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Customs agents in international trade

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May 2026

Centre for Inclusive Trade Policy
Working Paper No.035



Economic
and Social
Research Council

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Abstract

More than 85% of UK non-EU export value is facilitated by customs agents, yet little is known about how firms organize and adjust these relationships. This paper provides novel evidence on trader-agent relationships using transaction-level UK customs data from 2009 to 2019. We document a highly concentrated and skewed network structure: while most trader-agent links are short-lived and low value, a small number of persistent relationships account for the majority of agent-mediated trade. We show that agent use reflects distinct strategic motives. Firms are more likely to rely on agents when entering new markets or introducing new products (exploration), but these relationships are shallow and short-lived. In contrast, when firms trade in markets aligned with their agent's established expertise (exploitation), relationships are deeper and more persistent. Finally, exploiting the 2016 Brexit referendum as a large policy uncertainty shock, we show that firms more exposed to EU markets reorganize and deepen their reliance on customs agents. Our findings identify customs intermediation as an important organizational margin through which firms manage border frictions and trade policy uncertainty.

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Suggested citation

Chung, W; Elliott, R; Han, Y (2026) 'Customs agents in international trade', Centre for Inclusive Trade Policy, Working Paper 035

Non-Technical Summary

International trade is often understood as transactions between firms across borders. In practice, much of this activity depends on intermediaries that help firms navigate regulatory and administrative requirements. Among these, customs agents play a central role by handling documentation, compliance, and border procedures. In the UK, they facilitate more than 85% of exports to non-EU countries, yet their role in shaping trade outcomes remains poorly understood.

This research examines how firms use customs agents and how these relationships respond to changes in trade conditions. Using detailed transaction-level data on UK exports between 2009 and 2019, the study provides new evidence on how firms form, manage, and adjust relationships with agents. It shows that these intermediaries are not simply service providers, but a key part of how firms organise their international activities and respond to uncertainty.

The study first documents the structure of relationships between firms and agents. Agent use is widespread, but highly concentrated. A relatively small number of agents and firm-agent relationships account for most of the total value of trade. At the same time, these relationships are often short-lived. Many last only one or two years, while a small number persist and account for a large share of trade. This combination of concentration and turnover suggests that firms actively manage a portfolio of agents rather than relying on a single long-term partner.

The analysis shows that firms use customs agents in two distinct ways. One is during expansion into new markets or products. When firms enter unfamiliar environments, they are more likely to rely on agents to manage regulatory complexity and reduce uncertainty. These relationships tend to involve smaller agents and lower trade values, which suggests that firms use them to test new opportunities before committing more resources.

The second use arises when firms operate in areas that match an agent's established expertise. In these cases, relationships become deeper and more valuable, with larger volumes of trade flowing through specialised agents. This pattern indicates that firms rely on agents not only to reduce uncertainty, but also to support the efficient scaling of trade in established markets and products.

The study also examines how these relationships respond to trade policy uncertainty, focusing on the 2016 Brexit referendum. Firms with greater exposure to EU markets adjusted their use of agents following the vote. They reduced the number of agents they worked with, while increasing the size and value of their remaining relationships. This shift suggests that firms respond to uncertainty by consolidating their intermediary networks and relying more heavily on agents with greater capacity and expertise.

These findings highlight an important but often overlooked mechanism of adjustment in international trade. Firms do not respond to policy changes only by altering prices, quantities, or market participation. They also reorganise their relationships with intermediaries that help them manage regulatory requirements. Customs agents therefore form part of the institutional infrastructure that supports trade.

The results have several implications for policy. First, they show that trade facilitation depends not only on simplifying rules, but also on ensuring that firms can access the expertise needed to comply with them. Customs agents translate complex regulations into practical processes, making them essential for the functioning of modern trade systems.

Second, the concentration of the agent market suggests potential constraints in capacity and access. If a small number of agents handle a large share of trade, disruptions to these intermediaries could affect a wide range of firms. Smaller exporters may face particular

challenges in accessing high-quality agents, especially when demand for their services increases.

Third, policies aimed at supporting exporters, particularly small and medium-sized enterprises, should consider the role of intermediaries. Improving access to customs expertise, supporting training and certification, and facilitating connections between firms and agents could help reduce barriers to trade participation.

In sum, this research shows that customs agents play a central role in how firms navigate international trade. By enabling firms to manage complexity and respond to uncertainty, they contribute to the resilience and adaptability of the trading system. Recognising this role can help policymakers design more effective trade and regulatory policies in an increasingly complex global environment.

Customs Agents in International Trade^{*†}

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May 2026

Abstract

More than 85% of UK non-EU export value is facilitated by customs agents, yet little is known about how firms organize and adjust these relationships. This paper provides novel evidence on trader-agent relationships using transaction-level UK customs data from 2009 to 2019. We document a highly concentrated and skewed network structure: while most trader-agent links are short-lived and low value, a small number of persistent relationships account for the majority of agent-mediated trade. We show that agent use reflects distinct strategic motives. Firms are more likely to rely on agents when entering new markets or introducing new products (exploration), but these relationships are shallow and short-lived. In contrast, when firms trade in markets aligned with their agent's established expertise (exploitation), relationships are deeper and more persistent. Finally, exploiting the 2016 Brexit referendum as a large policy uncertainty shock, we show that firms more exposed to EU markets reorganize and deepen their reliance on customs agents. Our findings identify customs intermediation as an important organizational margin through which firms manage border frictions and trade policy uncertainty.

JEL: F13, F14

Keywords: Customs agents, firm-to-firm networks, intermediaries, export dynamics

*Disclaimer: This study uses statistical data from HM Revenue and Customs (HMRC) which is Crown Copyright. The research data sets used may not exactly reproduce HMRC aggregates. The use of HMRC statistical data in this study does not imply the endorsement of HMRC in relation to the interpretation or analysis of the information. HMRC agrees that the figures and descriptions of results in the attached document may be published. This does not imply HMRC's acceptance of the validity of the methods used to obtain these figures, or of any analysis of the results.

[†]We are grateful for the financial support from the Centre for Inclusive Trade Policy Innovation Fund, ESRC [grant number ES/W002434/1]. We also thank seminar audiences at the 2025 European Trade Study Group (ETSG) Annual Conference in Milan, the 2025 Econometric Society World Congress (ESWC) in Seoul, CITP Academic Conference in Glasgow, UK Firm-Level Trade Study Group Workshop, Midlands Empirical Economics Workshop in Leicester and Midlands Trade & Investment Network ECR Conference.

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1 Introduction

Global trade is becoming increasingly complex and fragmented. Administrative trade barriers, such as customs documentation and compliance requirements, generate real costs and delays that significantly affect trade flows (Hummels and Schaur, 2013). When trade policy becomes uncertain, these frictions become even more salient, as firms must anticipate potential changes in market access conditions and border regimes (Graziano et al., 2021; Handley and Limão, 2017). In response, firms often rely on customs agents to manage border procedures and regulatory compliance. In the UK, these agents facilitate more than 85% of non-EU export value.¹ Despite their pervasive use, little is known about how firms organize relationships with these agents, why they rely on them, and whether these relationships adjust when trade policy uncertainty rises.

This paper fills this gap by providing new empirical evidence on how firms form, manage, and adjust relationships with customs agents. We use transaction-level UK export data with non-EU countries from HM Revenue and Customs (HMRC) covering 2009-2019, which uniquely identify whether each export transaction is filed by a customs agent on behalf of the trading firm.² These agents are primarily third-party logistics (3PL) providers and freight forwarding firms that exporters use to handle customs declarations and border compliance on their behalf (Chung et al., 2025).³ This allows us to observe firm-agent matches at a highly disaggregated level and to track the formation, evolution, and dissolution of relationships over time. We begin by documenting the structure of trader-agent relationships, including concentration, matching patterns, and turnover. We then examine how firms' use of agents varies with two distinct motives: (i) *exploration*, when firms enter new export markets or introduce new products, and (ii) *exploitation*, when firms trade in markets or products aligned with agents' existing market or product specialization. Finally, we analyze how these relationships respond to a major policy uncertainty shock, the 2016 Brexit referendum, using variation in firms' pre-referendum exposure to EU markets.

Our contribution is threefold. First, we document the structure and dynamics of a previously understudied organizational layer of international trade: trader-agent networks. While existing research has examined cross-border buyer-seller linkages and network structure (Bernard, Moxnes and Ulltveit-Moe, 2018; Benguria, 2021) as well as wholesale trade intermediation (Ahn et al., 2011; Akerman, 2018), it has largely overlooked the domestic intermediaries that facilitate border compliance. We provide new evidence on how customs agents play a widespread and highly structured role in organizing trade flows within borders. Second, we show that agent use is systematically associated

¹Based on the authors' calculations using transaction-level UK customs data from HM Revenue and Customs.

²Agent identifiers are only available for non-EU trade in the pre-Brexit period, as intra-EU filings were not recorded in the same way. In HMRC customs data, this corresponds to the identifier of the agent authorized by the exporter or consignor to act as the representative for the consignment and to "declare the goods" on the export entry (HMRC, 2025).

³Customs agents do not take ownership of goods and are distinct from wholesalers or retailers that intermediate trade by purchasing and reselling products.

with firms' exploration of new markets and products, as well as with the alignment of trade flows with agents' specialized expertise. These patterns operate through distinct margins of adjustment, indicating that agent relationships are part of firms' broader strategies for managing heterogeneity across products and destinations. Third, we identify customs intermediation as an adjustment margin in response to trade policy uncertainty. Exploiting the Brexit referendum as a large and persistent uncertainty shock, we show that firms more exposed to EU markets reorganize and deepen their reliance on customs agents. Taken together, these results highlight that trader-agent relationships are not merely logistical arrangements but a flexible tool through which firms manage complexity, specialization, and regulatory risk.

The first part of the paper documents a set of descriptive facts about trader-agent relationships. Agent intermediation is the dominant mode of UK non-EU exporting: over 85% of export value and 97% of transactions are filed through customs agents. Yet this pervasive use coexists with strong concentration. A small number of large exporters and agents account for a substantial share of trade, and relationship values are highly skewed. In 2014, for example, the mean trader-agent relationship value is nearly 30 times the median, highlighting that a limited number of deep, high-value matches drive most agent-mediated exports. At the same time, trader-agent links are remarkably fluid: while exporters are persistently active, the average relationship lasts just over two years, and nearly half exist for only a single year. Short-lived relationships account for a large share of links but a small share of trade value, whereas high-value relationships are substantially more persistent. These patterns indicate that firms rely heavily on agents but actively manage their portfolios, maintaining a small set of durable, high-value relationships alongside many short-lived, low-value matches.

We next examine how firms' exploration and exploitation motives are associated with agent use.⁴ We proxy exploration using indicators for new market entry and newly exported products, defined relative to the firm's recent export history, and capture exploitation by measuring whether a firm's trade aligns with its agent's core market or product specialization. We consider three outcomes at the firm-product-destination-year level: an indicator for agent use (the extensive margin) and two intensive-margin measures: the average size of the agents used (measured by total export value) and relationship value (the average export value handled by connected agents).

Our findings indicate a clear exploration-exploitation pattern in firms' use of agents. Entry into new markets or products is associated with a higher likelihood of agent use, but these exploratory relationships involve smaller agents and lower trade values. By contrast, exporting in markets or products aligned with an agent's established expertise is associated with substantially deeper, higher-value relationships rather than broader agent use. These findings suggest that agents serve a dual role: facilitating entry into new activities while also supporting the expansion of trade where specialized

⁴Appendix C presents supplementary analysis examining how destination- and product-level characteristics, such as market size, geographic distance, cultural ties, and product classifications by degree of differentiation and end use, are associated with different margins of agent use.

knowledge can be leveraged. The results also reveal systematic heterogeneity across firms and destinations. In particular, agents play a more prominent role in facilitating entry into developing-country markets, consistent with higher informational and regulatory frictions in these environments.

In the final part of the analysis, we examine whether trader-agent relationships serve as an adjustment margin in response to trade policy uncertainty. Exploiting the 2016 Brexit referendum as a large and persistent uncertainty shock, we compare firms with greater pre-referendum exposure to EU markets to less exposed firms. We find that more EU-exposed firms reorganized their use of agents in non-EU markets following the referendum. In particular, exposed firms experienced a smaller contraction in the number of agent relationships and a stronger increase in relationship depth than less exposed firms. This pattern suggests that firms strengthened their customs expertise more broadly in anticipation of potential changes to trade agreements, market access conditions, and customs procedures, consistent with agents providing compliance scale economies and organizational flexibility that become more valuable under heightened policy uncertainty.

