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Non-Tariff Measures and the United Kingdom Internal Market

Report by Developing Trade Consultants
commissioned for BEIS

Acknowledgements

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We are grateful to BEIS staff, particularly Ivana Dimitrova, Ferry Lienert, Christina Ammon, Lucy Rimmington, and Kirby Chen. We also recognize the cooperation of the OECD Secretariat, in particular John Drummond, Hildegunn Kyvik Nordås, Janos Ferencz, Frederic Gonzales, and Sebastian Benz. Bernard Hoekman also provided comments and suggestions. However, this report is published under the sole responsibility of the authors, and the opinions and arguments expressed are our own.



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Contents

Contents	4
Executive Summary	5
Quantifying Regulatory Measures in Services Sectors	6
Using Trade Costs to Measure Market Integration	9
1 Introduction and Project Overview	11
2 Quantifying Regulatory Measures in Services: The OECD STRI Methodology	14
2.1 Nature of Services Trade	14
2.2 Overview of the OECD STRI Methodology	17
2.3 Data Analysis and Coding	19
2.3.1 Standard STRIs	20
2.3.2 UK-Specific STRIs	22
2.4 Regulatory Heterogeneity	26
2.5 Conversion of STRIs to Ad Valorem (Tax) Equivalents	27
2.6 Results and Discussion	28
2.7 International Comparison	38
3 Trade Costs and the UK Internal Market	43
3.1 Overview of Approach	44
3.2 Methodology	45
3.3 Limitations and Data Constraints	47
3.4 UK Internal Trade Costs	48
3.5 Comparison with Belgium, Germany, and Spain	52
3.6 Summarizing and Comparing Internal Markets	55
4 Conclusion	57
References	59
Datasets	60
Annex 1: Inferring Trade Costs from the Inverted Gravity Model	61
Annex 2: Estimation of AVEs using the Gravity Model	63
Annex 3: Estimated Ad Valorem Equivalents	69
Annex 4: STRI Components	73

Executive Summary

The UK internal market can be understood as a dynamic interconnected trading space for goods and services within the UK, comprising long standing trading relationships between the four constituent nations of the UK. Under its unique constitutional arrangements, the UK is a unitary state with legislative decentralisation by means of devolution. As a result of this devolution of powers, there is the prospect of different regulations in the four UK constituent nations. Such differences may reflect local circumstances and the exercise of legitimate public policy preferences in each constituent part. From an economic perspective, regulatory heterogeneity can be associated with additional costs for firms and consumers in the UK. These costs should be assessed against the intended public policy benefit. Looking forward, the regulatory framework governing intra-UK goods and services trade could undergo changes following EU exit, to the extent that that framework has itself been influenced by EU law.

The aim of this project is to identify and provide analysis of existing intra-UK non-tariff measures (NTMs), as a key factor influencing the degree of integration of the internal market. A second objective is to analyse NTMs in key sectors in the four UK constituent nations and to compare them with international benchmarks, in particular EU member states with comparable legislative decentralisation. We provide a detailed analysis of the state of play in services sectors, based on a review of regulatory sources. In addition, we undertake a data-based review of market integration in goods and services sectors, focusing on an assessment of trade costs within the UK.

Quantifying Regulatory Measures in Services Sectors

We collect data on regulatory measures affecting trade in services using the OECD's Services Trade Restrictiveness Index (STRI) methodology. We cover 13 sectors, and one cross-cutting area:

1. Accounting services.
2. Air transport.
3. Architecture services.
4. Computer services.
5. Construction.
6. Courier services.
7. Distribution.
8. Engineering services.
9. Legal services.
10. Logistics (cargo storage and warehousing).
11. Logistics (customs brokerage).
12. Maritime transport.
13. Road freight transport.
14. Digital services (cross-cutting).

A key project output is a database of regulatory measures covering each of these subsectors. In all, we have coded around 20,000 data points. For each sector, we record policy measures in force in all four UK constituent nations. We distinguish between policies that affect non-preferential trading partners, i.e. those trading under most favoured nation terms under WTO rules (MFN), those that apply to exporters from the EEA, those that apply to firms within the regulating jurisdiction, and those that apply to firms from the rest of the UK.

An STRI is a quantitative summary of the restrictiveness of policies affecting trade in services. A higher score indicates greater restrictiveness, but a score of, say 0.5, does not indicate that policies are necessarily "twice" as restrictive as a score of 0.25. The interpretation is largely ordinal, and scores cannot easily be compared across sectors.

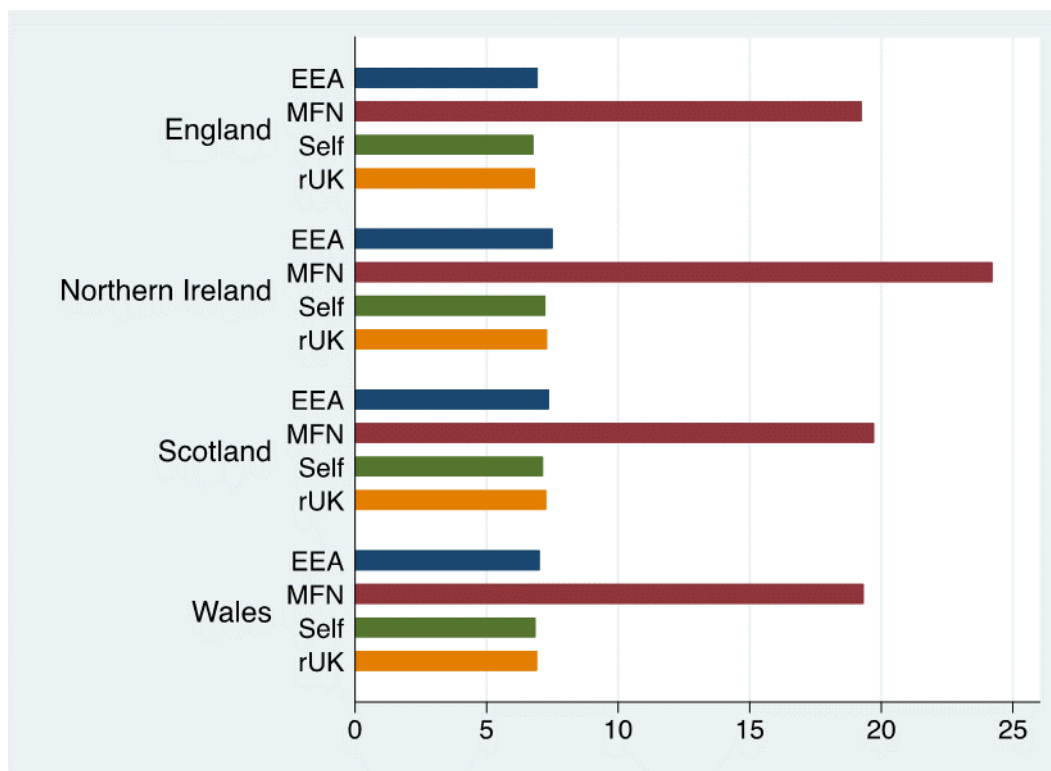
We convert the STRI scores to ad valorem equivalents (AVEs) using an econometric model. An AVE is the tax equivalent of the bundle of regulatory measures captured by the index. For example, if it costs a firm £10 to produce a service but regulatory measures mean that the resulting cost to the consumer is £20, then the difference between the two (£10) can be expressed as an AVE of 100%.

