

H1: Exporting is positively associated with firm performance.

This hypothesis follows from the evidence that exporting firms tend to exhibit higher productivity and profitability than firms that operate only domestically, partly due to self-selection of more productive firms into export markets and partly due to learning-by-exporting effects that further reinforce performance over time (Bernard & Jensen, 1999; Wagner, 2012; Grazzi, 2012).

H2: International joint ventures are positively associated with firm performance.

This hypothesis is grounded in the view that IJVs allow firms to share risk, access complementary resources and benefit from partner-specific knowledge, which can translate into improved performance when the partnership is well-managed (Kogut, 1988; Beamish & Killing, 1997; Ren et al., 2009).

H3: Cross-border acquisitions are positively associated with firm performance.

This hypothesis posits that acquisitions enable firms to rapidly access strategic capabilities, market positions and operating synergies that would be costly and slow to build organically, thereby improving post-acquisition performance (Healy et al., 1992; Aybar & Ficici, 2009).

In addition to these strategy-specific hypotheses, the literature reviewed in Section 2.3 also suggests that the breadth of internationalisation, that is, the number of distinct strategies simultaneously pursued by a firm, may relate to performance in a non-linear fashion. Moderate degrees of internationalisation tend to improve performance, while pursuing too

many strategies simultaneously may increase coordination costs and erode the benefits of international expansion (Lu & Beamish, 2001; Contractor et al., 2007; Pangarkar, 2008). This leads to the fourth hypothesis:

H4: The relationship between the breadth of internationalisation strategies pursued and firm performance is non-linear (inverted-U shaped).

Finally, the resource-based literature reviewed in Section 2.4 suggests that the extent to which internationalisation translates into improved performance is conditional on the firm's own resources and capabilities (Arbelo et al., 2024; Barney, 1991), with firm size repeatedly identified as a key structural characteristic shaping firms' ability to absorb the coordination costs and risks associated with international expansion (Contractor et al., 2007; Sudarsanam & Mahate, 2003). This motivates the fifth and final hypothesis:

H5: The effect of internationalisation strategies on firm performance is moderated by firm size, such that the relationship differs between smaller and larger firms.

3.1.2 Reduced form of the model specification

To test hypotheses H1 to H3, the reduced form of the baseline model is specified as:

$$Performance_{it} = \beta_0 + \beta_1 Export_{it} + \beta_2 IJV_{it} + \beta_3 Acquisition_{it} + \beta_4 Size_{it} + \beta_5 Age_{it} + \beta_6 Solvency_{it} + \sum_t \gamma_t Year_t + \varepsilon_{it}$$

where,

Performance is the dependent variable, alternately measured as Return on Assets (ROA) and Return on Equity (ROE), for firm *i* in year *t*;

Export, *IJV*, and *Acquisition* are dummy variables that assume the value 1 if firm *i* has pursued the corresponding internationalisation strategy, and 0 otherwise;

Size, *Age*, and *Solvency* are firm-level control variables (cf. Section 2.4), corresponding, respectively, to the natural logarithm of total assets, the number of years since incorporation, and the solvency ratio (asset-based), used as a proxy for the firm's capital structure;

Year is a set of year dummies included to control for time-specific shocks common to all firms (e.g., the COVID-19 pandemic and the 2022 energy/feedstock price crisis, cf. Section

2.2);

i corresponds to the firm ($i = 1, \ldots, n = 734$);

t corresponds to the year ($t = 2019 - 2024$).

Two of the control variables included in the model, Firm Size and Firm Age, warrant additional methodological clarification, given their limited or mechanical variation over time within firms.

Although Firm Size is recalculated annually from total assets, and therefore technically varies over time, most of its variation across the panel stems from persistent differences in scale *between* firms rather than from substantial growth or contraction *within* the same firm over the relatively short 2019–2024 window. As a result, the coefficient on Firm Size is identified predominantly through cross-sectional (between-firm) variation, a pattern the Random Effects estimator explicitly accommodates by combining within, and between, firm variation (Baltagi, 2021; Cameron & Trivedi, 2005), but which should be borne in mind when interpreting this coefficient: it reflects differences in performance associated with firms of different sizes, rather than the effect of a given firm becoming larger over time.

Firm Age presents a related, but more mechanical, methodological issue. Because Age increases deterministically by exactly one unit per year for every firm in the panel (Age$_{it} = t$ - incorporation year$_i$), its within-firm variation over time is identical across all firms and, once firm-level averages are removed, becomes perfectly collinear with the year dummies included in the model. This is one further reason why a Fixed Effects (FE) specification is unsuitable for this dataset (cf. Section 3.2): under the FE estimator, the within-firm effect of Age cannot be separately identified from common time effects. The Random Effects estimator, by contrast, does not rely exclusively on within-firm demeaning, and therefore still allows the coefficient on Age to be estimated, drawing on between-firm differences in firm vintage present in the sample at any given point in time, in combination with the year dummies that capture shocks common to all firms (Wooldridge, 2002; Baltagi, 2021).

To test H4, the model is extended by replacing the three individual strategy dummies with a single variable capturing the breadth of internationalisation pursued by the firm, together with its squared term, following the quadratic specification commonly used in the literature to test for non-linear (inverted-U shaped) relationships (Lu & Beamish, 2001; Contractor et al., 2007):

$$Performance_{it} = \beta_0 + \beta_1 Breadth_{it} + \beta_2 Breadth_{it}^2 + \beta_3 Size_{it} + \beta_4 Age_{it} + \beta_5 Solvency_{it} + \sum_t \gamma_t Year_t + \varepsilon_{it}$$

where *Breadth* is a discrete variable ranging from 0 to 3, corresponding to the number of internationalisation strategies (Export, IJV, Acquisition) simultaneously pursued by firm *i* in year *t*. Under H4, a positive coefficient on *Breadth* combined with a negative coefficient on *Breadth²* would be consistent with an inverted-U relationship between the extensiveness of internationalisation and firm performance.