Our findings carry important policy implications. In the run-up to new post-Brexit customs requirements, HMRC advised firms to “go and talk to a customs expert,” emphasizing the practical role of specialized agents in navigating regulatory change (BBC News, 2020). Our results provide systematic evidence consistent with this guidance. Firms are more likely to rely on agents when entering unfamiliar markets and when facing heightened policy uncertainty, suggesting that access to specialized customs expertise facilitates adjustment to administrative trade frictions. Moreover, the concentration and value-dependent persistence of trader-agent relationships indicate that intermediary capacity may be unevenly distributed, with potential implications for smaller firms and for trade resilience more broadly. Policies aimed at trade facilitation and SME support may therefore need to consider not only border procedures themselves but also the intermediary ecosystem through which firms access compliance expertise, particularly during periods of heightened trade disruption.

This paper builds on and contributes to the literature studying firm-to-firm relationships in international trade. The expansion of global trade has generated complex cross-border production networks linking firms across jurisdictions (Carballo et al., 2018). A large body of work examines how exporters form and maintain buyer-seller relationships with foreign importers, emphasizing the role of matching, search frictions, and relationship dynamics (Benguria, 2021; Bernard, Bøler and Dhingra, 2018). While this literature has substantially advanced our understanding of cross-border exchange, it focuses primarily on relationships between producers and foreign customers. Much less attention has been paid to domestic institutional relationships between firms that enable international transactions to occur. By focusing on relationships between trading firms and customs agents, we shed light on an understudied organizational layer of international trade.

Our analysis also connects to the literature on intermediaries in trade. Prior research documents the prominence of wholesalers and retailers in facilitating exports and shaping firm-level trade patterns

(e.g., Ahn et al., 2011; Tang and Zhang, 2012; Akerman, 2018; Boehm et al., 2023). A related supply-chain literature studies how intermediaries coordinate production and distribution across stages (e.g., Utar, 2017; Fung et al., 2007; Cole and Aitken, 2020). In contrast to these intermediaries, customs agents do not intermediate product flows or match buyers and sellers. Instead, they provide regulatory and logistical expertise that enables firms to navigate customs procedures and comply with border requirements. By focusing on trader-agent relationships, we examine a distinct and widespread intermediary relationship that has received little systematic empirical attention.

This paper also relates to the growing literature examining the economic consequences of Brexit. A broad set of studies predicts that the UK’s exit from the European Union would increase trade costs, raise uncertainty, and alter trade patterns (e.g., Van Reenen, 2016; Jackson and Shepotylo, 2018; Sampson, 2017).⁵ Empirical evidence documents heightened uncertainty and its effects on firm behavior and trade outcomes (Bloom et al., 2019; Graziano et al., 2021; Steinberg, 2019), while recent work highlights the disruption of supply-chain linkages (Springford, 2024). Rather than focusing on aggregate trade effects, we examine an organizational margin of adjustment: firms’ reliance on customs agents in response to heightened border frictions. By analyzing how trader-agent relationships evolve around Brexit, we provide new evidence on how firms adapt to geopolitical shocks through changes in their intermediary relationships.

The remainder of the paper is structured as follows. Section 2 describes the data and documents key features of trader-agent relationships. Section 3 examines how firms’ use of customs agents varies with market expansion and agent specialization. Section 4 analyzes how trader-agent relationships respond to the uncertainty induced by the Brexit referendum. Section 5 concludes.

2 Data and Stylized Facts

2.1 UK customs data

Our dataset uses transaction-level customs data for the UK economy, obtained from HM Revenue and Customs (HMRC), a non-ministerial department of the UK government responsible for tax collection, state support payments, and the compilation of trade statistics. Access to the data is restricted to approved projects, and all empirical outputs are subject to HMRC’s statistical disclosure control.

We focus on non-EU exports between 2009 and 2019, thereby excluding the period of the 2008 financial crisis and the disruptions associated with the COVID-19 pandemic after 2020.⁶ For each export transaction, the dataset reports a unique trader identifier, destination country, transaction date, 5-digit Standard International Trade Classification (SITC) code, 4-digit Harmonized System (HS)

⁵While several studies predicted that Brexit would divert UK trade away from the EU toward non-EU markets (e.g., Bootle et al., 2018; Van Reenen, 2016; Jackson and Shepotylo, 2018), recent evidence suggests that the anticipated “trade reversion” has been limited. Posen and Rengifo-Keller (2022) argues that Brexit has instead reduced overall trade openness without substantial reorientation.

⁶We focus on non-EU trade because, prior to Brexit, transaction-level customs data containing agent information for EU trade were not available, as reporting was voluntary rather than based on compulsory declarations.

code, and ten-digit comcode product code (corresponding to the 8-digit Combined Nomenclature), as well as the transaction value. Crucially, the data also include a unique agent identifier when a transaction is handled by an agent, allowing us to identify trader-agent relationships at a highly granular level.

We exclude the “Not classified” industry (SITC 9) but retain homogeneous commodities such as “Crude materials” (SITC 2) and “Mineral fuels” (SITC 3) in the sample. This yields a full sample of over 10 million observations.

2.2 Stylized facts about trader-agent relationships

This section documents three stylized facts that characterise trader-agent relationships in UK exports. First, we show that the use of customs agents is pervasive but highly concentrated: while the vast majority of exports rely on agents, trade is dominated by a small number of exporters, agents, and high-value relationships. Second, we examine matching patterns and network structure, documenting how exporters and agents connect to one another, including the degree of assortativity and the prevalence of different match types. Third, we analyze the dynamics of trader-agent relationships over time, highlighting their typically short duration, high turnover, and the persistence of higher-value relationships. Together, these stylized facts provide a descriptive foundation for understanding how firms organize trade through agents, which we build on in the next section when analyzing firms’ strategic use of agents during product and market exploration versus exploitation of agent expertise. Additional descriptive evidence on firm size, destination market characteristics, and agent use is presented in Appendix A.

2.2.1 Pervasiveness and concentration

We begin by documenting the pervasiveness and concentration of trader-agent relationships in UK exports. The use of customs agents is widespread: over 85% of UK non-EU exports (by value) are mediated by agents, indicating that agent intermediation is the dominant mode of export participation rather than a marginal phenomenon.

Table 1 provides an overview of the full sample and distinguishes between direct exports and exports conducted through agents.⁷ Several features stand out. First, indirect exports account for 97% of transactions (9.9 million out of 10.2 million), and over 210,000 exporters engage in agent-mediated trade. Second, agent-mediated transactions tend to be smaller on average than direct transactions, with a mean transaction value of £146,000 for indirect exports compared to £613,000 for direct exports, consistent with agents facilitating a large volume of smaller export flows. Third, Table 1 highlights the highly asymmetric structure of the agent market: while there are only 3,380 agents in the sample, the average exporter works with 7.07 agents, and the average agent serves 444 exporters, pointing to a strongly concentrated intermediary market.

⁷Descriptive statistics on the prevalence of agent use across years, sectors, and destination groups in the full sample are reported in Appendix A.

Table 1: Summary statistics: whole sample, 2009-2019

| | <i>All</i> | <i>Direct</i> | <i>Indirect</i> |
|---------------------------------|------------|---------------|-----------------|
| Value share (%) | 100 | 13.38 | 86.62 |
| # Transactions | 10,212,127 | 310,289 | 9,901,838 |
| Mean transaction value (£'000s) | 160.01 | 612.59 | 145.83 |
| # Exporters | 212,171 | 19,058 | 210,579 |
| # Destinations | 207 | 204 | 207 |
| # Products | 11,133 | 7,830 | 11,106 |
| # Agents | 3,380 | / | 3,380 |
| Mean agent per exporter | / | / | 7.07 |
| Mean exporter per agent | / | / | 444.25 |

Notes: Due to the existence of mixed strategists, the number of direct and indirect exporters do not add up to the total number of exporters.

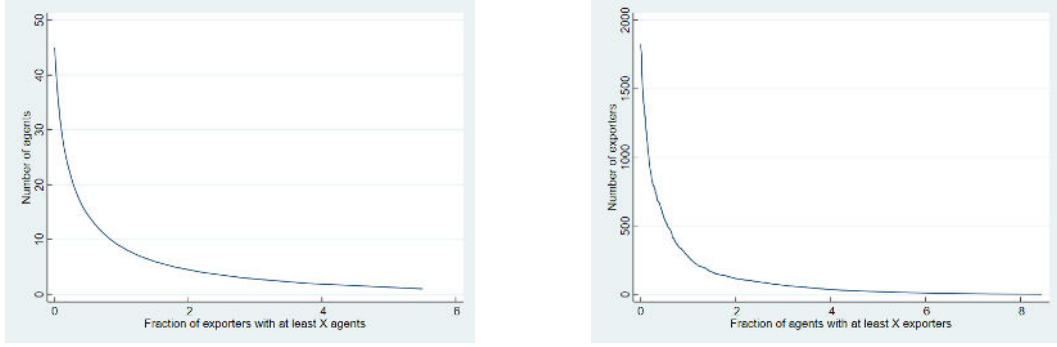
Table 2: A snapshot of indirect trade: 2014

| <i>Variables</i> | (1) <i>All</i> | (2) <i>US</i> | (3) <i>China</i> | (4) <i>UAE</i> | (5) <i>HK</i> | (6) <i>Singapore</i> |
|--|-------------------|------------------|---------------------|-------------------|------------------|-------------------------|
| Total value (in billion GBP) | 114.30 | 32.53 | 7.71 | 4.99 | 4.11 | 3.39 |
| # Exporters | 73,911 | 32,472 | 10,077 | 13,819 | 11,696 | 10,257 |
| # Agents | 1,728 | 1,054 | 848 | 942 | 808 | 800 |
| # Relationships | 314,081 | 66,419 | 20,991 | 29,436 | 20,352 | 19,464 |
| Mean value per relationship (£'000s) | 363.89 | 489.81 | 367.32 | 169.56 | 202.02 | 174.08 |
| Median value per relationship (£'000s) | 12.96 | 12.52 | 14.25 | 8.91 | 8.83 | 8.78 |
| Mean exporter per agent | 184 | 63.02 | 23.75 | 31.25 | 25.19 | 24.33 |
| Median exporter per agent | 24 | 7 | 4 | 4 | 4 | 3 |
| Mean agent per exporter | 4.13 | 2.05 | 2.08 | 2.13 | 1.74 | 1.90 |
| Median agent per exporter | 2 | 1 | 1 | 1 | 1 | 1 |

Notes: We include UK exports to non-EU countries in 2014 to show the distribution features. Data from other years have produced very similar results.

These asymmetries are reinforced when we examine relationship-level outcomes. Table 2 illustrates the concentration of trade using a snapshot of indirect exports in 2014. In column (1), the distribution of trader-agent relationship values is extremely skewed, with the mean relationship value nearly 30 times larger than the median for the full sample. This indicates that most trader-agent relationships are small in value, while a limited number of high-value relationships account for a disproportionate share of agent-handled trade.

Table 2 also shows that these concentration patterns are not driven by a single market. Columns (2)-(6) report statistics for the UK's top 5 non-EU export destinations—the United States, China, the United Arab Emirates, Hong Kong, and Singapore. Despite substantial differences in market size across destinations, trader-agent relationships are consistently skewed, with mean relationship values far exceeding medians in each market. The number of agents serving each destination also varies much less than the number of exporters. For example, while the number of exporters ranges from over 32,000 in the United States to about 10,000 in China, the number of agents serving these markets ranges more narrowly, from around 1,050 in the United States to about 850 in China. This pattern



(a) Fraction: agent numbers

(b) Fraction: trader numbers

Note: We include UK exports to non-EU countries in 2014. Data from other years have produced very similar results.

Figure 1: Relationship distribution: firm and agent

reinforces the presence of a small set of agents operating across multiple major markets.

Concentration is also evident in the connectivity of exporters and agents. On average, exporters engage with approximately 4 agents, while the median exporter works with only 2. The mean agent, however, handles 184 exporters, which is almost six times higher than the median value of 24 (column (1) of Table 2). These discrepancies underscore the role of a small number of large trading firms and dominant agents in shaping the market structure. Figure 1 plots the log-distributions of agents per exporter and exporters per agent. Both distributions exhibit long right tails, reflecting strong concentration on both sides of the market: a few exporters and agents are highly connected, while most firms use only one or two agents and most agents serve only a small number of clients.

Taken together, these patterns indicate that trader-agent relationships are characterized by two coexisting features: widespread reliance on agents and strong concentration of trade activity. While agent use is nearly universal among exporters, the bulk of agent-handled trade flows through a limited number of exporters, agents, and high-value relationships. This concentration provides an important backdrop for the analysis that follows, as it suggests substantial heterogeneity in how firms engage with agents and motivates closer examination of matching patterns and relationship dynamics.