Based on our review of the primary regulatory sources, we conclude that there is very little evidence of overt discrimination in favour of local suppliers in individual UK constituent nations. There are similarly relatively few examples of regulatory heterogeneity that could add to trade costs. Policies applied to intra-UK service providers are much more liberal than MFN policies, but are close or even identical to policies applied to EEA service providers. Indeed, EU law is a substantial source of regulatory measures captured by the STRI, although its importance varies from one sector to another.

AVEs vary substantially across sectors, but within sectors, results are relatively stable across constituent nations, with the exception of legal services where there is more substantial variation. Figure 1 shows the average AVE across all sectors, distinguishing UK constituent nations and the type of transaction involved. It makes clear that policies applied to MFN trading partners are much more restrictive than for other types of trade, and that policies applied to EEA and intra-UK traders are very close in most cases. The average AVE of MFN policies in England and

Wales is 19%. It is 20% in Scotland and 24% in Northern Ireland, with the main difference being due to legal services. For EEA service providers, by contrast, the average AVE is 7% in England, Scotland, and Wales, and 8% in Northern Ireland. Policies affecting service provision within and across constituent nations have AVEs of 7% in all cases. There is a clear cost advantage to UK firms from dealing with customers in relatively integrated market spaces, the most beneficial being the internal market, followed closely by the EU Single Market, based on these data.

Figure 1: AVE of services trade restrictions, average across all sectors, percent.



Source: Authors' calculations.

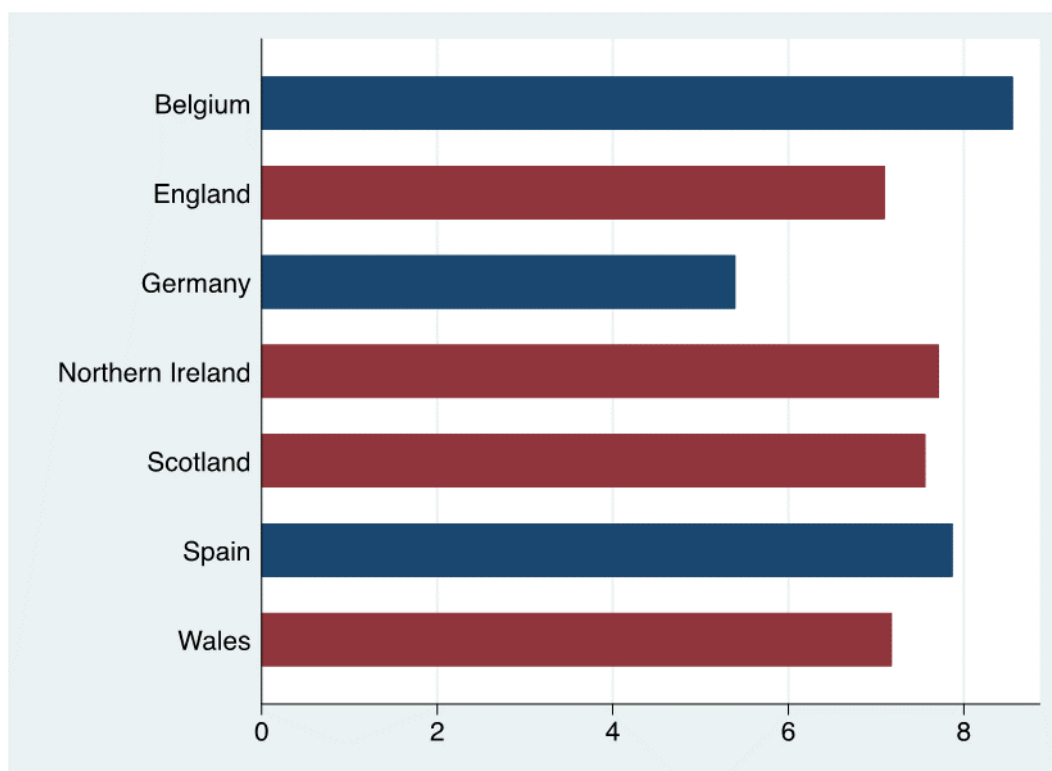
To put these results into perspective, it is important to remember that restrictive services policies not only limit the ability of service providers to access foreign markets, since regulation is effectively part of their production technology; they also limit the ability of domestic firms to access services inputs at competitive prices. Shepherd (2019) shows that as a result of the important role that services play as intermediates in the production of manufactured goods—approximately one third of the gross value of manufactured goods exports is in fact embodied services value added—there is actually a close relationship between liberal services policies and manufacturing export performance. The model in that paper suggests that the UK's total manufacturing exports would be nearly 3% higher if policy measures included in the STRI were liberalized so as to reduce the STRI score by 10%.

Regulatory data on intra-country transactions in other markets are not available. However, the requirements of EU law and the structures of the Single Market suggest that differences in treatment should, in theory, be relatively slight between EEA service suppliers and those from other constituent parts of an EEA country. The only empirical data available on this question, namely our evidence for the UK, support the theory. On the assumption that other EU countries have been at least as diligent as the UK in implementing EU law and Single Market structures, and have done so with a similar margin of appreciation for local particularities, it follows that EEA

policies in EU countries might provide an acceptable proxy for internal market integration in those countries. As a comparison group, we use Belgium, Germany, and Spain: all three are EU members that exhibit legislative decentralization, with the accompanying potential for regulatory differences that could add to trade costs.

Figure 2 shows that UK constituent nations have comparable AVEs relative to the comparator group, lower than Belgium and Spain, but higher than Germany. On the assumption that intra-country transactions in the other markets are governed by regulations very similar to those governing EEA transactions, as in the UK case, the figure then also means that the UK exhibits a similar degree of internal market integration as the comparator countries.

Figure 2: Comparison of AVEs of services trade restrictions vis-à-vis EEA service providers, average across all sectors, percent.



Source: Authors' calculations.

Using Trade Costs to Measure Market Integration

Due to problems of methodology and data, it is not possible to replicate the STRI analysis for goods sectors at the present time. However, it is feasible to use regional trade and production data to infer the level of inter- relative to intra-regional trade costs. In other words, we can infer the ratio of trade costs between, for example, Scotland and Wales relative to trade costs within each of them, based on the observed value of trade between them relative to internal trade in each of them. This approach is grounded in the standard gravity model of trade, which relates flows between entities to their economic sizes and the level of trade costs between them. In international trade, trade costs refer to the full set of costs incurred by a firm in getting a good or service to a final consumer, other than the firm's production cost itself. Trade costs are typically expressed in AVE terms. As a matter of basic economics, lower trade costs are associated with a higher degree of market integration in the sense that buyers and sellers in different places are more easily able to link with each other.

The Figure below shows trade costs for UK constituent nations vis-à-vis each other, as well as EU partners, and selected other countries (ROW). The manufacturing sector is used as an example. Trade costs are lowest for intra-UK trade, followed by trade with EU partners, with third-party trade subject to significantly higher trade costs. The data are consistent with a more integrated UK internal market relative to the EU Single Market or the world economy. The Figure does not control for the effect of distance, but econometric modelling that controls for that and other influences produces similar results. The model shows that trade costs within the UK but between UK constituent nations are 51 percentage points lower than other directions of trade in agriculture, 22 percentage points in manufacturing, and 76 percentage points in services. These results are similar to what is seen in other European countries for which data are available.

Figure 3: Trade costs for selected bilateral pairs, manufacturing, percent AVE



Source: Authors' calculations.