To test H5, the baseline model is further extended by including interaction terms between each strategy dummy and firm size:

$$Performance_{it} = \beta_0 + \beta_1 Export_{it} + \beta_2 IJV_{it} + \beta_3 Acquisition_{it} + \beta_4 (Export_{it} \times Size_{it}) + \beta_5 (IJV_{it} \times Size_{it}) + \beta_6 (Acquisition_{it} \times Size_{it}) + \beta_7 Size_{it} + \beta_8 Age_{it} + \beta_9 Solvency_{it} + \sum_t \gamma_t Year_t + \varepsilon_{it}$$

Under H5, a statistically significant coefficient on any of the interaction terms would indicate that the effect of the corresponding internationalisation strategy on firm performance is conditional on firm size, rather than constant across firms of different sizes.

3.2 Selection of the estimation method

Given that the dataset comprises repeated observations of the same 734 firms over the 2019–2024 period, the data are structured as an unbalanced panel, which allows the model to control for both cross-sectional heterogeneity across firms and time-specific effects common to all firms in a given year (Ruigrok & Wagner, 2003).

Panel data models are typically estimated through either a Fixed Effects (FE) or a Random Effects (RE) specification (Baltagi, 2021; Cameron & Trivedi, 2005). The FE estimator controls for unobserved firm-specific heterogeneity by exploiting only the within-firm variation over time, effectively comparing each firm to its own average across the sample period. However, this approach has an important limitation for the present study: because the internationalisation strategy dummies (Export, IJV, Acquisition) were constructed from firm-level ownership and corporate structure data retrieved at a single point in time (cf. Section 3.3), these variables are time-invariant within each firm across the panel. Because the

FE estimator absorbs variation that does not vary within firms over time, it cannot estimate the coefficients of primary interest to this dissertation.

For this reason, the Random Effects estimator is adopted as the main estimation method. Unlike the FE model, the RE estimator treats unobserved firm-specific heterogeneity as a random variable, uncorrelated with the explanatory variables, thereby allowing the estimation of coefficients on time-invariant regressors while still accounting for the panel structure of the data (Ruigrok & Wagner, 2003; Arbelo et al., 2024). This approach is also consistent with the broader empirical literature reviewed in Chapter 2, where firm-level heterogeneity is frequently modelled through panel estimators that accommodate firm-specific characteristics that do not vary substantially over the sample period (Arbelo et al., 2024).

The empirical model is further estimated using a contemporaneous specification, in which internationalisation strategies and firm performance are measured within the same year, rather than a lagged specification. This choice is partly imposed by the nature of the internationalisation strategy variables described above: because Export, IJV, and Acquisition are time-invariant firm-level status indicators rather than event variables dated to a specific year of adoption, introducing an arbitrary lag structure would not meaningfully separate the timing of the strategy from its outcome. Beyond this data constraint, the choice is also supported on methodological grounds: fixed-effects and related panel estimators are highly sensitive to the correct specification of temporal lags, and an incorrectly specified lag length can produce coefficients with the opposite sign of the true underlying relationship (Vaisey & Miles, 2017). Given the absence of a clear theoretical basis for imposing a specific lag length in this context, a contemporaneous specification is adopted as the most conservative and interpretable approach.

All models are estimated using the *plm* package in R (Croissant & Millo, 2008), applying the Swamy-Arora transformation for the Random Effects estimator. Year dummies are included in all specifications to control for common macroeconomic shocks affecting the petrochemical industry during the sample period, including the COVID-19 pandemic and the 2022 energy and feedstock price crisis (cf. Section 2.2).

Given that firm-level performance measures such as ROA and ROE are typically characterised by a highly skewed distribution, with a small number of extreme observations capable of disproportionately influencing regression estimates (Leone et al., 2019), both

dependent variables were winsorized at the 1st and 99th percentiles prior to estimation, a standard procedure in firm-level empirical research aimed at mitigating the influence of outliers without discarding observations.

3.3 Data collection and data source

Firm-level data for this dissertation were retrieved from the Orbis database (Moody's/Bureau van Dijk), a widely used source of financial and ownership information in the internationalisation-performance literature (Arbelo et al., 2024; Ruigrok & Wagner, 2003; Contractor et al., 2007; Aggarwal, 2017). Orbis was selected because it provides both standardized financial statements and detailed corporate ownership and structure data, which are required to construct the internationalisation strategy variables used in this study (cf. Section 3.4).

The sample was defined based on the NACE Rev. 2 code C20.52 (Manufacture of glues), which corresponds to the adhesives and glue manufacturing segment of the petrochemical industry, as characterised in Section 2.2. An initial search restricted to active companies within this NACE code returned a substantial global population of firms. As discussed in Section 2.5, an initial attempt was made to restrict the sample geographically to the European Union (EU-27), in line with common practice in firm-level studies focused on a single regional market. However, this restriction reduced the number of firms with sufficient financial and ownership data to a level insufficient for meaningful econometric analysis. This outcome is consistent with the characterisation of the petrochemical industry presented in Section 2.2, which identified North America, Asia, and the Middle East, alongside Europe, as major production hubs for the sector (IEA, 2018; Zhang et al., 2024; Verbeke & Mah, 2020). Given the documented geographic concentration of petrochemical and adhesives manufacturing across multiple continents, the sample was subsequently expanded to a worldwide geographic scope, in order to obtain a sample that is both empirically usable and representative of the global structure of the industry.