2.2.2 Matching and network structure

We next examine how exporters and agents match with one another and how trader-agent relationships are organized within the broader network. We document two key features of the trader-agent network. First, trade value is dominated by many-to-many relationships, in which exporters and agents are connected through multiple overlapping partnerships rather than isolated bilateral matches. Second, matching patterns exhibit negative assortativity: highly connected exporters tend to work with both large and small agents, and highly connected agents serve exporters of varying sizes.

Table 3 summarizes the structure of trader-agent matches by classifying exporters and agents according to whether they maintain a single partner or multiple partners. In this classification, one-

Table 3: Trader-agent matching types

| Matching type | 2009 | | 2014 | | 2019 | |
|---------------|---------|-------------|---------|-------------|---------|-------------|
| | Count | Value share | Count | Value share | Count | Value share |
| 1-1 | - | - | 34 | 0.03 | 30 | 0.07 |
| 1-many | 33,525 | 3.90 | 32,954 | 3.99 | 38,566 | 8.41 |
| many-1 | 195 | 0.57 | 231 | 0.83 | 268 | 0.58 |
| many-many | 271,819 | 95.53 | 280,862 | 95.15 | 277,890 | 90.94 |
| <i>Total</i> | 305,539 | 100% | 314,081 | 100% | 316,754 | 100% |

Notes: We have selected UK exports to non-EU countries in 2009, 2014, and 2019 to show the changes in the match types. Data from other years have produced very similar results. Some values in the 2009 columns are suppressed to comply with data disclosure rules.

to-many relationships correspond to exporters that rely on a single agent who serves multiple exporters, whereas many-to-one relationships correspond to exporters that work with multiple agents. Many-to-many relationships arise when both exporters and agents maintain multiple partners. Across all years, trade is overwhelmingly organized through many-to-many relationships, with both exporters and agents engaging with multiple counterparties. In 2014, for instance, many-to-many matches account for more than 95% of total UK non-EU export value. One-to-many and many-to-one relationships are present but contribute only marginally to aggregate trade flows, while one-to-one matches are rare. This pattern is stable over time, indicating that agent-mediated trade is primarily conducted within dense networks of repeated and overlapping exporter-agent relationships.

A natural next question is how exporters and agents sort within these networks. In particular, do highly connected exporters tend to match with similarly well-connected agents, or do connections instead exhibit systematic asymmetries?

To address this question, we examine assortativity in trader-agent matching, focusing on a subsample in which each exporter is paired with its most dominant agent (in terms of trade value) in 2014, yielding 73,557 relationships. By definition, assortativity measures whether nodes with many connections tend to be matched with similarly well-connected partners or instead with partners that have relatively few connections.⁸

Figure 2 plots the log number of agents used by each exporter on the horizontal axis against the log number of exporters served by its dominant agent on the vertical axis.⁹ Each observation corresponds to an exporter-dominant agent pair. While the relationship is characterized by substantial dispersion, the fitted line indicates a modest negative association between exporter connectivity and agent connectivity. This pattern suggests negative assortativity on average: exporters that work with

⁸In social networks, positive assortativity arises when highly connected nodes tend to match with other highly connected nodes. Prior work on exporter-importer networks has instead documented negative assortativity, whereby exporters with many connections tend to be linked to importers with fewer connections, and vice versa (Bernard, Bøler and Dhingra, 2018; Bernard, Moxnes and Ulltveit-Moe, 2018).

⁹The figure is truncated at 45 agents per exporter, which explains the vertical boundary on the right-hand side of the graph.

a larger number of agents tend to be matched, on average, with agents that serve fewer exporters, whereas exporters with fewer agent relationships are more likely to rely on highly connected agents. At the same time, the wide dispersion around the fitted line indicates that matching is far from deterministic. Highly connected exporters engage with agents across the full connectivity distribution, rather than exclusively with small or less connected agents.¹⁰

While the above assortativity analysis focuses on pairwise matching between exporters and agents, it does not capture how trade values are distributed across the broader network. Figure 3 presents a Sankey diagram that visualizes trade flows between exporters and agents, grouping both sides into quintiles based on their total trade value. The width of each band represents the volume of trade flowing between exporter and agent size groups, with both entity sizes and trade flows shown on a logarithmic scale. The diagram highlights a strong concentration of trade among large exporters and agents. Exporters in the top size quintile account for the majority of total export value, with a substantial share of their trade flowing to agents in the top agent size group. At the same time, exporters in smaller size groups distribute their trade across a wider range of agent sizes, with no single agent group dominating their export flows. This visualization reinforces the earlier evidence that agent-mediated trade is organized through dense networks with substantial heterogeneity in the scale of relationships.

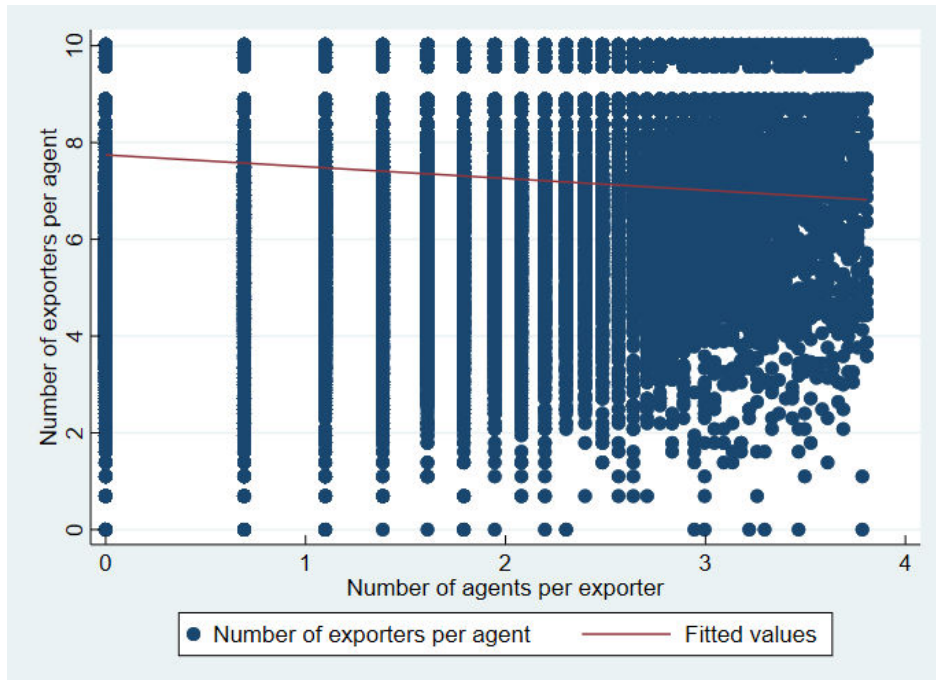
2.2.3 Relationship dynamics

To characterize the dynamics of trader-agent relationships, we begin by examining the duration of firm participation and the persistence of individual relationships. This step is important for assessing whether observed relationship lengths reflect genuine turnover rather than mechanical firm exit.

Table 4 reports summary statistics on firm activity and relationship duration. Exporters in our sample are active for an average of 8.8 years out of a possible 11, with more than half exporting in at least 11 years. In contrast, trader-agent relationships are considerably shorter lived. The average relationship lasts just over two years, and nearly half of all relationships exist for only a single year. Only about 1% of relationships persist throughout the entire sample period. Restricting attention to firms that export in at least six years yields very similar patterns, indicating that short relationship durations are not driven by firm exit. Overall, these statistics point to a setting in which exporters are relatively persistent, but the specific agents they use change frequently. Firms therefore appear to actively manage their agent portfolios over time rather than forming long-lived exclusive partnerships.

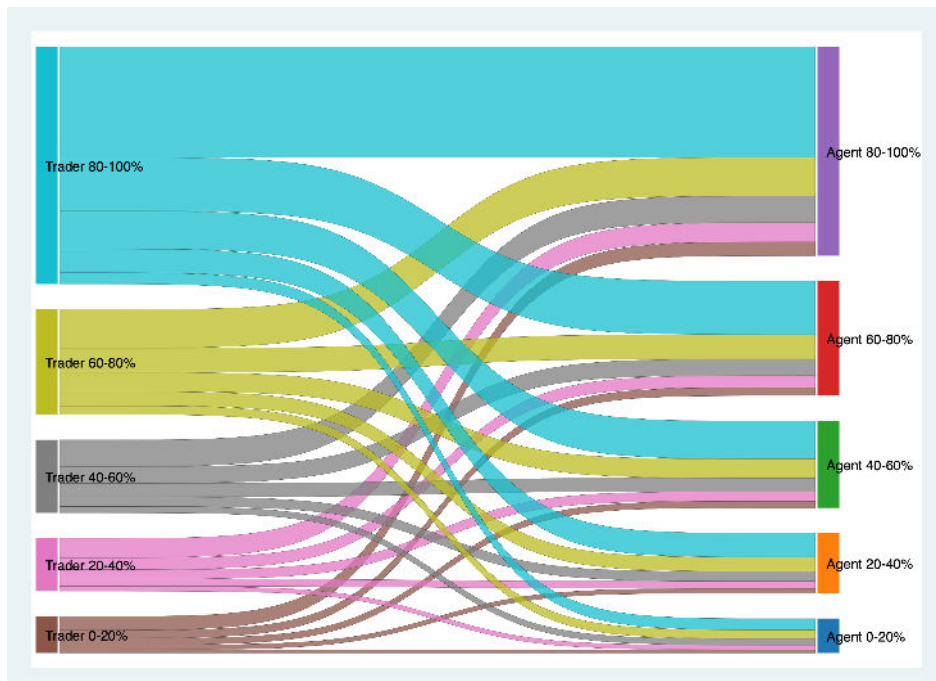
To shed further light on this process, Table 5 documents firms' decisions to add and drop agents over different horizons. We focus on firms that export continuously between 2009 and 2019 to abstract

¹⁰Negative assortativity between buyers and sellers is well documented in the trade literature, including evidence from Norwegian (Bernard, Moxnes and Ulltveit-Moe, 2018), Colombian (Bernard, Bøler and Dhingra, 2018), and Japanese (Bernard et al., 2019) export data. A common interpretation is that small firms are less likely to match profitably with other small firms, while larger firms can engage with partners of all sizes, in part because they sample more potential matches (Bernard and Zi, 2022).



Note: We include UK exports to non-EU countries in 2014. Data from other years have produced very similar results. The axes are in logs. A relationship represents an exporter and its dominant agent. There are 73,557 relationships in the figure. The vertical right edge is due to data censoring and does not affect our conclusion.

Figure 2: Assortativity between exporters and agents



Note: We include UK exports to non-EU countries in 2014. Data from other years have produced very similar results.

Figure 3: Sankey diagram: trade flows between exporters and agents

Table 4: Duration of firm activity and trader-agent relationships

| | Mean | sd | p25 | p50 | p75 |
|----------------------------------|------|-----|-----|-----|-----|
| Number of years a firm exports | 8.8 | 3.8 | 6 | 11 | 11 |
| Number of years an agent is used | 2.3 | 2.3 | 1 | 1 | 3 |

Notes: We include all relationships appearing between 2009 and 2019.

Table 5: Relationship dynamics: Adding and dropping of agents

| | <i>Within 1 year</i> | | <i>Within 3 years</i> | | <i>Within 5 years</i> | |
|-----------------------------|----------------------|------------|-----------------------|------------|-----------------------|------------|
| | <i>Drop</i> | <i>Add</i> | <i>Drop</i> | <i>Add</i> | <i>Drop</i> | <i>Add</i> |
| Share of relationships (%) | 42.8 | 42.3 | 56.8 | 57.9 | 67.2 | 65.9 |
| Share of firms involved (%) | 34.3 | 37.4 | 37.4 | 37.7 | 40.7 | 40.2 |
| Trade value share (%) | 7.4 | 7.9 | 20.8 | 21.1 | 32.5 | 33.6 |

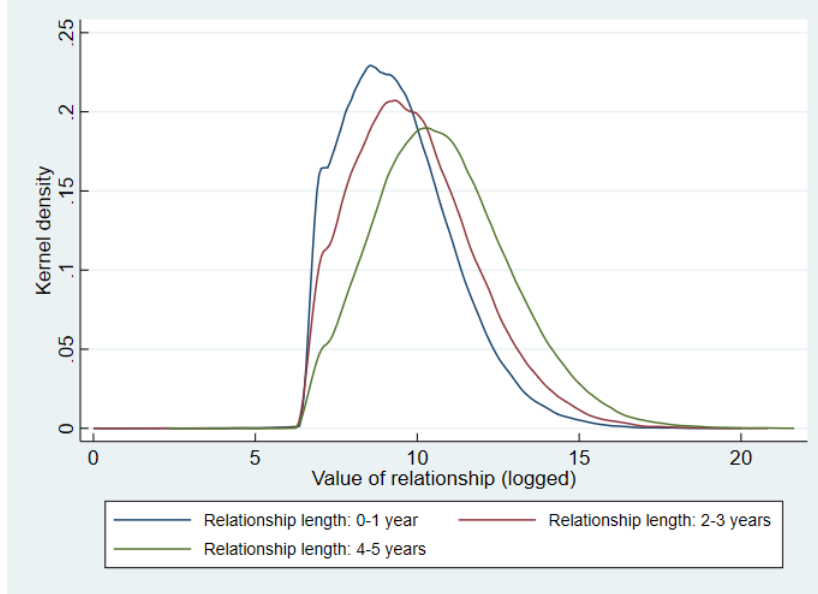
Notes: We include firms with positive exports in all years between 2009 and 2019. We set the year 2014 as t_0 and capture the dynamics of the relationships during 1-year, 3-year, and 5-year intervals.

from firm exit, set 2014 as the reference year (t_0), and track relationship changes over one-, three-, and five-year intervals. For dropped relationships, trade shares are computed using 2014 values; for added relationships, trade shares are computed using trade values in subsequent years.