1 Introduction and Project Overview

With its impending exit from the European Union (EU), the UK stands to see significant changes to the market realities facing its firms and consumers. An aspect of this dynamic that is as yet little analysed by economists or discussed by civil society is the impact of EU exit on the UK's internal market, and the institutions that support it. The UK's four constituent nations—England, Scotland, Wales, and Northern Ireland—have had distinct evolutions in terms of the laws and regulations that apply within their territories. The current status of the Devolution Settlements, however, means that each constituent nation has an assembly as well as the capacity to form an executive. Judicial functions are more or less integrated depending on the constituent nations involved. As such, the current status of the UK internal market is that transactions between parties located in different UK constituent nations need to take account of laws enacted by the Westminster Parliament, but also potentially by the Assemblies of the other constituent nations. Until EU exit takes place, such transactions are also structured by EU law. The UK remains a unitary state, as distinct from a federation, but there is notable scope for laws and regulations to differ across constituent nations as a result of Devolution.

From an economic point of view, the potential for laws and regulations to differ across constituent nations may make it more difficult for firms and consumers in different constituent nations to trade with each other as compared to firms and consumers in the same jurisdiction. In international trade, trade costs resulting from differences in regulations are subsumed under the heading of non-tariff measures (NTMs). That term is used with various meanings, ranging from an internationally agreed classification for measures in goods markets (UNCTAD, 2015) to a broader economic treatment in which NTMs covers all sources of trade costs in international markets other than standard tariffs (e.g., De Melo and Shepherd, 2018).

Against this background, the aim of the present project is to identify and provide analysis of intra-UK NTMs, focusing in particular on the services sector, which accounted for 70% of all economic activity in the country in 2017 according to the World Bank World Development Indicators, but also with some information on goods where feasible. We take a bottom up approach for services, collecting data directly from laws and regulations to construct Services Trade Restrictiveness Indices. This approach is not currently feasible for goods, so we adopt a top down approach in which we draw inferences about market integration based on observed patterns of trade and production. A second objective is to analyse NTMs in key sectors in the four UK constituent nations and to compare them with international benchmarks, in particular EU member states. This project is therefore primarily a data collection exercise, but a subsidiary purpose is to conduct a preliminary analysis of the new data with a view to informing stakeholders and the policy community as to the current degree of integration of the UK internal market in international comparison, and to identify aspects of service provision currently affected by EU law.

The UK stands in a relatively unusual position relative to other countries in terms of the legal mechanisms that support its internal market. Notwithstanding Devolution, the UK is still a unitary state, but one with a constitution derived from various sources rather than being codified in a single document. The issue of internal market integration arises most often in the context of federations, where the constituent units have significant legislative and executive powers, with the corresponding ability to affect inter-jurisdictional trade and commerce. As such, federal constitutions, which are usually codified, typically include provisions either requiring that trade among the constituent entities should be completely free or giving the central government the capacity to regulate it, presumably in the interests, in part, of keeping it free. Article I, Section 8, Clause 3 of the US Constitution, for example, gives the federal government power “to regulate commerce among the several states”. A corresponding power exists in article 51(i) of the

Australian Constitution, supported by Article 92, which requires that “trade, commerce, and intercourse among the States ... shall be absolutely free”. In Germany, Article 73(1)(5) of the Basic Law gives the federal government exclusive competence over “the unity of the customs and trading area ... [and] the free movement of goods.” The closest analogy with the UK position is perhaps Spain, which is not a federation, but a relatively decentralized unitary state that incorporates autonomous regions. However, its written constitution contains Article 139, which guarantees equality of treatment for Spanish citizens across the whole territory, as well as free movement of goods.

The British constitutional settlement creates a devolved structure with the potential for differences in laws and regulations across constituent nations. However, the EU Single Market provides for free movement of goods, services, and capital within the EU, effectively reducing the incentive to discriminate within the UK itself. Following EU exit, that legal situation will change fundamentally. We therefore seek to provide some preliminary information on the extent to which EU law currently structures transactions in the UK internal market.

For services markets, our analysis primarily uses the OECD’s Services Trade Restrictiveness Index (STRI) methodology. It is explained in full in Section 2. The essence of the methodology is the use of regulatory questionnaires to code policy measures according to their restrictiveness. Indices produced in this way can then be combined with an econometric model to produce ad valorem equivalents (AVEs), namely the tariff equivalent that produces the same wedge between producer and consumer prices as that represented by the bundle of policy measures included in the STRI. Our STRI analysis covers 13 sectors and one cross-cutting area, and takes account of trade with countries outside the EU, with those in the EU, within each UK jurisdiction, and between UK constituent nations. In all, the analysis covers approximately 20,000 individual data points, most collected specifically for this project, but also including some collected by OECD for their own STRI project, and by Shepherd et al. (2018) for the Department for the Economy of Northern Ireland.

No such approach is currently feasible for goods markets. The available international classification of NTMs (UNCTAD, 2015) is typically applied to a detailed product scheme: at the international level, the Harmonized System identifies around 5,000 individual products. Comparably disaggregated data are not available for transactions taking place across UK constituent nations, but within a single Customs space. We therefore take an alternative approach and use data on cross-border sales in goods and services markets to construct all-inclusive or “omnibus” measures of trade costs, as Arvis et al. (2016) have done at the international level. Trade costs are a standard inclusion in global and regional trade models. They refer to “all costs incurred in getting the good to a final user other than the marginal cost of producing the good itself” (Anderson and Van Wincoop, 2004, page 691). If the production cost of a product is £10 per unit but it sells to consumers for £20 per unit, the difference (£10) is accounted for by trade costs; in AVE terms, trade costs in this example are 100%. It is important to note that trade costs do not only arise if a good or a service crosses a border (be that international or sub-national). Trade costs here refer to the collective basket of activities and drivers that contribute to the costs of bringing a good to market, once it has been produced.

By comparing trade costs within the UK versus trade costs between the UK and other markets, as well as within other markets, we can obtain an initial understanding of how integrated the UK internal market is. In line with standard trade models, we expect more integrated markets to exhibit lower trade costs, which means that buyers and sellers can connect more easily across boundaries separating them. The analysis is primarily relevant for goods, which are not treated in more detail in the report, but is also presented for comparative purposes for services. We use this analysis to motivate a modelling exercise using regional trade data for EU countries that

uses more formal methods to analyse internal market integration in the UK and comparator countries.

Against this background, the report proceeds as follows. The next section looks in detail at services markets. It first presents the STRI methodology and discusses its application here. We then move to a consideration of results. Section 3 presents our methodology for estimating trade costs, which is discussed in detail in the Annex. It then moves to a presentation of results, and compares trade costs within the UK and between UK constituent nations and EU and non-EU trading partners. Section 4 presents the report's conclusions, and highlights areas that we feel are deserving of greater analysis moving forward.

2 Quantifying Regulatory Measures in Services: The OECD STRI Methodology

This section examines in detail the case of services trade within the UK internal market. While goods trade is easily understood, the case of services requires more discussion, as it is frequently the subject of misunderstandings in the public space. We therefore first discuss the nature of services trade, before moving to our key contribution, namely construction of indices to capture the degree of restrictiveness of services regulations in selected sectors for the four UK constituent nations.