Within this worldwide population of active firms under NACE C20.52, the sample was further refined by requiring firms to have available financial data, for at least one year within the 2019–2024 period, on the key variables required for the analysis: total assets, operating revenue, number of employees, net income, shareholders' funds, and the solvency ratio. Firms with no recorded financial data across the entire period were excluded from the

sample. This filtering process resulted in a final sample of 734 firms, observed over the period 2019–2024, corresponding to an unbalanced panel of 4 404 firm-year observations.

The time frame of the study (2019–2024) was defined based on the depth of historical financial data consistently available in Orbis and it covers a period marked by significant macroeconomic disruption relevant to the petrochemical industry, including the COVID-19 pandemic (2020–2021) and the subsequent energy and feedstock price crisis (2022), both of which are controlled for in the empirical model through the inclusion of year dummies (cf. Section 3.1).

Although Section 2.1 identified greenfield investment as one of the four internationalisation strategies commonly discussed in the literature, alongside export, international joint ventures, and cross-border acquisitions, this strategy was ultimately excluded from the empirical analysis. During the data collection process, it became apparent that Orbis does not provide a reliable and unambiguous indicator capable of measuring greenfield investment, understood as the establishment of a wholly new foreign subsidiary (Slangen & Hennart, 2007; Harzing, 2002). In order to preserve the reliability of the internationalisation strategy variables, greenfield investment was excluded from the empirical model. Consequently, the empirical analysis focuses on the three internationalisation strategies for which sufficiently reliable and distinct proxies could be constructed: exportation, international joint ventures, and cross-border acquisitions.

The three internationalisation strategy variables (Export, IJV, and Acquisition) were constructed from Orbis' ownership and M&A modules, using distinct search criteria for each strategy, given that no single indicator in Orbis directly and reliably captures each of these constructs at the firm level:

- **Cross-border Acquisition** was identified using Orbis' M&A module, by selecting completed deals of the type "Acquisition", in which the sample firm was recorded as the Acquiror and by retaining only those deals in which the country of the Acquiror differed from the country of the Target, in order to ensure that the acquisition was genuinely cross-border.

- **International Joint Venture** was approximated by combining two ownership-based criteria available in Orbis: (i) the presence of at least one foreign shareholder, of a

different country from that of the firm itself, and (ii) a BvD Independence Indicator classification of "B" (no majority ownership), which identifies firms in which no single shareholder holds a majority stake. This combination was used to capture firms characterised by shared capital ownership involving a foreign partner, without a single shareholder exercising majority control, consistent with the conceptual definition of an IJV discussed in Section 2.1.2.

- **Export** was approximated using the presence of at least one foreign subsidiary, located in a country different from that of the firm itself, following Orbis' ownership module. As discussed in Section 2.5, Orbis does not provide a direct, reliably populated measure of export intensity (e.g., foreign sales as a percentage of total sales) for the vast majority of non-listed firms in this sector, since such geographic segment reporting is generally limited to publicly listed companies. The presence of a foreign subsidiary was therefore used as a structural proxy for the firm's international commercial presence, an approach consistent with the use of foreign establishment as an indicator of internationalisation activity in prior firm-level research.

All three internationalisation variables were coded as binary indicators, taking the value 1 if the firm met the corresponding criterion and 0 otherwise. Because these variables were derived from ownership and corporate structure information retrieved at a single point in time, they are time-invariant across the panel for each firm, a methodological feature that directly informed the choice of estimation method discussed in Section 3.2.

3.4 Measures and data sources

This section presents the operational definition and measurement of all variables used in the empirical model, following the hypotheses and model specifications outlined in Section 3.1, and the data collection procedures described in Section 3.3. Table 4 summarizes the dependent, independent and control variables, together with their respective proxies and data sources.

Table 4: Proxies for the relevant variables and data source

Group of variables	Variable	Proxy / Measurement	Data source
Dependent variables	Return on Assets (ROA)	Net income / Total assets (winsorized at the 1st and 99th percentiles)	Orbis
	Return on Equity (ROE)	Net income / Shareholders' funds (winsorized at the 1st and 99th	

		percentiles)	
Independent variables (internationalisation strategies)	Export	Dummy variable: 1 if the firm has at least one foreign subsidiary (located in a country different from the firm's own country); 0 otherwise	Orbis
	International Joint Venture (IJV)	Dummy variable: 1 if the firm has at least one foreign shareholder (of a different country from the firm) *and* holds a BvD Independence Indicator of "B" (no majority ownership); 0 otherwise	
	Cross-border Acquisition	Dummy variable: 1 if the firm was recorded as Acquiror in a completed M&A deal of type "Acquisition", in which the Target's country differs from the Acquiror's country; 0 otherwise	
Breadth of internationalisation (H4)	Breadth	Discrete variable (0–3), corresponding to the number of internationalisation strategies (Export, IJV, Acquisition) simultaneously pursued by the firm	Own elabouration, based on the three dummies above
	$Breadth^2$	Squared term of Breadth, included to test for a non-linear (inverted-U shaped) relationship	Own elabouration
Moderating variables (H5)	Export × Size	Interaction term between the Export dummy and Firm Size	Own elabouration
	IJV × Size	Interaction term between the IJV dummy and Firm Size	Own elabouration
	Acquisition × Size	Interaction term between the Acquisition dummy and Firm Size	Own elabouration
Control variables	Firm Size	Natural logarithm of total assets	Orbis
	Firm Age	Number of years since the firm's date of incorporation	
	Solvency Ratio	Shareholders' funds / Total assets (%), used as a proxy for the firm's capital structure	
	Year dummies	Set of dummy variables for each year (2020–2024, relative to 2019), controlling for common macroeconomic shocks (e.g., COVID-19 pandemic, 2022 energy/feedstock price crisis)	

Note. Total Assets, Net Income, and Shareholders' Funds are reported in thousand USD. Nº of observations = 4 404 firm-year observations (734 firms, 2019–2024, unbalanced panel).