At t_0 , 73,439 exporters maintain 232,983 active relationships with agents. Within one year, nearly one-third of these firms drop close to 100,000 relationships. Although these dropped relationships account for 42.8% of all relationships, they represent only 7.4% of total trade value in 2014, indicating that low-value relationships are disproportionately likely to be terminated. Relationship turnover continues over longer horizons: within three years, more than half of the original relationships have ended, accounting for about 21% of trade value, while after five years 67.2% of relationships have dissolved, corresponding to 32.5% of trade value. Larger and more valuable relationships therefore exhibit substantially greater persistence.

The pattern for adding agents closely mirrors that for dropping them. Within one year, firms form nearly as many new relationships as they terminate, and the number of firms adding agents is almost identical to the number dropping them. This symmetry underscores the dynamic nature of agent use: exporters frequently replace agents rather than simply shrinking or expanding their overall level of intermediation.

Figure 4 further illustrates the relationship between relationship value and persistence. Grouping relationships by duration shows that longer-lasting relationships are systematically associated with higher trade values, with the entire distribution shifting to the right as relationship length increases. This pattern reinforces the interpretation that firms experiment with agents through many short-lived, low-value relationships while maintaining a smaller set of high-value relationships over time.



Note: We include firm-agent combinations with positive exports to non-EU destinations in 2014. Firms included have positive exports in all years between 2014 and 2019 so that relationships are not dropped due to firm exits. There are 70,171 firms included in the figure. The number of relationships in each curve is in Table 5. Data of other years yield very similar results.

Figure 4: Relationship value and relationship length

3 Empirical Analysis: Exploration, Specialization, and Agent Use

This section examines how firms' export expansion activities are associated with their use of agents. We focus on the role of firm experience and agent specialization in shaping both the extensive and intensive margins of trader-agent relationships. The analysis distinguishes between *exploration*, when firms enter new markets or introduce new products, and *exploitation*, when firms operate in areas where agents have established expertise.

3.1 Baseline specification and results

We examine the relationship between firms' export expansion activities and agent use using the following specification:

$$y_{ijct} = \alpha_0 + \alpha_1 \text{NewMarket}_{ict} + \alpha_2 \text{NewProduct}_{ijt} + \alpha_3 \text{TopMarket}_{ict} + \alpha_4 \text{TopProduct}_{ij't} + \alpha_5 \text{Size}_{i,t-1} + \delta_{ij'} + \omega_{ct} + \epsilon_{ijct} \quad (1)$$

where i denotes firms, j products (8-digit HS), c destinations, and t years. The outcome variable y_{ijct} captures three distinct dimensions of agent use: (i) D_{ijct}^{Agent} , an indicator equal to one if firm i uses an agent when exporting product j to destination c in year t ; (ii) AgentSize_{ijct} is the log of the average size of agents employed for a given product-destination pair in a given year, proxied by agents' total

export value; (iii) $RValue_{ict}$ denotes the log relationship value, defined as the average export value handled by all agents connected to firm i for a given product-destination pair in a given year.

The first two explanatory variables proxy firms' exploration activities. $NewMarket_{ict}$ equals one if destination c is new to the firm, and $NewProduct_{ijt}$ equals one if product j is newly exported by the firm. In both cases, "new" is defined as not appearing in the firm's export portfolio in the previous two years.¹¹ We also capture the exploitation of agent expertise with $TopMarket_{ict}$ and $TopProduct_{ij't}$. These variables equal one if the market or product corresponds to the firm's dominant agent's top-ranked market or operating industry j' (4-digit HS) across its entire client portfolio in year t , and zero otherwise.¹²

We also include country-year fixed effects, which absorb destination-specific demand shocks and other time-varying country characteristics such as macroeconomic conditions, and firm-industry (4-digit HS) fixed effects, which control for time-invariant firm-product characteristics such as baseline product quality, technology, and industry-specific regulatory or compliance requirements. In addition, we control for firm size using lagged export value. Standard errors are clustered at the firm-year level.

Table 6 reports baseline estimates linking firm experience and agent specialization to agent use along the extensive and intensive margins. Columns (1)-(3) correspond respectively to the probability of using an agent, average agent size, and average relationship value. Two main findings emerge.

First, firm exploration is associated with a higher likelihood of agent use but smaller and lower-value relationships. The first two rows of Table 6 show that entering a new market or exporting a new product is associated with a higher likelihood of agent use. As reported in column (1) of Table 6, the coefficients on $NewMarket_{ict}$ and $NewProduct_{ijt}$ are both positive and statistically significant, consistent with firms being more likely to rely on agents when exploring unfamiliar destinations or products. However, columns (2) and (3) reveal a contrasting pattern along the intensive margin: exploration is associated with smaller agents and significantly lower relationship values. This suggests that firms use agents to facilitate exploration but initially engage smaller intermediaries and commit limited trade volumes.

Second, agent specialization (exploitation) is associated with deeper relationships rather than broader agent use. Rows three and four examine the role of agent expertise. Exporting to an agent's top market is associated with a higher probability of agent use in column (1) of Table 6, whereas operating in an agent's top product does not significantly affect the extensive margin. In contrast, columns (2) and (3) show that both specialization measures are strongly related to the depth of relationships: agent size declines sharply, while relationship value increases substantially. These results are consis-

¹¹Because exploration measures and agent-use outcomes are observed within the same year, the estimates should be interpreted as contemporaneous associations rather than causal effects. Agent use may both facilitate and accompany firms' expansion into new products and destinations.

¹²A firm's dominant agent is defined as the agent with the highest trade value at the product-destination-year level. The majority of firms employ only one agent at this level. In robustness checks, we show that our results are robust to relaxing this definition to allow the agent's top three markets or industries.

Table 6: Patterns of agent use: exploration and exploitation

| Outcome variable | (1) D_{ijct}^{Agent} | (2) $AgentSize_{ijct}$ | (3) $RValue_{ijct}$ |
|-----------------------------------|---------------------------|---------------------------|------------------------|
| $NewMarket_{ict}$ | 0.0005** (0.0002) | -0.0625*** (0.0059) | -0.2591*** (0.0030) |
| $NewProduct_{ijt}$ | 0.0008*** (0.0001) | -0.0343*** (0.0028) | -0.2705*** (0.0022) |
| $TopMarket_{ict}$ | 0.0006** (0.0002) | -1.1138*** (0.0085) | 0.2526*** (0.0045) |
| $TopProduct_{ijt}$ | 0.0007 (0.0005) | -0.9937*** (0.0126) | 0.4417*** (0.0091) |
| $Size_{i,t-1}$ | -0.0007** (0.0002) | 0.0242*** (0.0037) | 0.0343*** (0.0024) |
| Country-year fixed effects | Yes | Yes | Yes |
| Firm-industry (HS4) fixed effects | Yes | Yes | Yes |
| Observations | 9,363,733 | 9,363,733 | 9,363,733 |
| R^2 | 0.3032 | 0.4969 | 0.4317 |

Notes: Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1% and 5% significance level respectively. The estimation sample excludes 2009 due to the inclusion of the lagged firm-size control, which requires data from the previous year.

tent with firms deepening trade relationships with specialized agents, rather than by expanding the number or scale of intermediaries they employ.

Overall, these results reveal a clear exploration-exploitation pattern in firms' use of agents. Exploration through new markets or products is primarily associated with changes along the extensive margin and involves smaller, lower-value relationships, whereas exploitation of agent expertise is reflected in higher relationship values concentrated among smaller agents. In terms of magnitudes, the effects on the extensive margin are modest, while adjustments in agent composition are economically meaningful. Entering a new market or introducing a new product increases the probability of using an agent by about 0.05-0.08 percentage points, a non-trivial effect given the already high baseline prevalence of agent use and the fact that firms often enter multiple new products or destinations in a given year. At the same time, exploration is associated with smaller agents: entering a new market reduces average agent size by roughly 6.3%, while introducing a new product lowers it by about 3.4%. By contrast, exploiting agent expertise is associated with much larger shifts in agent composition. Exporting to an agent's top market or top product is associated with roughly a 63-67% reduction in average agent size (based on log-point changes of -1.11 and -0.99, respectively).

Finally, Table 6 shows that firm size plays a distinct conditioning role across margins. On average, larger firms are slightly less likely to use agents, but when they do, they tend to work with larger agents and maintain higher-value relationships. This is consistent with larger firms having greater internal capacity while still forming more intensive partnerships with agents when intermediation is used.¹³

¹³Importantly, this result does not contradict the negative assortativity documented in Section 2.2.2. The

Table 7: Agent use: Developed vs developing countries

| Outcome variable | Developed | | | Developing | | |
|--------------------|---------------------------|---------------------------|------------------------|---------------------------|---------------------------|------------------------|
| | (1) D_{ijct}^{Agent} | (2) $AgentSize_{ijct}$ | (3) $RValue_{ijct}$ | (4) D_{ijct}^{Agent} | (5) $AgentSize_{ijct}$ | (6) $RValue_{ijct}$ |
| $NewMarket_{ict}$ | -0.0002 (0.0003) | -0.0463*** (0.0062) | -0.2503*** (0.0044) | 0.0009*** (0.0002) | -0.0688*** (0.0060) | -0.2404*** (0.0033) |
| $NewProduct_{ijt}$ | 0.0008*** (0.0002) | -0.0268*** (0.0030) | -0.3417*** (0.0027) | 0.0008*** (0.0001) | -0.0509*** (0.0040) | -0.2114*** (0.0029) |
| $TopMarket_{ict}$ | 0.0004 (0.0003) | -0.6896*** (0.0087) | 0.2094*** (0.0060) | 0.0011** (0.0003) | -1.6843*** (0.0118) | 0.2951*** (0.0061) |
| $TopProduct_{ijt}$ | -0.0009 (0.0006) | -0.8761*** (0.0117) | 0.4685*** (0.0106) | 0.0018** (0.0007) | -1.0173*** (0.0170) | 0.4107*** (0.0104) |
| $Size_{i,t-1}$ | -0.0008** (0.0003) | 0.0206*** (0.0039) | 0.0398*** (0.0032) | -0.0006** (0.0002) | 0.0305*** (0.0051) | 0.0318*** (0.0025) |
| Country-year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-industry FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,478,395 | 4,478,395 | 4,478,395 | 4,885,338 | 4,885,338 | 4,885,338 |
| R^2 | 0.3511 | 0.5119 | 0.4683 | 0.2988 | 0.5127 | 0.4470 |

Notes: Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1% and 5% significance level respectively. Developed countries are defined according to the IMF World Economic Outlook.

3.2 Heterogeneity across destinations and product types

The baseline results establish a clear exploration-exploitation pattern in firms' use of agents. We next examine whether this pattern varies systematically across destination markets and product types, focusing on differences between developed and developing destinations and across BEC product categories.

Developed versus developing countries

We first estimate our baseline specification separately for developed and developing destinations, where differences in institutional quality, regulatory complexity, and information frictions are likely to shape both the demand for intermediation and the way firms organize relationships with agents. Table 7 reports the corresponding estimates, based on the IMF World Economic Outlook classification, and the key findings are summarized below.