2.1 Nature of Services Trade

Historically, economists and commentators tended to treat services as “non-tradeable”. However, this position changed radically in the 1980s and 1990s, as it was recognized that technological and organizational changes were making services easier to trade internationally (see Francois and Hoekman, 2010, for a review). This development was reflected in the GATT Uruguay Round negotiations, which gave birth to the General Agreement on Trade in Services (GATS), now part of the WTO’s legal infrastructure. Similarly, regional trade agreements (RTAs), including the EU, have dealt more extensively with services in recent years.

In goods markets, trade policy measures have historically focused on the act of crossing borders, which is a necessary condition for trade to take place. It is at the border that tariffs (taxes on imports) are levied. As world average tariff rates have fallen, attention has shifted to NTMs, in essence the range of regulatory measures that affect the incentives facing exporting producers and importing consumers. NTMs are sometimes applied at the border, but are often also applied behind the border, in the sense that they are general regulations, like product standards, that affect all goods, domestic and foreign alike (see UNCTAD, 2018, for a review). So, although attention has moved away somewhat from border measures over time, trade in goods is still conceptualized largely in terms of the physical movement of products from one place to another.

Services, by contrast, typically do not display physical evidence of their movement similar to passage through Customs for goods. At the same time, there is often a need for proximity between buyers and sellers of services: the example most often given is a haircut, in which the provider (a hairdresser) has to be physically proximate to the purchaser (the consumer). Considerations such as these gave rise to the historical treatment of services as part of the non-tradeable economy.

The rise of information and communication technologies (ICTs) has made it possible to trade more and more services at a distance: for instance, a business in one country can deal with a lawyer (a professional services provider) in another country by using a telephone or email. This is the type of services trade that is most easily captured in trade statistics, specifically the balance of payments.

But when negotiations on trade in services started in earnest in the Uruguay Round (1998-1994), it was quickly realized that in the modern economy, there are in fact multiple ways of trading services internationally. This realization gave rise to the definition of four Modes of Supply for international trade in services, specifically:

- **Mode 1:** Pure cross-border trade in services. When a lawyer in Northern Ireland gives advice to a client in the Republic of Ireland using email and the telephone only, there is an export of professional services from Northern Ireland to the Republic of Ireland, and correspondingly an import to the Republic of Ireland from Northern Ireland, equal to the value of the invoice paid by the client.
- **Mode 2:** Movement of the consumer. When a French student comes to study at a university in Scotland, there is an export of educational services from Scotland to France, and correspondingly an import to France from Scotland, equal to the value of fees paid by the student.
- **Mode 3:** Commercial establishment. When a German bank establishes a subsidiary in England, there is an export of banking services from Germany to England, and correspondingly an import to England from Germany, equal to the sales of the affiliate within England.
- **Mode 4:** Temporary movement of service providers. When a consultant engineer from Wales moves temporarily to Poland to supervise a construction project there, there is an export of professional services from Wales to Poland, and correspondingly an import to Poland from Wales, equal to the value of the engineer's consulting fees. This mode of supply does not cover permanent migration for work purposes, but only temporary movements.

In addition to differences in the ways of trading services relative to goods, there are also differences in the ways that policies can restrict that trade. Border measures like tariffs typically do not exist in services, because there is no physical passage of a border related to the transaction that gives rise to the trade, although providers and consumers themselves may move. As a result, all measures affecting services trade are effectively NTMs.

Clearly, any regulatory measure has the capacity to affect the incentives of producers or consumers, and as such can potentially have an impact on trade. But the GATS and RTAs that cover services do not by any means prevent governments from regulating their services markets. Indeed, they typically explicitly recognize the right to regulate. But trade agreements impose two key disciplines: most favoured nation (MFN) treatment, which means that the same policy has to be applied to all trading partners, except in defined cases such as a valid RTA, or listed exemptions in national schedules of commitments; and national treatment, which means that foreign and domestic service providers need to be treated in the same way, again subject to exceptions. These two rules are the main legal infrastructure underlying international trade in services, as in goods. Upon this foundation, countries then exchange schedules, in which they agree to particular bindings on the restrictiveness of policies they can apply in each services sector.

Clearly, quantifying services policies and assessing their economic impacts is a complex task relative to the baseline case of tariffs in goods markets. Tax incidence is well understood in microeconomics, and data are easy to come by. Collecting data on regulatory measures—whether NTMs in goods or in services—requires examination of primary texts and use of a coding system to map particular policy measures to quantitative indicators. We discuss the methodology for doing so in more detail below, in relation to the OECD's STRI.

Although developed for the purposes of understanding international trade, the GATS and its modes of supply are also useful for understanding services transactions within a single country

that has multiple constituent nations, like the UK. Regulatory measures and policies can, in theory, make it harder for a service provider based in, say, Northern Ireland, to sell her services to clients based in Scotland than to people and businesses in her home jurisdiction. At a data level, research such as Gervais and Jensen (2013) shows that standard methodologies, like the gravity model, can be applied equally well within countries as between them, a finding that necessarily rests on the fact that services are bought and sold across jurisdictional lines in the same ways as they are between countries. It is with results like this in mind that we move in the following sections to examine the ways in which existing methods used for understanding policy restrictiveness at an international level can be adapted to the context of the UK internal market.

2.2 Overview of the OECD STRI Methodology

To measure the restrictiveness of policies in services sectors, we follow the OECD's Services Trade Restrictiveness Index (STRI) methodology (Geloso Grosso et al., 2015). The starting point is a conceptualization of the various types of policy measures that can restrict services trade according to mode of supply (Table 3). We collect data on these measures using regulatory questionnaires developed by the OECD. Concretely, we use Excel sheets to code information about policy restrictions, and note sources for transparency and dialogue purposes. Most measures are coded as one (restriction) or zero (no restriction), or where there is a numerical answer, the methodology applies thresholds for binary scores. One complexity of services regulations is that apparently liberal policies in one area can be rendered *de facto* null and void by a single highly restrictive measure in another area. For instance, if the foreign equity limit for services firms in a particular sector is zero—i.e., FDI is not permitted—then a lack of other specific measures dealing with foreign providers does not mean that the sector is liberal: in fact, it is completely closed for Mode 3. For that reason, the OECD methodology takes account of dependencies among measures by coding dependent measures as one if there is a related measure that has the effect of closing the market. On the flipside, complementary measures are grouped and scored as zero only if all measures in the bundle are not restrictive.

To aggregate these data into an STRI, the OECD methodology applies expert weights. Specifically, the organization convened consultative meetings for each sector, to bring together experts proposed by member countries, as well as others from the World Bank, WTO, and the Secretariat itself, including specialized departments. Together, these experts concentrated on identifying relevant policy measures for inclusion in the STRI, and deciding on how each measure should be weighted relative to the others. The OECD has developed a custom algorithm to aggregate answers to regulatory questionnaires into overall STRI scores, taking account of sectoral differences. That approach is also applied here.

Finally, to translate the numerical STRI—which ranges between zero and one—into an economic impact, Benz (2017) uses an AVE. We adapt his method here, as per the explanation below and in the Annex. An AVE measures the size of the wedge, in percentage terms, that policies drive between producer prices in the exporting country and consumer prices in the importing country. So if a service costs £10 to produce in the exporting country but regulatory measures result in a final cost to consumers of £20, the difference of £10 equates to an AVE of 100% in this example.

We follow the OECD's approach here, in the interests of rigor, comparability, and transparency. We emphasize that the STRIs constructed in this way measure *de jure* restrictions in place, not other *de facto* impediments that may exist to the operations of services firms. That is an important, but distinct, question. The next section discusses our approach to data collection and analysis in more detail, noting in particular the innovation of looking at UK constituent nations.