As discussed in Section 2.4, firm size, firm age, and capital structure (leverage or solvency) are the control variables most consistently used across the internationalisation-performance literature reviewed (Arbelo et al., 2024; Ruigrok & Wagner, 2003; Hsu & Boggs, 2003; Lu & Beamish, 2001; Santos & Castanho, 2022), which supports their inclusion in the present model. The solvency ratio is used as the proxy for the firm's financial structure, following Santos and Castanho (2022), who similarly assess the financial soundness of

internationalized firms using Orbis-derived solvency ratios. This choice is further supported by the greater availability of the solvency ratio in Orbis relative to a directly computed leverage ratio for the firms under analysis, while conceptually representing the inverse relationship: higher solvency indicates lower reliance on debt financing.

4. Results

4.1 Descriptive statistics

This section presents the descriptive statistics of the variables used in the empirical model, based on the final sample of 734 firms operating under NACE C20.52 (Manufacture of glues), observed over the period 2019–2024, corresponding to an unbalanced panel of 4 404 firm-year observations.

Regarding the dependent variables, the average Return on Assets (ROA) across the sample is 0,064 (winsorized), with a standard deviation of 0,117, ranging between -0,591 and 0,859. The average Return on Equity (ROE) is somewhat higher, at 0,166 (winsorized), with greater dispersion (standard deviation of 0,470), ranging between -1,308 and 2,091. The wider dispersion observed in ROE relative to ROA is consistent with ROE being more sensitive to firms' capital structure, particularly among firms with comparatively low levels of shareholders' funds.

Concerning the internationalisation strategy variables, the sample shows that IJVS are the most prevalent strategy, present in 15,9% of firm-year observations, followed by Export, present in 5,9% of observations, and Cross-border Acquisition, the least common strategy, present in only 3,8% of observations. This distribution is broadly consistent with the characterisation of the adhesives and glue manufacturing segment presented in Section 2.2.2, where cross-border acquisitions were identified as being concentrated among a smaller number of larger, well-established firms, while joint ventures and other forms of shared ownership tend to be more broadly represented across firms of different sizes operating internationally.

With respect to the breadth of internationalisation, the majority of firm-year observations (3 432, corresponding to 77,9% of the sample) correspond to firms pursuing none of the three strategies simultaneously, while 834 observations (18,9%) correspond to firms pursuing

exactly one strategy. Only 120 observations (2,7%) correspond to firms pursuing two strategies simultaneously, and a mere 18 observations (0,4%) correspond to firms pursuing all three strategies at once. This distribution indicates that combining multiple internationalisation strategies simultaneously remains a comparatively rare occurrence within the adhesives and glue manufacturing segment, a pattern that should be taken into account when interpreting the results concerning the breadth hypothesis (H4) in Section 4.2.

Regarding firm-level control variables, the average firm size, measured as the natural logarithm of total assets, is 7 665, with considerable dispersion (standard deviation of 2 687), reflecting the coexistence of small and large multinational firms within the sample (cf. Section 2.2.2). The average firm age is approximately 36 years, ranging from newly incorporated firms to those with up to 124 years of activity, indicating a sample comprising both young entrants and long-established players in the industry. The average solvency ratio is 45,8%, with a standard deviation of 33,3%, reflecting substantial heterogeneity in firms' capital structure across the sample.

Table 5 presents the descriptive statistics for all relevant variables included in the empirical model.

Table 5: Descriptive statistics of the relevant variables

Group of variables	**Variable**	**N**	**Mean**	**Min**	**Max**	**SD**
Dependent variables	ROA (winsorized ratio)	3 684	0,064	-0,591	0,859	0,117
	ROE (winsorized ratio)	3 368	0,166	-1,308	2,091	0,470
Internationalisation strategies	Export (dummy 0/1)	4 404	0,059	0,000	1,000	0,235
	IJV (dummy 0/1)	4 404	0,159	0,000	1,000	0,366
	Acquisition (dummy 0/1)	4 404	0,038	0,000	1,000	0,192
Control variables	Firm Size (ln Total Assets, th. USD)	3 732	7,665	-3,155	17,430	2,687
	Firm Age (years)	4 234	35,698	0,000	124,000	36,130
	Solvency Ratio (%)	3 666	45,783	-99,281	100,000	33,332
	Total Assets (th. USD)	3 732	107 789,899	0,043	37 119 753,808	1 502 382,625

	Number of Employees	3 370	252,106	0,000	52 700,000	2 484,502

Note. N corresponds to the number of valid (non-missing) firm-year observations for each variable. ROA and ROE are expressed as ratios and winsorized at the 1st and 99th percentiles; Export, IJV, and Acquisition are binary (0/1) indicators; Firm Size is measured as the natural logarithm of total assets (in thousand USD); Total Assets and Number of Employees are reported in their original units (thousand USD and number of persons, respectively) for descriptive purposes only, and are not used directly as regressors, Firm Size being used instead (cf. Section 3.4).