We begin by interpreting the exploration variables. First, the role of agents on the extensive margin is markedly stronger in developing destinations than in developed destinations, as shown in columns (1) and (4). Entering a new market does not significantly increase the likelihood of agent use in developed countries, suggesting that firms' familiarity with these destinations reduces the need

assortativity analysis is conducted at the firm-agent matching level, whereas results in Table 6 are estimated at the firm-product-destination level and capture how trade is allocated across existing relationships. Larger firms do not systematically match only with large agents; instead, they allocate greater volumes to agent-mediated trade at specific product-destination pairs, including through larger agents.

for agents to facilitate market entry. In contrast, entry into new markets in developing destinations is associated with a significant increase in agent use, indicating that agents play a more central role when firms lack destination-specific experience and face greater uncertainty. By comparison, exploration through new products exhibits a more uniform pattern across destination groups, increasing the probability of agent use in both developed and developing markets. This suggests that product-level experimentation generates informational and compliance needs even in otherwise familiar destinations. We find no significant differences between the two destination groups along the intensive margins.

Turning to the exploitation variables, agent specialization plays a more prominent role along the extensive margin in developing destinations: exporting to an agent's top market or product significantly raises the probability of agent use, while the corresponding effects are not significant in developed markets, consistent with greater reliance on agents with destination- or product-specific expertise in higher-uncertainty environments.

Along the intensive margin, the effects of exploitation through agent specialization are qualitatively similar across destination groups. In both developed and developing markets, exporting to an agent's top market or top product is associated with higher relationship values and smaller average agent size, consistent with firms deepening trade with agents that have more targeted market or product expertise. However, the magnitude of these effects differs systematically across destinations. In particular, the reduction in average agent size associated with agent specialization is substantially larger in developing markets, suggesting that firms rely more heavily on smaller agents when trading in markets or products aligned with agents' existing specialization in institutionally less familiar environments.

In summary, the main contrast across destinations emerges along the extensive margin for both exploration and exploitation. In developing destinations, entering new markets and exploiting agent specialization—through an agent's top market or top product—both significantly increase the likelihood of agent use, indicating that agents are central to initiating and organizing export activity in less familiar environments. In developed destinations, by contrast, neither new market entry nor agent specialization plays a comparable role at the extensive margin, consistent with accumulated exporter experience substituting for intermediation. This contrast highlights that agent use on the extensive margin is driven jointly by exploration and exploitation only where destination-specific uncertainty remains high.

Product heterogeneity

Table 8 reports results by product type, distinguishing between consumption goods (columns 1–3), intermediate inputs (columns 4–6), and capital goods (columns 7–9), as defined by the Broad Economic Categories (BEC) classification. As with destination heterogeneity, differences across product types primarily emerge along the extensive margin, while intensive-margin patterns remain qualitatively similar.

Along the extensive margin, product-level exploration plays the dominant role. Introducing a new

Table 8: Agent use by product type

| Outcome variable | Consumption | | | Intermediate | | | Capital | | |
|--------------------|----------------------|------------------------|------------------------|-----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| | D_{ijt}^{Agent} | $AgentSize_{ijt}$ | $RValue_{ijt}$ | D_{ijt}^{Agent} | $AgentSize_{ijt}$ | $RValue_{ijt}$ | D_{ijt}^{Agent} | $AgentSize_{ijt}$ | $RValue_{ijt}$ |
| $NewMarket_{ict}$ | 0.0008 (0.0006) | -0.0429*** (0.0104) | -0.2715*** (0.0063) | 0.0004* (0.0002) | -0.0704*** (0.0064) | -0.3093*** (0.0039) | 0.0001 (0.0002) | -0.0563*** (0.0070) | -0.1798*** (0.0043) |
| $NewProduct_{ijt}$ | 0.0013** (0.0004) | -0.0163** (0.0061) | -0.2847*** (0.0054) | 0.0005*** (0.0001) | -0.0433*** (0.0035) | -0.2573*** (0.0026) | 0.0004** (0.0001) | -0.0253*** (0.0048) | -0.2386*** (0.0039) |
| $TopMarket_{ict}$ | 0.0015** (0.0005) | -1.1585*** (0.0169) | 0.2056*** (0.0078) | 0.0002 (0.0002) | -1.0928*** (0.0097) | 0.2525*** (0.0053) | 0.0005 (0.0003) | -1.1172*** (0.0108) | 0.2748*** (0.0067) |
| $TopProduct_{ijt}$ | -0.0041* (0.0011) | -1.2054*** (0.0235) | 0.0101*** (0.0164) | 0.0001 (0.0005) | -1.0342*** (0.0171) | 0.5510*** (0.0130) | 0.0017* (0.0007) | -1.0280*** (0.0148) | 0.4287*** (0.0103) |
| $Size_{i,t-1}$ | -0.0016* (0.0007) | 0.0432*** (0.0075) | 0.0352*** (0.0054) | -0.0004* (0.0002) | 0.0194*** (0.0045) | 0.0360*** (0.0027) | -0.0000 (0.0001) | 0.0151** (0.0049) | 0.0324*** (0.0034) |
| Country-year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-industry FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,087,171 | 2,087,171 | 2,087,171 | 4,393,284 | 4,393,284 | 4,393,284 | 1,928,647 | 1,928,647 | 1,928,647 |
| R^2 | 0.3885 | 0.5185 | 0.4529 | 0.2345 | 0.4940 | 0.4266 | 0.2724 | 0.4970 | 0.4407 |

Notes: Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1% and 5% significance level respectively. 875,883 observations are not classified by BEC.

product significantly increases the probability of agent use across consumption, intermediate, and capital goods. In contrast, entry into a new market does not have a robust effect on the likelihood of using an agent. Exploitation through agent specialization shows more limited extensive-margin effects: exporting to an agent’s top market increases agent use primarily for consumption goods, while top-product specialization does not yield consistent effects across categories. Overall, the extensive-margin evidence suggests that agent use is more strongly linked to product-level experimentation than to geographic expansion.

By contrast, along the intensive margin, the exploration-exploitation pattern is qualitatively similar across all product types. Exploration is associated with smaller agents and lower relationship values, while exploitation through agent specialization is associated with higher relationship values and smaller average agent size in both cases, with differences across product types largely reflected in magnitudes rather than signs.

3.3 Robustness and further analysis

Appendix B reports a series of robustness checks that support our main conclusions. We consider (i) alternative fixed-effects specifications and relaxations of the definitions of agents’ top markets and products; (ii) additional heterogeneity across sectors and firm size; and (iii) alternative subsamples, including top trading partners and shorter periods. Across all specifications, the baseline exploration–exploitation pattern remains qualitatively robust.

Finally, the heterogeneity analysis across destinations and product types highlights that both destination- and product-specific characteristics shape firms’ use of agents, beyond firm experience and agent specialization. We also examine how destination and product characteristics are associated with agent use. In particular, we include measures of market size, geographic distance, and cultural ties alongside product features, distinguishing between homogeneous and differentiated goods and between intermediate, consumption, and capital goods.¹⁴ Results are presented in Appendix C.

4 Trade Policy Uncertainty and Agent Use

In this section, we examine how heightened trade policy uncertainty surrounding Brexit affected firms’ use of customs agents in non-EU export transactions. We compare changes in trader–agent relationship characteristics before and after the 2016 referendum, contrasting firms with high versus low pre-referendum exposure to EU trade. To do so, we first estimate difference-in-differences effects of the referendum and then present event-study evidence to assess dynamics and support the identification strategy. A key data constraint is that agent identifiers are not available for EU transactions. We therefore measure each firm’s pre-referendum *EU trade intensity* using matched export records from the EU’s Intrastat system. We define 2013–2015 as the pre-referendum period and 2017–2019 as

¹⁴Product differentiation follows the Rauch (1999) classification, and end-use categories are based on the Broad Economic Categories (BEC) classification.

the post-referendum period, excluding 2016 as a transition year.

Although Brexit directly altered trading conditions between the UK and the EU, it also generated broader trade policy uncertainty affecting firms' foreign operations. In addition to increasing the likelihood of trade diversion away from EU markets, Brexit created uncertainty about the continuity of market access to non-EU destinations previously covered by EU-wide agreements, as well as about future regulatory and customs requirements.¹⁵ Even in markets not immediately subject to new trade barriers, firms faced greater uncertainty about trading conditions. This environment raises the informational and administrative costs of exporting and increases the value of specialized intermediation. We therefore hypothesize that firms more exposed to EU trade respond by reorganizing their export intermediation structure, including in non-EU markets, using agents as an adjustment margin.

To identify how agent use responds to this uncertainty shock, we estimate a difference-in-differences (DiD) specification that compares changes in outcomes for high- and low-EU-exposure firms before and after the referendum:

$$y_{ict} = \theta_0 + \theta_1 Post + \theta_2 HighEU_i + \theta_3 (Post \times HighEU_i) + \delta_{ic} + \omega_t + \varepsilon_{ict}, \quad (2)$$

where *Post* indicates the post-referendum period (2017–2019), and *HighEU_i* identifies firms whose share of EU exports in total exports is above the sample average in the pre-referendum period (2013–2015).¹⁶ The outcome variable *y_{ict}* (in logs) captures three dimensions of a firm's use of agents in destination *c* and year *t*: (i) *NumAgent_{ict}*, the number of agents employed by firm *i*; (ii) *AgentSize_{ict}*, the average size of the agents used; and (iii) *RValue_{ict}*, the average relationship value, with (ii) and (iii) defined as in Specification (1). We include firm-country fixed effects δ_{ic} and year fixed effects ω_t .

We restrict the sample to firms with positive exports in at least one year in both the pre- and post-referendum periods to limit compositional changes from entry and exit. We also exclude firms with zero pre-referendum EU exposure, as these firms are unlikely to be affected by Brexit through the EU trade channel that defines our treatment.¹⁷ We exclude 2016 as a transition year, although results are similar when it is included in the post period.

Table 9 reports the results. Two findings stand out. First, in the post-referendum period, firms adjust along both the *breadth* (extensive margin) and *depth* (intensive margin) of their agent relationships. Both groups reduce the number of agents used, but the decline is substantially smaller for high-exposure firms: low-exposure firms reduce their agent count by about 3.7 percent ($= (e^{-0.0378} - 1) \times 100\%$), whereas the decline for high-exposure firms is only about 1.2 percent (column (1)). At the same time, both groups shift toward larger agents, with average agent size increasing by about

¹⁵For arguments that Brexit may increase non-EU trade through trade reversion whereby firms seek alternative trading partners outside the European Union rather than experiencing pure trade destruction, see, for instance, Bootle et al. (2018) and Portes (2022).

¹⁶Using the sample median instead of the mean yields qualitatively similar results.

¹⁷These are firms that did not export to the EU during the 2013–2015 pre-referendum period. The results remain qualitatively similar when firms with zero EU exposure are included. These results are available upon request.

Table 9: Brexit and changes in firms' use of customs agents

| | (1) <i>NumAgent_{ict}</i> | (2) <i>AgentSize_{ict}</i> | (3) <i>RValue_{ict}</i> |
|------------------------------------|--------------------------------------|---------------------------------------|------------------------------------|
| $(POST = 1) \times (HighEU_i = 0)$ | -0.0378*** (0.0046) | 0.1704*** (0.0106) | 0.0187 (0.0101) |
| $(POST = 1) \times (HighEU_i = 1)$ | -0.0123** (0.0045) | 0.2007*** (0.0121) | 0.0990*** (0.0105) |
| Firm-country fixed effects | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes |
| Observations | 1,223,805 | 1,223,805 | 1,223,805 |
| R^2 | 0.7303 | 0.8660 | 0.8110 |

Note: Standard errors are clustered at the firm level. ***, **, and * denote 0.1%, 1% and 5% significance level respectively.

18.6 percent ($= (e^{0.1704} - 1) \times 100\%$) for low-exposure firms and 22.2 percent ($= (e^{0.2007} - 1) \times 100\%$) for high-exposure firms (column (2)). Second, high-exposure firms experience a substantial rise in average relationship value of about 10.4 percent, while the corresponding change for low-exposure firms is small and statistically insignificant (column (3)). Overall, these results indicate that firms respond to heightened trade policy uncertainty by consolidating their intermediary networks and reallocating activity toward larger, more valuable relationships.

To assess dynamics and support the identification strategy, we present event-study estimates based on a two-way fixed effects specification with firm–country and year fixed effects:

$$y_{ict} = \delta_{ic} + \omega_t + \sum_{k \neq -1} \beta_k \left(HighEU_i \times \mathbf{1}\{Year_t = t\} \right) + \varepsilon_{ict}. \quad (3)$$

Figure 5 plots the year-specific coefficients on the interaction between $HighEU_i$ and year indicators, with 2015 as the omitted reference year, using the same sample and clustering as in the baseline DiD (Equation 2). The dots correspond to point estimates, the vertical bars denote the associated confidence intervals, and the dashed vertical line marks the omitted reference year (2015).