Table 1: Examples of policy restrictions by mode of supply

<p>Mode 1: Cross-border supply</p>	<ul style="list-style-type: none"> • Requirement for foreign service providers to establish a commercial presence, i.e., requiring them to switch to another mode of supply; • Restrictions on business outsourcing; • Regulations on consumer protection that unduly restrict trade.
<p>Mode 2: Consumption abroad</p>	<ul style="list-style-type: none"> • Travel restrictions to the country where the service supplier is based and the service is offered; • Regulations on domestic recognition of documents proving the act of receiving certain services (e.g., domestic recognition of foreign degrees in educational services).
<p>Mode 3: Commercial presence</p>	<p>Restrictions on establishment:</p> <ul style="list-style-type: none"> • Licenses; • Quotas on establishment; • Restrictions on certain forms of legal entity; • Minimum capital requirements; • Limitations on the share of foreign capital; • Prohibition of FDI in certain sectors; • Location conditions. <p>Restrictions on operation:</p> <ul style="list-style-type: none"> • Local content requirements; • Operational permits and licenses.
<p>Mode 4: Movement of natural persons</p>	<ul style="list-style-type: none"> • Visa requirements; • Quotas on inflows of temporary workers; • Limitation of the maximum period of stay.

Source: Authors.

2.3 Data Analysis and Coding

DTC's data collection and coding processes began on the April 22nd and ended on June 14th, 2019. Our team covered a total of 13 sectors and one cross-cutting area in England, Scotland, Wales, and Northern Ireland, namely:

1. Accounting services.
2. Air transport.
3. Architecture services.
4. Computer services.
5. Construction.
6. Courier services.
7. Distribution.
8. Engineering services.
9. Legal services.
10. Logistics (cargo storage and warehousing).
11. Logistics (customs brokerage).
12. Maritime transport.
13. Road freight transport.
14. Digital services.

The results of the coding process are based on data available as of June 2019, when DTC completed its internal validation process. Sector selection was based on advice from BEIS, and partly reflects sectors chosen for analysis by the Department for the Economy, Northern Ireland (Shepherd et al., 2018).

DTC coded responses to approximately 900 variables, covering thirteen services sectors and one cross cutting area, four constituent nations and four bases for each jurisdiction. The coding process required the analysis of more than 200 regulatory and legislative sources. Most of these sources were freely available online, with only a few exceptions where DTC required expert assistance from BEIS. The final regulatory database, which has been supplied to BEIS, contains approximately 20,000 observations. In addition to quantitative answers based on our analysis of the relevant regulations, the database also includes lists of sources and links to primary legal documents.

The OECD Secretariat provided DTC with coding sheets identical to the ones used to undertake their own STRI data collection. To further ensure that the analysis of legislative and regulatory sources resulting in the final coding was rigorous, comparable, and transparent, DTC also relied on the OECD's Sector Guidelines.

The final data collected according to the OECD's protocols was submitted to its Secretariat, that graciously agreed to assist in producing aggregate STRIs using their own proprietary algorithm

to weight and convert data to summary indices. We discuss these results separately below. This section describes the data collection exercise in more detail, in the interests of being as transparent and replicable as possible.

In the remainder of this section, we discuss the coding exercises undertaken for each type of analysis we undertook. We first consider two “standard” STRI applications, namely policies applying to non-preferential trading partners (MFN), and those applying to selected preferential partners (EEA). We then move to develop two novel STRI applications designed to fit the needs of this project, and which summarize policies that each of the four UK constituent nations apply to their own service providers (self) and those they apply to service providers from other UK constituent nations (rUK for “rest of UK”). We provide details on the types of data collected, the sources consulted, and the methods used to ensure completeness and consistency. The presentation makes use of concrete examples that guide the reader through exactly how particular analytical decisions were made.

2.3.1 Standard STRIs

The standard OECD STRI contains information on MFN policies (those that apply vis-à-vis non-preferential trading partners) and EEA policies (those that apply to EEA countries). The novelty of the first part of our approach is to collect data in these two areas for the four UK constituent nations, following the original exercise of Shepherd et al. (2018) for Northern Ireland. This part of the exercise has two components: policies applied to service suppliers from EU member countries, and policies applied to other countries under the MFN rule. We consider each in turn.

MFN Policies

This coding exercise was meant to produce the standard OECD STRI based on MFN policies (general trade in services policy environment) that England, Scotland, Wales, and Northern Ireland respectively maintain as of 2019. The focus here was on gathering data on the extent to which regulatory measures affect the ability of third country nationals (except for EU countries) to do business in a given sector.

The baseline for this exercise was the OECD’s UK STRI that includes a data series for the UK as a whole (focusing primarily on the laws of England). Departures from the UK STRI were recorded in those cases where the laws of each devolved administration differed from the laws of England.

Since MFN data for England (OECD’s UK STRI) was given, and that for Northern Ireland was produced by DTC in 2018 (Shepherd et al., 2018), the outputs in this case were the following: MFN data for Scotland and MFN data for Wales.

The following steps were undertaken as part of the coding exercise:

- Identifying the complete set of laws and regulations cited in the OECD’s UK STRI.
- Verifying the extent to which those sources also applied to Scotland and Wales, and subsequently developing a list of specific Scottish and Welsh references.
- Thoroughly reading the specific Scottish and Welsh references, together with the OECD’s Sector Guidelines, to produce the final coding indices.

Online sources were used for the legal and policy research, supplemented by consultations facilitated by and directly with BEIS and the OECD.

To see how the coding process was undertaken in practice, we consider an example, namely measure 3_2_1 in Scotland's MFN sheet for the construction sector. This measure captures whether or not there is explicit preference for local suppliers in public procurement. The answer is "no", as is the case in other parts of the UK, even though the Scottish regulation is distinct from the law applying in the other three constituent nations. All of these factors are noted in the comments section, as is the influence of EU law.

Jurisdiction: Scotland

Basis: MFN

Sector: Construction

Heading: Other discriminatory measures

Variable no.: 3_2_1

Measure: Public procurement: Explicit preference for local suppliers

Answer 2018: no

Source 1: The Public Contracts (Scotland) Regulations 2015

Details 1: S, The Public Contracts (Scotland) Regulations 2015, No. 446, entered into force 18 December 2015, last amended on 19 October 2017, Sec. 19.

Hyperlink 1: <http://www.legislation.gov.uk/ssi/2015/446/contents/made>

Comments: Note that the UK Public Contracts Regulations 2015, which applies to England, Wales and NI, do not apply to Scotland, except for paragraph 19 of Schedule 6. While Art. 19(1) contains a general prohibition of discrimination, other more specific provisions (such as Arts. 30(19(b), 31(9)(b), and 57(1)) enshrine such principle as well. Contracting authorities have to give economic suppliers signatories to the GPA agreement and any other international agreement by which the EU is bound a treatment no less favorable than the treatment accorded to the economic suppliers of the EU. There is an open policy towards tenderers from third countries as well. This regulation implements Directive 2014/24/EU of 24 February of 2014 on public procurement.

Preferential (EEA) Policies

This coding exercise produces a preferential OECD STRI based on intra-EU policies that apply in England, Scotland, Wales, and Northern Ireland. The focus of this coding iteration was the treatment of EU service providers (and not rest-of-the-world) in the UK. The OECD's EEA UK STRI, which includes a data series for the UK as a whole, served as a baseline. Departures from the EEA UK STRI were recorded in those cases where the laws applicable in the devolved administrations differed from the laws that prevail in England.