4.2 Estimation Results

This section presents the results of the Random Effects panel regressions used to test hypotheses H1 to H5, as specified in Section 3.1. Statistical significance is assessed at conventional levels (10%, 5%, 1%, and 0,1%) and applied consistently to all estimated coefficients. For each hypothesis, models are estimated separately for the two performance proxies, ROA and ROE, allowing for comparison of results across both dependent variables. All models include year dummies to control for common macroeconomic shocks, and both ROA and ROE were winsorized at the 1st and 99th percentiles prior to estimation (cf. Section 3.2).

4.2.1. Baseline Model: Internationalisation Strategies and Firm Performance (H1–H3)

Table 6 presents the results of the baseline model, testing the direct relationship between each internationalisation strategy (Export, IJV, and Acquisition) and firm performance.

Table 6: Baseline model - Random Effects

Variable	**ROA**	**ROE**
Export	0,0106 (0,0197)	0,0344 (0,0496)
IJV	-0,0060 (0,0116)	-0.,173 (0,0299)
Acquisition	-0,0072 (0,0242)	0,0629 (0,0609)
Firm Size	0,0013 (0,0016)	-0,0166*** (0,0044)
Firm Age	-0,0006*** (0,0001)	-0,0013*** (0,0003)
Solvency Ratio	0,0018*** (0,0001)	-0,0003 (0,0003)

Year dummies	Included	Included
N (firm-year obs.)	3 617	3 361
R^2	0,092	0,018

Note. Standard errors in parentheses. Significance codes: *** p<0,001, ** p<0,01, * p<0,05.

As shown in Table 6, none of the three internationalisation strategies exhibits a statistically significant relationship with firm performance, either measured through ROA or ROE. Consequently, H1, H2, and H3 are not supported by the data. While unexpected relative to the positive relationships typically found in the exporting literature (Wagner, 2012; Grazzi, 2012; Bernard & Jensen, 1999), this result is nonetheless consistent with a broader strand of the internationalisation-performance literature, which finds that the relationship is frequently inconsistent, contingent or non-significant once firm-specific heterogeneity and industry context are accounted for (Aggarwal, 2017; Hsu & Boggs, 2003). Firm Age and Solvency Ratio emerge as consistently significant predictors of ROA, while Firm Size and Firm Age are significant predictors of ROE, suggesting that firm-level structural characteristics play a more prominent role in explaining performance than the internationalisation strategies themselves, at least when tested in this direct, linear specification.

4.2.2. Internationalisation Breath and Firm Performance (H4)

Table 7 presents the results of the model testing the non-linear (inverted-U shaped) relationship between the breadth of internationalisation strategies pursued and firm performance.

Table 7: Breadth of internationalisation - Random Effects

Variable	**ROA**	**ROE**
Breadth	-0,0087 (0,0190)	-0,0409 (0,0486)
$Breadth^2$	0,0044 (0,0108)	0,0318 (0,0272)
Firm Size	0,0014 (0,0016)	-0,0155*** (0,0043)
Firm Age	-0,0006*** (0,0001)	-0,0012*** (0,0003)
Solvency Ratio	0,0018*** (0,0001)	-0,0003 (0,0003)
Year dummies	Included	Included

N (firm-year obs.)	3 617	3 361
R^2	0,092	0,018

Note. Standard errors in parentheses. Significance codes: *** p<0,001, ** p<0,01, * p<0,05.

Neither the linear nor the quadratic term of Breadth is statistically significant for ROA or ROE, providing no support for H4. As shown in the descriptive statistics (Section 4.1), the vast majority of firm-year observations (77,9%) correspond to firms pursuing none of the three strategies, with only 0,4% of observations corresponding to firms pursuing all three simultaneously. This limited variation at the higher end of the breadth distribution likely constrains the model's ability to detect a non-linear relationship, even if one exists in the underlying population, a limitation consistent with the relatively small samples of high-breadth internationalisers reported in comparable studies (Lu & Beamish, 2001; Contractor et al., 2007).

4.2.3. Moderating Role of Firm Size (H5)

Table 8 presents the results of the model testing whether firm size moderates the relationship between internationalisation strategies and firm performance, through the inclusion of interaction terms between each strategy dummy and firm size.

Table 8: Moderating role of firm size - Random Effects

Variable	**ROA**	**ROE**
Export	0,2270**	0,3591†
	(0,0756)	(0,1950)
IJV	-0,1164***	-0,2417**
	(0,0345)	(0,0931)
Acquisition	0,0292	-0,0702
	(0,1254)	(0,3148)
Export × Size	-0,0217**	-0,0331†
	(0,0073)	(0,0187)
IJV × Size	0,0147***	0,0293*
	(0,0044)	(0,0116)
Acquisition × Size	-0,0012	0,0139
	(0,0105)	(0,0264)
Firm Size	0,0004	-0,0194***
	(0,0018)	(0,0047)
Firm Age	-0,0006***	-0,0013***
	(0,0001)	(0,0003)

Solvency Ratio	0,0018*** (0,0001)	-0,0003 (0,0003)
Year dummies	Included	Included
N (firm-year obs.)	3 617	3 361
R^2	0,096	0,020

Note. Standard errors in parentheses. Significance codes: *** p<0,001, ** p<0,01, * p<0,05, † p<0,10.

The results reported in Table 8 provide clear support for H5. Both the direct effects of Export and IJV, and their respective interaction terms with Firm Size, are statistically significant across both performance measures, indicating that the relationship between these two internationalisation strategies and firm performance is conditional on firm size, rather than uniform across firms.

For each moderated strategy, the marginal effect of the internationalisation strategy on performance, conditional on firm size, is given by $\partial Performance/\partial Strategy = \beta_1 + \beta_2 \times Size$, where β_1 is the direct coefficient of the strategy dummy and β_2 is the coefficient of its interaction term with Firm Size. The turning point, that is, the level of Firm Size at which the marginal effect changes sign, is obtained by setting this expression to zero, yielding $Size^* = -\beta_1/\beta_2$.