The pre-referendum coefficients are close to zero and statistically insignificant across all outcomes, providing supportive evidence against differential pre-trends. Following the referendum, we observe a discrete and persistent increase in agent size and relationship value for high-exposure firms, alongside a smaller but positive shift in the number of agents. These dynamics closely mirror the DiD results and indicate that firms adjust their intermediation structure in response to the rise in trade policy uncertainty.

Overall, the DiD and event-study evidence indicates that Brexit operates as a broad-based shock to trade-policy risk that extends beyond EU markets. Firms more exposed to EU trade reorganize their intermediary networks even in third-country markets, shifting toward a smaller contraction in agent breadth and greater relationship depth. This pattern underscores the role of intermediaries



Note: The dots represent the estimated coefficients for the interaction terms $\text{HighEU}_i \times \mathbf{1}\{\text{Year}_t = t\}$, and the vertical lines represent the corresponding confidence intervals.

Figure 5: Event-study evidence on Brexit and agent use

as a key adjustment margin through which firms manage trade-policy risk in their broader export activities.

5 Conclusion

This paper studies the role of customs agents in organizing international trade. We show that agent-mediated trade is not a marginal phenomenon but a central and structured component of cross-border activity. Trader-agent relationships are concentrated yet dynamic, with firms actively managing portfolios of intermediaries rather than relying on stable, exclusive ties. These patterns reveal an intermediary layer that shapes how trade is conducted within borders.

Our analysis further indicates that firms use customs agents strategically. Agent relationships expand during market and product exploration and deepen when firms exploit specialized expertise. Most importantly, we show that these relationships adjust in response to trade policy uncertainty. Following the Brexit referendum, firms more exposed to EU markets reorganized their reliance on customs agents, highlighting intermediation as a mechanism through which firms manage regulatory risk.

Our results suggest that intermediary relationships form part of the institutional infrastructure

of trade. When policy regimes change or uncertainty rises, adjustment does not occur solely through prices, entry, or exit, but also through the reorganization of intermediary networks. Recognizing this organizational margin broadens our understanding of how firms respond to trade frictions and how trade resilience is shaped.

These findings have important implications for trade policy and trade facilitation. Efforts to reduce trade frictions typically focus on simplifying procedures or lowering formal barriers. Our results suggest that facilitation also depends on the availability and capacity of customs intermediaries who translate regulatory requirements into workable compliance for firms. The customs agent market therefore constitutes an important channel through which trade facilitation operates in practice, particularly for smaller firms that lack in-house expertise. Strengthening trade resilience may require attention not only to border rules themselves, but also to the intermediary ecosystem that enables firms to navigate them. More broadly, our results suggest that trade resilience depends in part on the flexibility of intermediary networks when regulatory environments change.

This study also has limitations. Our analysis focuses on transaction-level trade data and does not observe firms' internal organization or financial outcomes. In addition, while our analysis emphasizes firms' use of agents, we do not observe agent pricing, capacity constraints, or contracting decisions. As a result, some observed matching patterns may also reflect supply-side selection by agents. Future research could examine how intermediary capacity evolves following the full implementation of post-Brexit trade arrangements, including the UK-EU Trade and Cooperation Agreement (TCA), and whether similar adjustment mechanisms operate in other institutional settings. As compulsory customs reporting now extends to UK-EU trade, newly available data may allow for a more comprehensive assessment of how intermediary relationships shape trade dynamics under changing regulatory regimes.

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Appendix

A Supplementary Stylized Facts

This appendix presents supplementary descriptive evidence that complements the main analysis but is not central to the core results. Section A.1 reports summary patterns of agent use by year, sector, and destination. Section A.2 documents additional correlations between firm size and agent use, as well as the scale of trader-agent relationships. Section A.3 provides descriptive evidence on how destination market size and geographic distance are associated with agent use across export markets.

A.1 Agent use by year, sector and destination

Table A1 reports summary statistics on the prevalence of agent use across years, sectors, and destination groups in the baseline sample. The agent share is defined as the share of export value handled by agents. Agent use is high throughout the sample period, averaging above 85% in all years between 2010 and 2019, with no strong time trend. This stability suggests that the widespread use of agents is a persistent feature of UK non-EU exports rather than a transitory response to short-run shocks.

There is, however, substantial heterogeneity across sectors and destinations. Agent use is lowest in food- and agriculture-related sectors, particularly beverages and tobacco (SITC 1), where fewer than half of export observations involve agents, and is highest in manufacturing-intensive sectors such as chemicals (SITC 5) and manufactured goods classified chiefly by material (SITC 6), where agent shares exceed 95%. Across destinations, agent use is especially high for exports to the U.S. and Europe (excluding the EC), while it is notably lower for exports to China. These differences underscore the importance of sector- and destination-specific factors in shaping firms' reliance on intermediaries.

Table A1: Agent use by year, sector, and destination

| Year | Agent share (%) | Sector | Agent share (%) | Destination | Agent share (%) |
|------|-----------------|--------|-----------------|-------------------|-----------------|
| 2010 | 87.81 | SITC0 | 78.15 | The U.S. | 90.52 |
| 2011 | 88.43 | SITC1 | 46.40 | Europe (excl. EC) | 90.52 |
| 2012 | 87.33 | SITC2 | 86.12 | Other America | 83.96 |
| 2013 | 86.94 | SITC3 | 91.27 | China | 72.97 |
| 2014 | 85.56 | SITC4 | 97.95 | East and SE Asia | 89.82 |
| 2015 | 86.12 | SITC5 | 98.38 | All other | 89.10 |
| 2016 | 84.79 | SITC6 | 96.45 | | |
| 2017 | 85.78 | SITC7 | 80.10 | | |
| 2018 | 85.08 | SITC8 | 93.71 | | |
| 2019 | 87.43 | | | | |

Notes: Agent share by sector and destination is calculated based on the sample between 2010 and 2019. Sectors are defined using SITC Rev.3 categories: SITC 0 (Food and live animals), SITC 1 (Beverages and tobacco), SITC 2 (Crude materials, inedible, except fuels), SITC 3 (Mineral fuels, lubricants and related materials), SITC 4 (Animal and vegetable oils, fats and waxes), SITC 5 (Chemicals and related products), SITC 6 (Manufactured goods classified chiefly by material), SITC 7 (Machinery and transport equipment), and SITC 8 (Miscellaneous manufactured articles).

A.2 Firm size and agent use

This subsection provides additional descriptive evidence on how firm size relates to the use and scale of agent relationships. Figure A1 illustrates the relationship between firm size and agent use. The vertical axis reports the number of agents used by each exporter, while the horizontal axis shows logged total firm exports. The figure is based on 70,171 firms exporting to non-EU destinations in 2014.¹ The fitted line indicates a positive association between firm size and the number of agents used. Larger exporters tend to work with a greater number of agents, while smaller exporters are more likely to rely on a limited number of intermediaries. The clustering of observations along the $y = 1$ line highlights the prevalence of exporters working with a single agent.

While Figure A1 focuses on the extensive margin of agent use, Figure A2 provides complementary evidence on the intensive margin, examining how the value of trader-agent relationships varies with firm size. Firms are grouped into quartiles based on total exports, and the figure plots the distribution of average per-agent export values within each size group. The box plots show that relationship values increase systematically with firm size: exporters in higher size quartiles exhibit higher median per-agent trade values and greater dispersion. This pattern indicates substantial heterogeneity in the scale of agent relationships among large exporters, while smaller exporters tend to maintain lower-value and more tightly clustered relationships.

Overall, these figures document systematic correlations between firm size, the number of agents used, and the scale of trader-agent relationships, highlighting substantial heterogeneity in how firms engage with intermediaries.

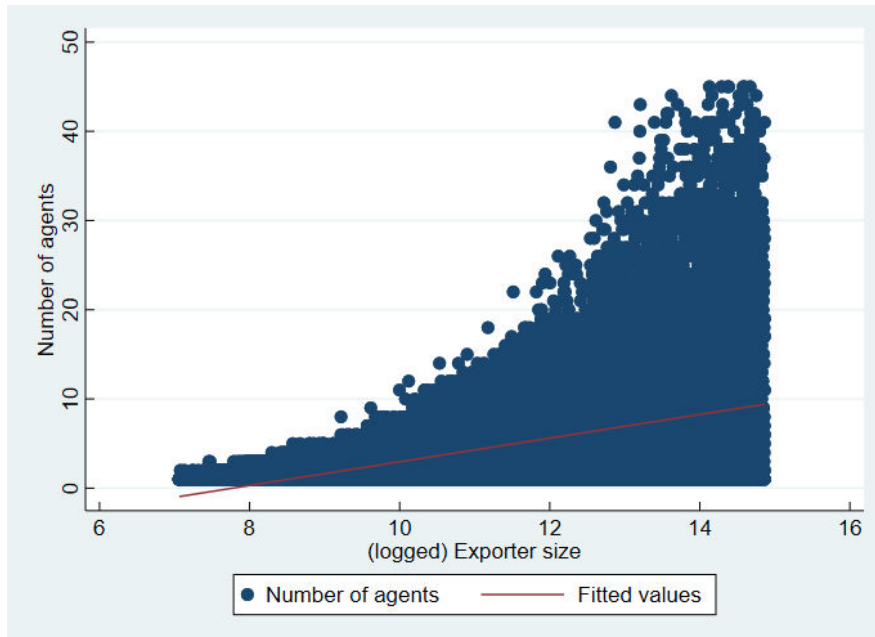
A.3 Market size, distance, and agent use

Figure A3 presents evidence on how destination market size and geographic distance are associated with the use of agents across export markets. Focusing on UK exports to 145 non-EU destinations in 2014, we relate standard measures of agent use—the total number of agents operating in a market, the average size of agents (proxied by trade value), and the average number of agents used per exporter—to destination GDP and distance.² The figures are intended to illustrate broad correlations rather than estimate causal gravity relationships.

Panels A3a-A3c plot these measures against destination market size, proxied by logged GDP. The figures show a positive association between market size and both the total number of agents and the average number of agents used per exporter. In contrast, the average size of agents exhibits a negative association with market size, indicating that markets with larger aggregate demand tend to host a larger number of relatively smaller agents.

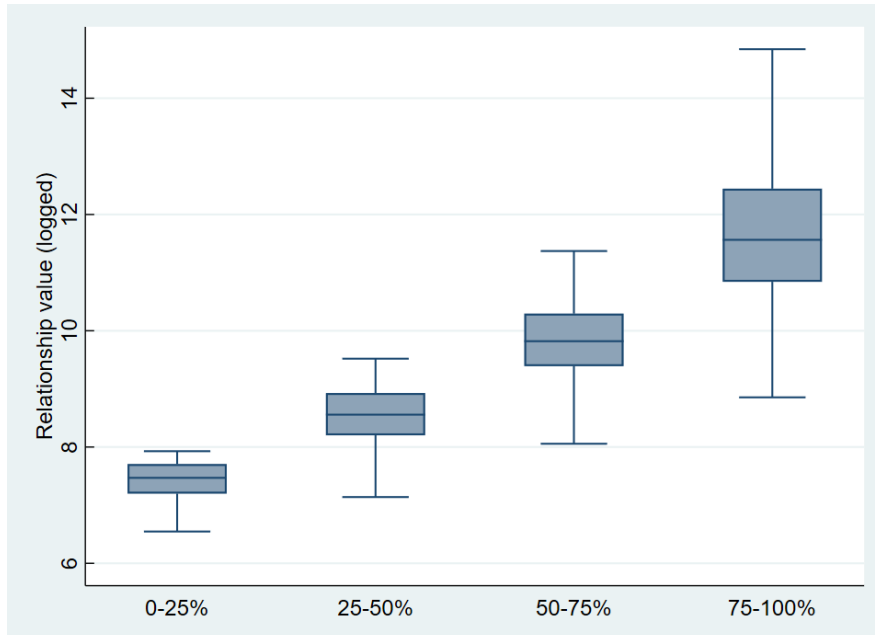
¹Due to data disclosure restrictions, the figure excludes firms in the top and bottom 5% of the size distribution and firms with more than 45 agents, which explains the vertical boundary on the right-hand side of the graph.

²Destinations with insufficient observations are excluded due to disclosure requirements; over 90% of the sample remains.



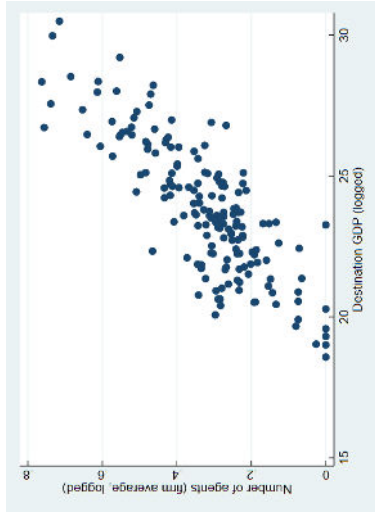
Note: We include firms exporting to non-EU destinations in 2014. Data of other years yield very similar patterns. There are 70,171 firms included in the figure. The vertical right edge is due to data censoring and does not affect our conclusion.