Since EEA data for England (OECD's UK STRI) was given, and that for Northern Ireland was produced by DTC in 2018 (Shepherd et al., 2018), the outputs in this case were the following: EEA data for Scotland and EEA data for Wales.

The following steps were undertaken as part of the coding exercise:

- Identifying relevant EU Directives and Regulations applicable in each sector of interest
- Verifying transposition laws of those EU Directives and Regulations in the UK as a whole, and in Scotland and Wales specifically.
- Analysing each Directive and Regulation for Scotland and Wales-specific derogations or opt-outs.

Online sources were used for the legal and policy research, supplemented by consultations facilitated by and directly with BEIS and the OECD.

To see how the coding process was undertaken in practice, we consider an example, namely measure 4_8_53 in Wales's EEA sheet for the courier services sector. This measure captures whether or not the designated postal operator is exempted from certain transport regulations, such as parking regulations. The answer is "yes", based on the applicable law for Wales. As a result, competitive conditions for EEA courier service providers are not entirely neutral in this area, as they are required to comply with the regulations that the designated postal operator (a UK entity) is exempted from. The relevant sources are cited and hyperlinks provided.

Jurisdiction: Wales

Basis: EEA

Sector: Courier Services

Heading: Barriers to competition

Variable no.: 4_8_53

Measure: The designated postal operator obtains exemptions from transport bans

Answer 2018: yes

Source 1: Wales Civil Parking Enforcement Procedures.

Details 1: Wales Civil Parking Enforcement Procedures, sec. 41

Hyperlink 1: <https://www.wppp.org.uk/pdf/WPPP%20CPE%20Procedures.pdf>

Source 2: Goods Vehicles (Licensing of Operators) Act 1995.

2.3.2 UK-Specific STRIs

This section presents a novel application of the STRI methodology to produce intra-UK STRIs. Our approach is to consider two further types of regulations: "self", or the regulations that a jurisdiction applies to its own services providers, and "rUK", or the regulations that a jurisdiction applies to service providers elsewhere in the UK. Intuitively, differences between these two sets of policies would indicate areas where the UK internal market has issues of integration, as the regulatory measures captured by the two indices would show the difference in treatment between local service providers and those from other UK constituent nations.

2.3.2.1 Policies vis-à-vis Own Service Providers

This coding exercise produces an OECD STRI based on policies that apply in England, Scotland, Wales, and Northern Ireland to service providers operating in their respective home constituent nations. It is referred to as “self” in shorthand, in the sense that it represents the set of policies applied by a jurisdiction to its own service providers. DTC’s MFN STRIs for Northern Ireland, Scotland, and Wales were used as a baseline, and so was the OECD’s MFN STRI for England. The outputs in this case were the following: self data for England, Northern Ireland, Scotland, and Wales.

The following steps were undertaken as part of the coding exercise:

- Carefully analysing the MFN STRIs for each jurisdiction and keeping the sources and answers that apply in an equal manner to rest of the world service providers and home service providers. These would be the rather more technical variables that have to do with the necessity of owning a license to practice law for example.
- For the variables that record restrictions to the freedom of movement of people, the same answers used in the EEA STRIs were maintained, whereas different sources to justify this coding in the UK internal market were used (where applicable).

Online sources were used for the legal and policy research, supplemented by consultations facilitated by and directly with BEIS and the OECD.

To see how the coding process was undertaken in practice, we consider an example, namely measure 1_7_1 in Wales’s self sheet for the road freight transport sector. This measure captures whether or not acquisition and use of land and real estate is restricted. The answer is “no”, based on the relevant law, which is directly applicable to Wales as well as England. The relevant sources are cited and hyperlinks provided.

Jurisdiction: Wales

Basis: Self

Sector: Road freight transport

Heading: Restrictions on foreign entry

Variable no.: 1_7_1

Measure: Acquisition and use of land and real estate by foreigners is restricted

Answer 2018: no

Source 1: Acquisition of Land Act 1981.

Details 1: E+W, Acquisition of Land Act 1981, c. 67, entered into force on 30 October 1981, last amended on 3 October 2018.

Hyperlink 1: <http://www.legislation.gov.uk/ukpga/1981/67/contents>

Source 2: Land Registration Act 2002.

Details 2: E+W, Land Registration Act 2002, c. 9, entered into force on 26 February 2002, last amended on 1 March 2019.

Hyperlink 2: <http://www.legislation.gov.uk/ukpga/2002/9/contents>

2.3.2.2 Policies vis-à-vis Other UK Service Providers

The focus of this coding iteration was the treatment of UK services providers in each of its constituent nations. That is to say, the manner in which Welsh, Scottish, and English service providers (collectively) are treated in Northern Ireland, for example. In shorthand, this STRI is referred to as “rUK”, in the sense that it is policies in one UK jurisdiction as they affect service providers from other UK constituent nations.

DTC’s MFN, EEA, and Self STRIs for Northern Ireland, Scotland and Wales were used as a baseline, and so were the OECD’s respective STRIs for England. The outputs in this case were the following: rUK data for England, Northern Ireland, Scotland and Wales.

The following steps were undertaken as part of the coding exercise:

- Carefully analysing the MFN STRIs for each jurisdiction and keeping the sources and answers that apply to rest of the world service providers and RUK service providers in an equal manner. These would be the rather more technical variables that have to do with the necessity of owning a license to practice law for example.
- For the variables that record restrictions to the freedom of movement of people, the same answers used in the EEA STRIs were maintained.

Online sources were used for the legal and policy research, supplemented by consultations facilitated by and directly with BEIS and the OECD.

To see how the coding process was undertaken in practice, we consider an example, namely measure 1_5_2 in Scotland's rUK sheet for the construction sector. This measure captures whether or not screening exists without exclusion of economic interests. The answer is "no", based on the applicable law, which is derived from UK-wide measures as well as EU law. The relevant sources are cited and hyperlinks provided.

Jurisdiction: Scotland

Basis: rUK

Sector: Construction

Heading: Restrictions on foreign investment

Variable no.: 1_5_2

Measure: Screening exists without exclusion of economic interests

Answer 2018: no

Source 1: Enterprise Act 2002.

Details 1: UK, Enterprise Act 2002, c. 40, entered into force on 7 November 2002, last amended on 1 July 2018, Sec. 42 and 58.

Hyperlink 1: <http://www.legislation.gov.uk/ukpga/2002/40/contents>

Source 2: Finance Act 1987

Details 2: Finance Act 1987, c. 16, entered into force on 15 May 1987, last amended on 10 September 2016.

Hyperlink 2: <https://www.legislation.gov.uk/ukpga/1987/16/contents>

Source 3: Directive (EEC) on the abolishment restrictions on movements of capital.

Details 3: Council Directive 88/361/EEC of 24 June 1988 for the implementation of Article 67 of the Treaty, OJ L 178/5, pp. 5- 18, entered into force on 24 June 1990.

Hyperlink 3: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31988L0361>

Comment: Under UK law, there is no obligation to notify transactions, but the UK government may intervene in a merger or acquisition transaction involving a transfer of material influence (above 15% shareholding) on public interest grounds when certain criteria listed in section 58(1)-(2D) of the Enterprise Act are met. Where the investigation subsequently finds that the merger operates against the stated public interest consideration, remedial measures may be taken including blocking the merger altogether or allowing it to proceed subject to certain conditions. However, no screening without the exclusion of economic interests under EU law.