Regarding the Export model, the direct coefficient is positive and significant (ROA: β=0,227, p<0,01; ROE: β=0,359, p<0,10), while the interaction term with Firm Size is negative and significant (ROA: β=-0,022, p<0,01; ROE: β=-0,033, p<0,10). This pattern indicates that exporting is positively associated with performance primarily among smaller firms, with this positive effect progressively diminishing as firm size increases. The estimated turning point ($Size^* = -0,227/(-0,0217) \approx 10,5$), at which the effect of Export on ROA becomes zero, corresponds to a Firm Size (log Total Assets) of approximately 10,5, above the sample mean of 7,67 (cf. Table 5), suggesting that the positive effect of exporting remains present for the majority of firms in the sample, but weakens considerably among the largest firms. This finding is consistent with the view that exporting represents a lower-commitment, lower-risk internationalisation strategy, particularly valuable for smaller firms with more limited resources to pursue higher-commitment alternatives (Wagner, 2012; Root, 1994), while larger firms may derive comparatively smaller marginal benefits from export activity relative to other, higher-commitment strategies already available to them.

Regarding the IJV model, the pattern is reversed: the direct coefficient is negative and significant (ROA: β=-0,116, p<0.001; ROE: β=-0,242, p<0,01), while the interaction term with Firm Size is positive and significant (ROA: β=0,015, p<0,001; ROE: β=0,029, p<0,05). This indicates that international joint ventures are associated with lower performance among smaller firms, but that this negative effect diminishes and eventually reverses, as firm size increases. The estimated turning point ($Size^* = 0,1164/0,0147 \approx 7,9$) for ROA corresponds to a Firm Size of approximately 7,9, remarkably close to the sample mean of 7,67, indicating that firms of average size in this sample are positioned near the threshold at which the effect of IJVs on performance shifts from negative to positive. This result is consistent with the joint venture literature discussed in Section 2.3, which emphasizes that IJV performance is highly contingent on the partners' ability to manage the relational and governance complexity inherent to shared ownership arrangements (Ren et al., 2009; Beamish & Killing, 1997; Larimo et al., 2016). Smaller firms may lack the managerial resources and negotiating capacity required to structure and manage IJVs effectively, while larger firms, better equipped to absorb the coordination costs and governance demands associated with shared international ventures (Contractor et al., 2007; Sudarsanam & Mahate, 2003), are able to convert IJV participation into a performance advantage.

No significant direct or moderating effect is found for Cross-border Acquisition in either specification, suggesting that, within this sample, the performance implications of acquisitions are not systematically related to firm size, in contrast to the pattern observed for Export and IJV.

4.2.4. Robustness Checks

To assess the robustness of the results reported in Sections 4.2.1 to 4.2.3, two complementary checks were performed: (i) a Breusch-Pagan Lagrange Multiplier test, comparing the Random Effects specification against a Pooled OLS alternative (Breusch & Pagan, 1980), and (ii) the re-estimation of standard errors using cluster-robust standard errors at the firm level (Arellano, 1987), in order to account for potential heteroskedasticity and within-firm serial correlation.

The Breusch-Pagan test is designed to determine whether the panel structure of the data contains meaningful firm-specific heterogeneity that a simple Pooled OLS model would fail to capture. Under the null hypothesis of no significant firm-specific effects, Pooled OLS

would be the more equally valid choice, whereas rejecting the null supports the use of a panel estimator such as Random Effects (Breusch & Pagan, 1980). Applied to the present data, this test strongly rejects the null hypothesis of no significant firm-specific effects, both for ROA (χ^2=1 309,3, p<0,001) and ROE (χ^2=939,5, p<0,001), confirming that meaningful firm-level heterogeneity is indeed present in the sample, and that the Random Effects specification is statistically preferable to Pooled OLS. This result validates the panel data approach adopted throughout this dissertation (cf. Section 3.2).

The second check addresses a different concern: standard Random Effects standard errors assume homoskedastic and serially uncorrelated errors, an assumption that is frequently violated in firm-level panel data, where the same firm is observed repeatedly over time and its unobserved characteristics can generate correlated errors across years (Arellano, 1987). Re-estimating the model with cluster-robust standard errors at the firm level relaxes this assumption, testing whether the statistical significance of the coefficients reported in Sections 4.2.1 to 4.2.3 holds once heteroskedasticity and within-firm serial correlation are accounted for; coefficients that remain significant under this more conservative approach can be considered more reliable, while those that lose significance should be interpreted with greater caution.

Table 9 and Table 10 compares the coefficients, standard errors, and significance levels of the variables of interest across the baseline standard errors and the cluster-robust standard errors, for the two models most central to the hypotheses tested (H1–H3 and H5).