Figure A1: Log exports and the number of agents

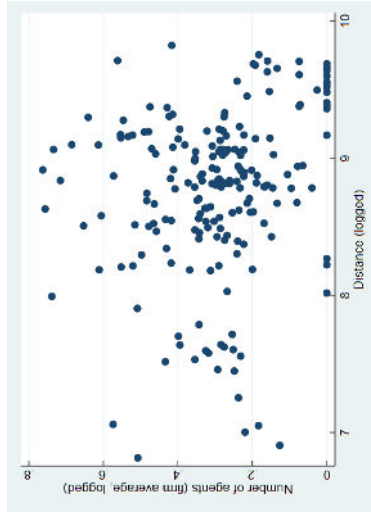


Note: We include firms exporting to non-EU destinations in 2014. Data of other years yield very similar patterns. The number of observations (that is, individual firm) in each group is 13,044, 16,268, 15,183, and 14,338 respectively. We remove outliers, and this should not change our results.

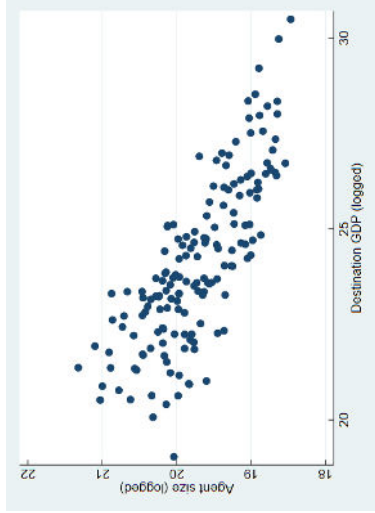
Figure A2: Log exports and the relationship value



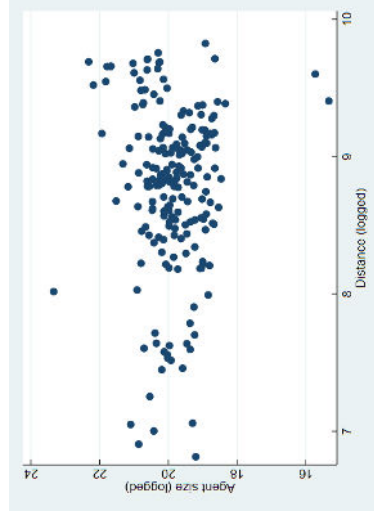
(c) Average number of agents per trader and market size



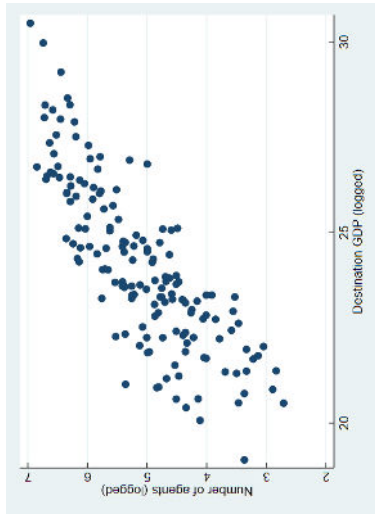
(f) Average number of agents per trader and distance



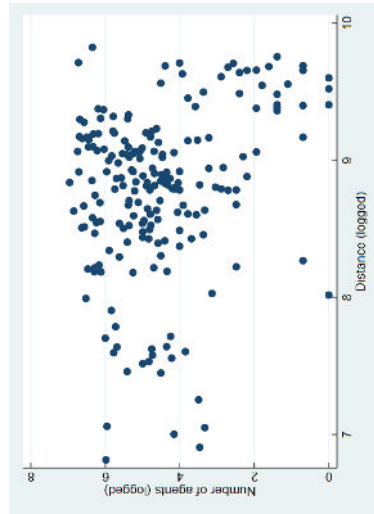
(b) Size of agents and market size



(e) Size of agents and distance



(d) Number of agents and market size



(d) Number of agents and distance

Note: We include UK exports to non-EU countries in 2014 in this figure. Data from other years have produced very similar results.

Figure A3: Gravity and the use of agents

Panels A3d-A3f relate the same measures of agent use to geographic distance. No clear systematic relationship emerges between distance and the number of agents, agent size, or the average number of agents per exporter.³ Overall, these figures illustrate how agent presence and organization vary across destination markets along standard gravity dimensions, providing additional descriptive context for the patterns discussed in the main text.

B Robustness

This appendix reports a series of robustness checks that support the main results in the paper. The analysis assesses the stability of the baseline exploration-exploitation pattern under alternative specifications, sample restrictions, and additional dimensions of heterogeneity. Across all exercises, the qualitative patterns remain unchanged.

B.1 Alternative Fixed Effects and Definitions of Agent Specialization

We first assess the robustness of the baseline results to alternative fixed-effects structures and to relaxations of the definitions of agent specialization. Table B1 replaces the baseline specification with country-industry and firm-year fixed effects, thereby accounting for destination-industry-specific demand shocks and fully absorbing all time-varying firm characteristics, including firm size. Table B2 further augments the specification by including product-year fixed effects to control for global shocks and trends that are specific to individual products over time. Overall, our findings remain robust across both the extensive and intensive margins. Finally, Table B3 shows that the results are unchanged when we adopt more relaxed definitions of agents' top markets and top products, allowing for broader measures of specialization.

Table B1: Alternative fixed effects

| Outcome variable | (1) D_{ijct}^{Agent} | (2) $AgentSize_{ijct}$ | (3) $RValue_{ijct}$ |
|---------------------------------|---------------------------|---------------------------|------------------------|
| <i>NewMarket_{ict}</i> | 0.0009*** (0.0001) | -0.0556*** (0.0046) | -0.2306*** (0.0023) |
| <i>NewProduct_{ijt}</i> | 0.0022*** (0.0001) | -0.0083*** (0.0022) | -0.6026*** (0.0028) |
| <i>TopMarket_{ict}</i> | 0.0003*** (0.0002) | -1.1805*** (0.0075) | 0.2376*** (0.0037) |
| <i>TopProduct_{ijt}</i> | -0.0018** (0.0006) | -0.8852*** (0.0111) | 0.6622*** (0.0092) |
| Country-HS4 fixed effects | Yes | Yes | Yes |
| Firm-year fixed effects | Yes | Yes | Yes |
| Observations | 9,363,733 | 9,363,733 | 9,363,733 |
| R^2 | 0.2994 | 0.4816 | 0.3501 |

Notes: Firm size is absorbed by the firm-year fixed effects. Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1% and 5% significance level respectively.

³The descriptive correlations are weak, although the regression results reported in Section C indicate a negative association once controls are included.

Table B2: Additional fixed effects (product-year included)

| Outcome variable | (1) D_{ijct}^{Agent} | (2) $AgentSize_{ijct}$ | (3) $RValue_{ijct}$ |
|-----------------------------------|---------------------------|---------------------------|------------------------|
| $NewMarket_{ict}$ | 0.0005** (0.0002) | -0.0637*** (0.0036) | -0.2670*** (0.0024) |
| $NewProduct_{ijt}$ | 0.0007*** (0.0001) | -0.0144*** (0.0028) | -0.2452*** (0.0022) |
| $TopMarket_{ict}$ | 0.0006** (0.0002) | -1.1033*** (0.0085) | 0.2471*** (0.0045) |
| $TopProduct_{ijt}$ | 0.0008 (0.0005) | -1.0057*** (0.0124) | 0.4028*** (0.0079) |
| $Size_{i,t-1}$ | -0.0007** (0.0002) | 0.0245*** (0.0036) | 0.0357*** (0.0024) |
| Country-year fixed effects | Yes | Yes | Yes |
| Firm-industry (HS4) fixed effects | Yes | Yes | Yes |
| Product (HS6)-year fixed effects | Yes | Yes | Yes |
| Observations | 9,364,359 | 9,364,359 | 9,364,359 |
| R^2 | 0.3121 | 0.5067 | 0.4422 |

Notes: Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1% and 5% significance level respectively.

Table B3: Agent top 3 products and destinations

| Outcome variable | (1) D_{ijct}^{Agent} | (2) $AgentSize_{ijct}$ | (3) $RValue_{ijct}$ |
|-----------------------------------|---------------------------|---------------------------|------------------------|
| $NewMarket_{ict}$ | 0.0005** (0.0002) | -0.0620*** (0.0059) | -0.2591*** (0.0030) |
| $NewProduct_{ijt}$ | 0.0008*** (0.0001) | -0.0344*** (0.0028) | -0.2705*** (0.0022) |
| $TopMarket_{ict}$ | 0.0006** (0.0002) | -1.1049*** (0.0085) | 0.2499*** (0.0045) |
| $TopProduct_{ijt}$ | 0.0006 (0.0005) | -0.9831*** (0.0123) | 0.4327*** (0.0089) |
| $Size_{i,t-1}$ | -0.0007** (0.0002) | 0.0242** (0.0038) | 0.0343*** (0.0024) |
| Country-year fixed effects | Yes | Yes | Yes |
| Firm-industry (HS4) fixed effects | Yes | Yes | Yes |
| Observations | 9,364,359 | 9,364,359 | 9,364,359 |
| R^2 | 0.3033 | 0.4966 | 0.4316 |

Notes: Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1% and 5% significance level respectively. We use the top 3 products and destinations of the firms' dominant agent.

B.2 Sectoral and Firm-Level Heterogeneity

We next explore additional heterogeneity across sectors. Table B4 reports results for manufacturing sectors (SITC 6-8) and primary goods (SITC 0-4), respectively. SITC 5 (chemicals) is excluded due to its heterogeneous nature, spanning both primary and manufacturing characteristics, while SITC 9 is omitted as it corresponds to unclassified goods.

Table B4: Agent use: Manufacturing vs primary goods

| Outcome variable | Manufacturing (SITC 6–8) | | | Primary goods (SITC 0–4) | | |
|--------------------|---------------------------|---------------------------|------------------------|---------------------------|---------------------------|------------------------|
| | (1) D_{ijct}^{Agent} | (2) $AgentSize_{ijct}$ | (3) $RValue_{ijct}$ | (4) D_{ijct}^{Agent} | (5) $AgentSize_{ijct}$ | (6) $RValue_{ijct}$ |
| $NewMarket_{ict}$ | 0.0001 (0.0002) | −0.0523*** (0.0062) | −0.2277*** (0.0030) | 0.0064*** (0.0009) | −0.1801*** (0.0192) | −0.4341*** (0.0119) |
| $NewProduct_{ijt}$ | 0.0006*** (0.0001) | −0.0358*** (0.0030) | −0.2631*** (0.0023) | 0.0038** (0.0012) | −0.0501*** (0.0120) | −0.3972*** (0.0127) |
| $TopMarket_{ict}$ | 0.0001 (0.0002) | −1.1710*** (0.0095) | 0.2676*** (0.0049) | 0.0052*** (0.0012) | −0.7512*** (0.0177) | 0.2281*** (0.0107) |
| $TopProduct_{ijt}$ | 0.0022*** (0.0006) | −0.9587*** (0.0136) | 0.4103*** (0.0091) | −0.0086*** (0.0022) | −0.8525*** (0.0331) | 0.4103*** (0.0236) |
| $Size_{i,t-1}$ | −0.0006* (0.0003) | 0.0220* (0.0041) | 0.0349*** (0.0026) | −0.0031*** (0.0009) | 0.0387*** (0.0095) | 0.0083 (0.0062) |
| Country-year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-industry FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 7,968,849 | 7,968,849 | 7,968,849 | 443,012 | 443,012 | 443,012 |
| R^2 | 0.2052 | 0.4839 | 0.4122 | 0.5300 | 0.5059 | 0.5056 |

Notes: Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1% and 5% significance levels, respectively. Manufacturing sectors correspond to SITC 6–8, while primary goods correspond to SITC 0–4. SITC 5 (chemicals) is excluded due to its heterogeneous composition, and SITC 9 is omitted as it represents unclassified goods.

Overall, the results for the intensive margins are highly consistent across sectors. By contrast, patterns along the extensive margin differ. In manufacturing sectors, agent use is more strongly associated with product-level exploration and product-level specialization, with little role for market-related margins. For primary goods, both market and product exploration matter, while exploitation operates primarily through market specialization rather than product specialization.

We also examine heterogeneity across the firm size distribution in Table B5, which compares the top 5% of firms by trade value with the remaining firms. The intensive-margin results are qualitatively consistent across both groups: exploration is associated with smaller agents and lower relationship values, while exploitation is associated with deeper, higher-value relationships.