2.4 Regulatory Heterogeneity

The OECD STRI methodology measures the restrictiveness of services policies, and can be adapted to be specific to particular types of transaction, as discussed above. An additional dimension of policy-related trade costs that is of particular relevance to services trade is regulatory heterogeneity. This concept captures the idea that regulatory policies affect the production technologies used by firms. As a result, differences in regulation—even without overall differences in restrictiveness—can affect trade costs, by making it necessary for firms to adopt different production technologies for different types of transactions (domestic versus cross-border with particular partners).

The OECD STRI is based, as discussed above, on detailed regulatory questionnaires that code jurisdiction-level regulatory measures by sector. Comparing answers to the questionnaire across constituent nations can provide the basis for a measure of regulatory heterogeneity, that is to say, the extent to which regulations differ across constituent nations, without necessarily concluding that one constituent nation is more restrictive than the other. Nordas (2017) develops such a measure using OECD data, including development of a custom algorithm that aggregates differences in individual questionnaire responses to an overall measure of regulatory heterogeneity across constituent nations within a sector. She shows that a higher level of regulatory heterogeneity is indeed associated with reduced bilateral trade in services.

We follow the Nordas (2017) approach here, and apply the same algorithm to the problem of measuring regulatory heterogeneity across UK constituent nations, with the assistance of the OECD Secretariat. We then compare these measures with OECD data on regulatory differences across a set of comparator countries from within the EU.

2.5 Conversion of STRIs to Ad Valorem (Tax) Equivalents

As noted above, an STRI is a quantitative summary of the restrictiveness of policies affecting trade in services. A higher score indicates greater restrictiveness, but a score of, say 0.5, does not indicate that policies are necessarily “twice” as restrictive as a score of 0.25. The interpretation is largely ordinal, and scores cannot easily be compared across sectors.

To undertake more detailed comparisons, a necessary intermediate step is to convert them to AVEs. An AVE is, simply, the tariff (tax) equivalent of a particular STRI score. So if we say that a score of 0.5 equates to an AVE of 20%, it means that the policy restrictions together drive a 20% wedge between the price paid by the consumer in the importing country, and the price received by the producer in the exporting country. This approach involves a major simplification, namely an assumption that services policies can be properly understood as primarily affecting variable trade costs (per shipment). It is likely that many services policies in fact create fixed cost barriers to market entry, in the sense that the cost must be paid once regardless of quantity shipped (see Dee, 2005, for a review). Such barriers are likely more distortionary than variable cost barriers because they reduce competition in the importing market. As a result, we believe that AVEs represent a lower bound for the actual level of economic distortion introduced by services policies.

An economic model is necessary to convert an STRI score to an AVE. Many approaches are possible, but the simplest is to use a gravity model, which expresses bilateral trade between two countries as proportional to their economic sizes, and inversely proportional to the trade costs (including policies) between them. This is the approach adopted by the OECD (Benz, 2017), which we adapt here, following Shepherd et al. (2018). Full details are in the Annex, but an intuitive explanation is that the STRI is one of many factors that affect trade costs. By using the data to estimate a relationship between trade flows and the STRI, we can—at the price of an assumption described in the Annex—estimate the difference in trade costs between the STRI as currently measured and a hypothetical STRI of zero, which would be consistent with a fully open market. This is the AVE of a country’s STRI score. For this report, we use the econometric estimates reported in Shepherd et al. (2018) and apply them to the STRI scores calculated here.

2.6 Results and Discussion

Figures 4 through 7 show STRI scores by sector, converted to AVEs using the methodology described above and set out in detail in the Annex. The figures are presented on different scales, so policy restrictiveness needs to be compared with care across panels and figures. The vertical axis groups results by constituent nation and type of trade, as per the classification discussed above. Full results in table format are available in the Annex, which also contains graphs that break down STRI scores into five major components: restrictions on foreign entry, restrictions on movement of people, barriers to competition, regulatory transparency, and other discriminatory measures.

The first point to emerge from the figures is that in all cases, MFN treatment is substantially more restrictive than any of the other data points. AVEs are typically at least twice as high for MFN trading partners—those outside the EU—than for preferential trading partners, or for intra-national trade. For England, MFN services policies have an AVE of 19% on average, compared with 7% for EEA partners, and a very slightly lower average AVE with other UK partners. For Northern Ireland, MFN policies have an AVE of 24%, compared with 8% for EEA partners and 7% for other UK constituent nations. For Scotland, policy restrictions vis-à-vis MFN partners amount to an AVE of 20% compared with 7% for EEA partners and other UK constituent nations. Finally, for Wales, MFN restrictiveness is again 20%, compared with 7% for EEA partners and other UK constituent nations. Variation across constituent nations is relatively small for most sectors, but there are exceptions, like legal services, where there is substantial variation: MFN policies range from 14% in England and Wales to 84% in Northern Ireland, for example. In terms of the sectoral distribution of AVEs, we find that restrictiveness is highest in legal services and courier services, while it is lowest in engineering services.

The general pattern of results is entirely expected, and is in line with the findings of Shepherd et al. (2018) for Northern Ireland. Our results on MFN versus EEA treatment also sit well with the similar conclusion from a different methodology of Mayer et al. (2018), as well as Benz and Gonzalez (2019).

To put these results into perspective, it is important to remember that restrictive services policies not only limit the ability of service providers to access foreign markets, since regulation is effectively part of their production technology; they also limit the ability of domestic firms to access services inputs at competitive prices. Shepherd (2019) shows that as a result of the important role that services play as intermediates in the production of manufactured goods—approximately one third of the gross value of manufactured goods exports is in fact embodied services value added—there is actually a close relationship between liberal services policies and manufacturing export performance. The model in that paper suggests that the UK's total manufacturing exports would be nearly 3% higher if policy measures included in the STRI were liberalized so as to reduce the STRI score by 10%.

The second major finding is that policy restrictiveness is generally quite similar across the four UK constituent nations. Indeed, it is exactly identical in many cases, and only legal services stands out as having major differences across constituent nations. At a micro level, there are small differences, however. Taking MFN treatment as a benchmark, the tables in the Annex show that there are differences in policy restrictiveness in the following sectors: air transport, distribution, legal services, and logistics storage and warehousing. In all cases except legal services, the size of the difference in restrictiveness is not substantial, and could be characterized as stemming from relatively minor policy differences that are best understood through the lens of heterogeneity rather than as significantly more or less restrictive in particular constituent nations. However, these differences could be of interest from a policy perspective.

In distribution, for example, Scotland does not impose maximum limits on shop opening times, whereas all other constituent nations do; this more liberal approach could be of interest to policymakers elsewhere. In air transport, England does not have schedules for airport use, whereas the other constituent nations do. Again, the more liberal approach may be of policy interest. In both cases, the preference for a liberal regulatory stance is consistent with the desire to facilitate trade within the UK.