Table 9: Robustness of coefficients - Baseline model (H1–H3)

Variable	**ROA (standard SE)**	**ROA (robust SE)**	**ROE (standard SE)**	**ROE (robust SE)**
Export	0,0106	0,0106	0,0344	0,0344
	(0,0197)	(0,0192)	(0,0496)	(0,0600)
IJV	-0,0060	-0,0060	-0,0173	-0,0173
	(0,0116)	(0,0109)	(0,0299)	(0,0302)
Acquisition	-0,0072	-0,0072	0,0629	0,0629*
	(0,0242)	(0,0133)	(0,0609)	(0,0318)

Table 10: Robustness of coefficients - Moderation model (H5)

Variable	**ROA (standard SE)**	**ROA (robust SE)**	**ROE (standard SE)**	**ROE (robust SE)**
Export	0,2270**	0,2270†	0,3591†	0,3591
	(0,0756)	(0,1269)	(0,1950)	(0,3385)

IJV	-0,1164*** (0,0345)	-0,1164** (0,0405)	-0,2417** (0,0931)	-0,2417* (0,1037)
Acquisition	0,0292 (0,1254)	0,0292 (0,0900)	-0,0702 (0,3148)	-0,0702 (0,1796)
Export × Size	-0,0217** (0,0073)	-0,0217† (0,0115)	-0,0331† (0,0187)	-0,0331 (0,0289)
IJV × Size	0,0147*** (0,0044)	0,0147** (0,0051)	0,0293* (0,0116)	0,0293* (0,0119)
Acquisition × Size	-0,0012 (0,0105)	-0,0012 (0,0081)	0,0139 (0,0264)	0,0139 (0,0159)

Note. Standard errors in parentheses. Significance codes: *** p<0,001, ** p<0,01, * p<0,05, † p<0,10. Coefficients without a symbol are not significant (p≥0,10).

The robustness analysis reveals two noteworthy patterns. First, in the moderation model (H5), the moderating role of IJV, together with its interaction term with Firm Size, remains statistically significant across both performance measures and both standard error specifications, reinforcing the robustness of this result and providing strong support for the moderating role of firm size on the IJV-performance relationship, as discussed in Section 4.2.3. Second, also within the moderation model (H5), the direct and moderating effects of Export weaken considerably once cluster-robust standard errors are applied, remaining significant only at the 10% level for ROA and losing significance entirely for ROE. This suggests that the evidence supporting the moderating role of firm size on the Export-performance relationship should be interpreted with some caution, as it is comparatively more sensitive to the standard error specification than the corresponding result for IJV.

Additionally, in the baseline model (H1–H3), Acquisition emerges under cluster-robust standard errors as a marginally significant and positive predictor of ROE (β=0,063, p=0,048; cf. Table 9), a result not present under conventional standard errors. Given that this result does not appear consistently across specifications and standard error assumptions, it is reported here as an exploratory finding rather than as robust evidence in support of H3 and is not further emphasized in the interpretation of the results.

Overall, the robustness checks confirm the Random Effects specification as appropriate for the data, and reinforce IJV, moderated by firm size in the moderation model (H5), as the most robust and consistent finding of the empirical analysis, while indicating that the corresponding result for Export in that same model should be interpreted with greater

caution.

4.3 Discussion

The empirical analysis conducted in this dissertation set out to examine the relationship between three internationalisation strategies, exporting, international joint ventures, and cross-border acquisitions, and firm performance within the adhesives and glue manufacturing segment of the petrochemical industry, testing five hypotheses derived from the literature reviewed in Chapter 2.

Taken together, the results reveal a consistent pattern across the baseline (H1–H3) and breadth (H4) specifications: none of the internationalisation strategies, whether tested individually or through the number of strategies simultaneously pursued, exhibits a statistically significant direct relationship with firm performance, as measured by either ROA or ROE. At first glance, this outcome may appear to contradict the largely positive relationships reported in parts of the literature reviewed in Section 2.3, particularly regarding exporting (Wagner, 2012; Grazzi, 2012; Bernard & Jensen, 1999). However, it is fully consistent with a broader and equally well-established strand of that same literature, which finds the internationalisation-performance relationship to be frequently inconsistent, contingent, and highly sensitive to firm-specific characteristics, industry context, and model specification (Aggarwal, 2017; Hsu & Boggs, 2003; Contractor et al., 2007). Rather than undermining the empirical exercise, this finding reinforces the relevance of moving beyond a simple, direct-effect framework and lends support to the theoretical expectation, articulated in Section 2.3, that the effect of internationalisation on performance is rarely uniform across firms (Ruigrok & Wagner, 2003; Arbelo et al., 2024).

This expectation is precisely what the results for H5 confirm. When the moderating role of firm size is introduced, both Export and IJV emerge as significant predictors of performance, revealing two distinct and theoretically coherent patterns that were entirely concealed in the baseline specification. Exporting is found to benefit smaller firms more than larger ones, a pattern consistent with the characterisation of exporting as a comparatively low-commitment, low-risk internationalisation strategy (Root, 1994), well suited to firms with more constrained resources, and one that offers proportionally diminishing returns as firms grow and gain access to alternative, higher-commitment strategies. International joint ventures display the opposite pattern: negatively associated with

performance among smaller firms, but increasingly beneficial as firm size increases, with the turning point of this relationship located remarkably close to the sample's average firm size. This result directly corroborates the joint venture literature discussed in Section 2.1.2 and 2.3, which consistently emphasizes that IJV performance hinges on the partnering firm's capacity to manage the governance complexity, resource-sharing arrangements, and coordination costs inherent to shared international ownership (Kogut, 1988; Beamish & Killing, 1997; Ren et al., 2009; Larimo et al., 2016). Larger firms, possessing greater managerial capacity and financial resources (Contractor et al., 2007; Sudarsanam & Mahate, 2003), appear better equipped to convert IJV participation into a genuine performance advantage, whereas smaller firms may struggle to absorb these same demands.

The robustness checks reported in Section 4.2.4 add an important layer of nuance to this interpretation. While the moderating effect of firm size on the IJV-performance relationship remains significant across both performance measures and both standard error specifications, the corresponding result for Export weakens considerably once cluster-robust standard errors are applied. This asymmetry suggests that, of the two significant findings under H5, the moderating role of firm size on international joint ventures constitutes the most robust and reliable empirical contribution of this dissertation, while the equivalent result for exporting, though theoretically plausible and directionally consistent, should be interpreted with greater caution.