Along the extensive margin, exploration increases the likelihood of agent use for both large and small firms. In contrast, responses to agent specialization differ across groups: for larger firms, specialization is associated with a higher likelihood of agent use, whereas for smaller firms the effects are weaker and in some cases negative. Overall, these findings indicate that the exploration–exploitation pattern is present across the firm size distribution, with differences emerging primarily in how firms adjust along the extensive margin.

Table B5: Top 5% vs the rest

| Outcome variable | Top 5% firms | | | The rest | | |
|--------------------|---------------------------|---------------------------|------------------------|---------------------------|---------------------------|------------------------|
| | (1) D_{ijct}^{Agent} | (2) $AgentSize_{ijct}$ | (3) $RValue_{ijct}$ | (4) D_{ijct}^{Agent} | (5) $AgentSize_{ijct}$ | (6) $RValue_{ijct}$ |
| $NewMarket_{ict}$ | 0.0021*** (0.0004) | -0.1023*** (0.0169) | -0.4053*** (0.0110) | 0.0005*** (0.0001) | -0.0585*** (0.0034) | -0.2598*** (0.0021) |
| $NewProduct_{ijt}$ | 0.0022*** (0.0004) | -0.0630*** (0.0155) | -0.3467*** (0.0062) | 0.0003*** (0.0001) | -0.0233*** (0.0024) | -0.2437*** (0.0018) |
| $TopMarket_{ict}$ | 0.0015*** (0.0003) | -1.1751*** (0.0088) | 0.3180*** (0.0059) | -0.0001 (0.0001) | -1.0585*** (0.0061) | 0.1963*** (0.0029) |
| $TopProduct_{ijt}$ | 0.0023** (0.0008) | -0.9272*** (0.0183) | 0.6003*** (0.0119) | -0.0014** (0.0005) | -1.0898*** (0.0130) | 0.2332*** (0.0065) |
| $Size_{i,t-1}$ | -0.0039** (0.0012) | 0.0782*** (0.0161) | 0.0997*** (0.0077) | -0.0000 (0.0000) | 0.0132** (0.0019) | 0.0190*** (0.0011) |
| Country-year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-industry FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,820,688 | 3,820,688 | 3,820,688 | 5,543,671 | 5,543,671 | 5,543,671 |
| R^2 | 0.3342 | 0.4340 | 0.4149 | 0.1907 | 0.5439 | 0.4265 |

Notes: Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1% and 5% significance level respectively.

B.3 Other subsamples

Finally, we re-estimate the baseline specification on a subsample limited to the UK's top 10 destination markets (Table B6). The results remain qualitatively consistent along the intensive margins. However, along the extensive margin, exploration effects are more limited: entry into new markets does not significantly increase the likelihood of agent use, while new product introduction continues to do so. This pattern is consistent with firms already being familiar with major export destinations, reducing the need for agents when entering these markets, while product-level uncertainty continues to generate demand for intermediation. Agent market specialization, however, remains positively associated with agent use, indicating that firms rely on specialized intermediaries even in familiar markets.

We also re-estimate the baseline specification separately for the periods 2010–2015 and 2016–2019 (Table B7) to assess whether the results are driven by a particular time period. The intensive-margin results remain stable across both subsamples. By contrast, the extensive-margin effects are more muted in the later period, with weaker or insignificant effects of both exploration and agent specialization after 2016. One possible interpretation is that, following the Brexit referendum, firms increasingly adjusted along intensive margins, such as reallocating trade across existing agent relationships, rather than expanding the set of agents used. This is consistent with a shift toward consolidation and deeper relationships under heightened uncertainty, as documented in Section 4.

Table B6: Top 10 destinations only

| Outcome variable | (1) D_{ijct}^{Agent} | (2) $AgentSize_{ijct}$ | (3) $RValue_{ijct}$ |
|-----------------------------------|---------------------------|---------------------------|------------------------|
| $NewMarket_{ict}$ | -0.0002 (0.0003) | -0.0795*** (0.0059) | -0.2575*** (0.0042) |
| $NewProduct_{ijt}$ | 0.0009*** (0.0002) | -0.0354*** (0.0030) | -0.3495*** (0.0027) |
| $TopMarket_{ict}$ | 0.0007** (0.0003) | -0.5660*** (0.0082) | 0.1808*** (0.0045) |
| $TopProduct_{ijt}$ | -0.0005 (0.0007) | -0.8627*** (0.0122) | 0.4764*** (0.0107) |
| $Size_{i,t-1}$ | -0.0007* (0.0003) | 0.0210** (0.0038) | 0.0416*** (0.0029) |
| Country-year fixed effects | Yes | Yes | Yes |
| Firm-industry (HS4) fixed effects | Yes | Yes | Yes |
| Observations | 4,256,434 | 4,256,434 | 4,256,434 |
| R^2 | 0.3432 | 0.5112 | 0.4706 |

Note: Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1% and 5% significance level respectively. Top 10 destinations are defined based on average trade value in the full sample. The top 10 countries are: the United States, China, Switzerland, Hong Kong (PRC), UAE, Turkey, Japan, Canada, Singapore, and India.

Table B7: Subsample comparison: 2010-2015 vs 2016-2019

| Outcome variable | 2010-2015 | | | 2016-2019 | | |
|--------------------|---------------------------|---------------------------|------------------------|---------------------------|---------------------------|------------------------|
| | (1) D_{ijct}^{Agent} | (2) $AgentSize_{ijct}$ | (3) $RValue_{ijct}$ | (4) D_{ijct}^{Agent} | (5) $AgentSize_{ijct}$ | (6) $RValue_{ijct}$ |
| $NewMarket_{ict}$ | 0.0010*** (0.0001) | -0.0701*** (0.0076) | -0.2897*** (0.0036) | 0.0001 (0.0002) | -0.0631*** (0.0097) | -0.2812*** (0.0050) |
| $NewProduct_{ijt}$ | 0.0009*** (0.0001) | -0.0403*** (0.0036) | -0.2776*** (0.0031) | 0.0006** (0.0002) | -0.0373*** (0.0034) | -0.3138*** (0.0032) |
| $TopMarket_{ict}$ | 0.0010*** (0.0006) | -1.0307*** (0.0131) | 0.2516*** (0.0075) | 0.0000 (0.0003) | -1.2083*** (0.0150) | 0.2666*** (0.0084) |
| $TopProduct_{ijt}$ | 0.0015* (0.0007) | -0.9164*** (0.0163) | 0.4248*** (0.0125) | -0.0001 (0.0006) | -1.0943*** (0.0201) | 0.5078*** (0.0141) |
| $Size_{i,t-1}$ | -0.0002 (0.0002) | 0.0240*** (0.0053) | 0.0134*** (0.0031) | -0.0012* (0.0006) | 0.0197** (0.0058) | -0.0255*** (0.0036) |
| Country-year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-industry FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 5,393,307 | 5,393,307 | 5,393,307 | 3,971,052 | 3,971,052 | 3,971,052 |
| R^2 | 0.3131 | 0.5022 | 0.4412 | 0.3540 | 0.5341 | 0.4523 |

Notes: Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1% and 5% significance level respectively.

C Further Analysis: Destination- and Product-Level Characteristics

This appendix presents supplementary empirical analysis examining how destination- and product-level characteristics are associated with firms' use of agents in international trade. Specifically, we assess whether destination market size, geographic distance, and cultural ties, together with product characteristics based on Rauch and BEC classifications, are systematically related to different margins of trader-agent relationships.

To examine these relationships formally, we estimate the following specification at the firm-product-country-year level:

$$y_{ijct} = \gamma_0 + \gamma_1 \text{Size}_{i,t-1} + \vec{\gamma}_2' \vec{X}_{ct} + \vec{\gamma}_3' \vec{\Omega}_j + \delta_{ij'} + \omega_t + \epsilon_{ijct}, \quad (4)$$

where i denotes firms, j products (8-digit HS), c destinations, and t years. The outcome variable y_{ijct} captures three distinct dimensions of agent use: (i) D_{ijct}^{Agent} , an indicator equal to one if firm i uses an agent when exporting product j to destination c in year t ; (ii) $AgentSize_{ijct}$ is the log of the average size of agents employed for a given product-destination pair in a given year, proxied by agents' total export value; (iii) $RValue_{ijct}$ denotes the log relationship value, defined as the average export value handled by all agents connected to firm i for a given product-destination pair in a given year.

The vector \vec{X}_{ct} includes destination-specific gravity variables capturing geographical, economic, and cultural characteristics, including distance, market size (proxied by GDP), common language, colonial ties, and the presence of a free trade agreement.⁴ Product characteristics, $\vec{\Omega}_j$ include whether goods j are differentiated or homogeneous (Rauch classification) and whether they are consumption, intermediate, or capital goods (BEC classification). We also include lagged firm size, firm-industry fixed effects and year fixed effects, $\delta_{ij'}$ and ω_t , controlling for time-invariant firm characteristics and common macroeconomic shocks. Firm size is measured using lagged total export value. Standard errors are clustered at the firm-year level.

Table C1 reports the regression results. Destination market size, proxied by GDP, is positively associated with all margins of agent use. Larger markets are more likely to be served via agents, exhibit higher relationship values, and are associated with larger agents. These results indicate that market size scales up both the breadth and intensity of agent-mediated trade.

By contrast, more distant destinations are less likely to be served by agents and are associated with smaller agents and lower relationship values. This pattern suggests that geographic remoteness discourages both the extensive and intensive margins of agent use, rather than inducing a shift toward larger or more capable intermediaries.

Cultural proximity matters, though its effects differ across margins. Former colonial ties are associated with larger agents and higher relationship values, but with a lower likelihood of agent

⁴Gravity variables are drawn from the Dynamic Gravity Dataset (Version 2.1) by the United States International Trade Commission, available at <https://www.usitc.gov/data/gravity/dgd.htm>.

Table C1: Agent use: destination- and product-level characteristics

| <i>Dependent variable</i> | (1) D_{ijct}^{Agent} | (2) $AgentSize_{ijct}$ | (3) $RValue_{ijct}$ |
|-----------------------------------|---------------------------|---------------------------|------------------------|
| GDP_{ct} | 0.0004*** (0.0001) | 0.0989*** (0.0150) | 0.1109*** (0.0014) |
| $Distance_c$ | -0.0005** (0.0001) | -0.0172*** (0.0037) | -0.0356*** (0.0018) |
| $Colony_c$ | -0.0004*** (0.0001) | 0.1170*** (0.0053) | 0.0650*** (0.0026) |
| $CommonLanguage_c$ | 0.0005** (0.0002) | 0.0251*** (0.0052) | -0.0410*** (0.0031) |
| FTA_{ct} | -0.0013 (0.0002) | -0.0704*** (0.0059) | -0.0002 (0.0028) |
| $Differentiated_j$ | 0.0062*** (0.0017) | 0.0422 (0.0097) | 0.0024 (0.0083) |
| $Consumption_j$ | 0.0019** (0.0001) | -0.0255*** (0.0057) | 0.0014 (0.0060) |
| $Size_{i,t-1}$ | -0.0007* (0.0002) | 0.0275*** (0.0040) | 0.0683*** (0.0023) |
| Firm-industry (HS4) fixed effects | Yes | Yes | Yes |
| Time fixed effects | Yes | Yes | Yes |
| Observations | 9,363,733 | 9,363,733 | 9,363,733 |
| R^2 | 0.4577 | 0.4230 | 0.3073 |

Notes: Standard errors are clustered at the firm-year level. ***, **, and * denote 0.1%, 1%, and 5% significance levels, respectively.

use. Sharing a common language increases both the likelihood of using agents and agent size, but is associated with lower relationship values.

The presence of a free trade agreement has limited effects on the extensive and relationship-value margins, but is associated with smaller agents. This suggests that reductions in formal trade barriers may reduce the need for large intermediaries without substantially affecting the likelihood or intensity of agent-mediated trade.

Table C1 also shows that product characteristics play an important role. Differentiated goods are more likely to be exported through agents, but are not associated with larger agents or higher relationship values. This suggests that agents facilitate entry into more complex product markets without necessarily increasing the scale of relationships. Consumption goods are also more likely to be traded through agents, but are associated with smaller agents on average and show no significant difference in relationship value. This pattern is consistent with agents supporting a larger number of smaller transactions in consumer-oriented markets.

Finally, larger firms are less likely to use agents, but when they do, they work with larger agents and maintain higher relationship values. This indicates that larger firms scale their use of intermediation primarily along the intensive margin, reallocating activity toward larger agents and higher-value relationships rather than increasing the number of agent-mediated transactions.