No significant relationship, direct or moderated by firm size, is found for cross-border acquisitions in any specification. This result stands in contrast to parts of the acquisitions literature reviewed in Section 2.3, which generally reports positive performance effects associated with M&A activity (Healy et al., 1992; Aybar & Ficici, 2009), although it is consistent with evidence that acquisition performance is highly conditional on factors not captured in the present model, such as the method of payment, the degree of strategic fit between acquirer and target, and the quality of post-acquisition integration (Sudarsanam & Mahate, 2003; Bertrand & Betschinger, 2012). Combined with the comparatively small number of firms classified as having pursued cross-border acquisitions within the sample (cf. Section 4.1), this suggests that the absence of a significant effect may reflect either the genuine heterogeneity of acquisition outcomes documented in the literature, or the limited statistical power available to detect such an effect within this specific sample, rather than the absence of any relationship between acquisitions and performance in the broader population

of adhesives and glue manufacturers.

Across all model specifications, firm age is consistently and negatively associated with both ROA and ROE, while solvency is a strong positive predictor of ROA specifically. These results indicate that structural firm-level characteristics play a substantial role in shaping the performance of firms in this industry, a finding aligned with the broader determinants of firm performance discussed in Section 2.4 (Rumelt, 1991; Majumdar, 1997), and one that further underscores the importance of controlling for these characteristics when isolating the specific contribution of internationalisation strategies.

5.Conclusions

5.1 Main Results

This dissertation examined the relationship between internationalisation strategies and firm performance within the adhesives and glue manufacturing segment of the petrochemical industry (NACE C20.52), using firm-level panel data for 734 firms observed between 2019 and 2024. Three internationalisation strategies were considered, exporting, international joint ventures, and cross-border acquisitions, and their effect on performance, measured through ROA and ROE, was tested through five hypotheses.

The results show that none of the three strategies exhibits a significant direct effect on firm performance, nor does the breadth of internationalisation pursued display the hypothesized non-linear relationship (H1–H4 not supported). However, firm size is found to significantly moderate the relationship between internationalisation and performance (H5 supported): exporting is positively associated with performance among smaller firms, with this effect weakening as firm size increases, while international joint ventures show the opposite pattern, being negatively associated with performance among smaller firms but increasingly beneficial for larger ones. Robustness checks confirm the moderating effect of firm size on the IJV-performance relationship as the most reliable finding of this dissertation, while the corresponding result for exporting is comparatively more sensitive to the standard error specification. No significant effect, direct or moderated, is found for cross-border acquisitions. Firm age and solvency further emerge as consistent determinants of performance across most specifications.

5.2 Contributions

This dissertation contributes to the internationalisation-performance literature in three main ways. First, it provides sector-specific empirical evidence for the petrochemical industry, and more specifically for the adhesives and glue manufacturing segment, an industry context that had not been previously examined in this literature, thereby addressing the gap identified in Section 2.5. Second, it jointly tests three internationalisation strategies within a single econometric model, rather than examining each strategy in isolation, allowing for a more integrated assessment of how different modes of international expansion relate to firm performance within the same industry. Third, by identifying firm size as a significant moderator of the internationalisation-performance relationship, this dissertation offers a more nuanced explanation for the mixed and often inconsistent findings reported in the broader literature (Aggarwal, 2017; Hsu & Boggs, 2003), showing that the relevant question is not simply whether internationalisation improves performance, but for which firms it does so.

5.3 Limitations and Future Research

This dissertation is subject to several limitations, which also point to promising directions for future research. First, the internationalisation strategy variables were constructed as time-invariant indicators, based on ownership and corporate structure data retrieved from Orbis at a single point in time, rather than as year-specific measures capturing when each strategy was actually adopted. This precluded the use of a Fixed Effects specification, which would have allowed for stronger control of unobserved firm heterogeneity and future research with access to time-stamped internationalisation events could adopt such an approach.

Second, as discussed in Section 3.3, greenfield investment, one of the four internationalisation strategies identified in the literature review (Section 2.1), was excluded from the empirical analysis, since Orbis does not provide a reliable indicator capable of distinguishing greenfield investment from cross-border acquisition. Future studies with access to more detailed entry-mode data, such as Zephyr or SDC Platinum, could reintegrate this strategy into the analysis.

Third, the proxy used for exporting, the presence of at least one foreign subsidiary, constitutes a structural approximation rather than a direct measure of export intensity, given

the unavailability of firm-level foreign sales data for non-listed firms in Orbis (cf. Section 2.5). Similarly, the proxy used for international joint ventures, combining foreign shareholding with the BvD Independence Indicator, does not fully capture the relational and governance dimensions emphasized in the joint venture literature (Ren et al., 2009; Larimo et al., 2016). Future research could complement these proxies with survey-based or case-study evidence to validate and refine these constructs.

Fourth, the relatively limited number of firm-year observations classified as pursuing cross-border acquisitions, particularly those pursuing multiple strategies simultaneously (cf. Section 4.1), may have constrained the statistical power to detect significant effects for H3 and H4. Future research with access to a larger sample, potentially spanning multiple related NACE codes within the specific chemicals sector, could help to confirm whether the non-significant results obtained for these hypotheses reflect a genuine absence of effect or a limitation of statistical power.

Finally, the moderating role of firm size identified under H5, particularly for exporting, was shown to be sensitive to the standard error specification adopted (cf. Section 4.2.4). Future research could further investigate this relationship using larger samples or alternative estimation techniques to more definitively establish whether this result reflects a robust structural relationship or a sample-specific pattern.

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