A third important finding is that in all sectors except legal services, self and rUK treatment—capturing regulations affecting firms from the jurisdiction in question and those from other parts of the UK—are very close. Indeed, in many cases they are identical. Based on this result, as well as our review of the relevant regulations, we conclude that in the sectors under consideration, there is very little evidence of what could be called overt discrimination: the use of regulatory measures to directly slant the playing field in favour of local service providers by discriminating against those based in other UK constituent nations. One case that requires further explanation is road freight transport. In England, Wales, and Scotland, the law requires an operator seeking a license to be established in “Great Britain”; as such, establishment in Northern Ireland would appear, on the face of it, to be insufficient to support an application for a license in those constituent nations. Similarly, in Northern Ireland, the law requires an operator to be established in Northern Ireland, so establishment elsewhere in the UK would appear to be insufficient to support a license application. We have not investigated the legislative history of these requirements, and so cannot conclude as to whether or not the discrimination introduced by the distinction between Great Britain and Northern Ireland is intentional, or an artefact of the drafting process. In any case, this example stands out against a general pattern where no such measures are in evidence in other sectors. However, in the case of road freight transport, the discrimination present in the law does not appear to have any de facto implications for market entry due to equivalent regulations in Northern Ireland and the other parts of Great Britain, which provide for mutual recognition of licenses. In terms of our coding, the measure is coded as discriminatory in the database, as we are concerned with de jure measures, but it does not affect the final STRI as it is down-weighted to zero by the OECD’s aggregation algorithm.

The final key finding from the STRIs is that the self and rUK measures are typically very close to, often identical to, the EEA value. In other words, policies affecting operators within a UK jurisdiction and across UK constituent nations are essentially the same as the policies affecting operators from EU member states. The data only disclose limited departures from this general picture. In legal services across all four constituent nations, conditions facing intra-UK suppliers are very slightly more favourable than those facing EU suppliers, a difference of a percentage point or so in AVE terms. There are differences of a similar order of magnitude in logistics storage and warehousing in all constituent nations. In addition, there are small differences, again no more than one percentage point, in Northern Ireland for maritime transport and road freight transport. From a purely economic standpoint, the regulatory differences do not translate into significant AVEs.

It is important to be clear about the limitations and caveats attached to these results, and the way in which they play out in particular cases. The first key caveat is that we only consider legal measures, not their de facto implementation, and we code them so as to be consistent with the remainder of the OECD STRI database. The rationale for proceeding in this way is primarily to ensure comparability of results for the UK with results for other countries already in the OECD database. But it results in some complications in particular cases, notably legal services. EU-registered lawyers are subject to a different regime from lawyers moving within the UK, but there are exam requirements in both cases due to significant legal differences among UK constituent nations. It is possible that these requirements are implemented differently in the two cases, but both legal regimes allow for exemptions granted by professional bodies, so the measure is coded

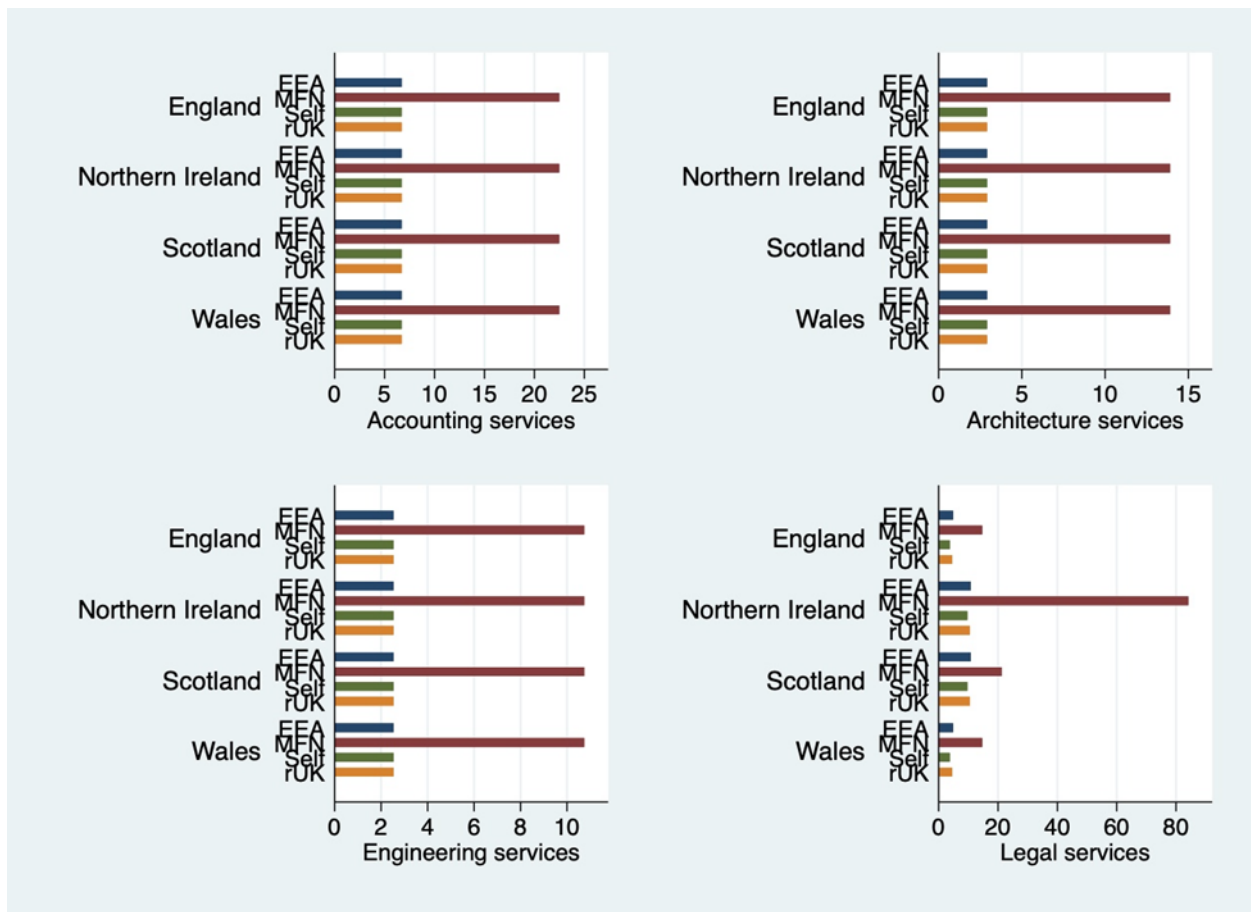
as non-restrictive and any de facto differences are not accounted for. The reason for coding the measure in this way is that it reflects the approach taken elsewhere in the OECD database, and thereby ensures comparability. Coding these measures as restrictions in the UK but not in other OECD countries would give the appearance of a more restrictive regime in the UK relative to OECD comparators.

A second instance in which consistency plays a significant role is in the distribution sector. Given the STRI's development in the international arena, it contains data on trade facilitation measures that affect the ability of distribution firms to conduct business. For instance, one measure that is captured is whether or not pre-arrival processing by Customs is possible. Clearly, Customs is not active in relation to intra-UK trade. But coding this measure as "no" would result in a restrictive score for intra-UK trade relative to intra-EEA trade, where the OECD database codes the measure as "yes" to reflect the fact that goods move without Customs frictions across borders within the Single Market. We therefore follow the OECD coding once again, in order to ensure comparability.

In addition to the issues of consistency and legal versus de facto measures, it is also important to stress that the STRI was developed in the context of international trade. It therefore focuses on measures that affect the ability of firms to enter international markets and do business abroad. Moreover, the regulatory database includes measures that receive low, or even zero, weight when aggregated into overall sectoral STRIs. Such down-weighting of particular types of regulation means that the discrimination we have identified in the road transport sector does not result in different AVEs for EEA and rUK treatment because the measure is not considered to be a binding constraint on the ability of firms to do business.

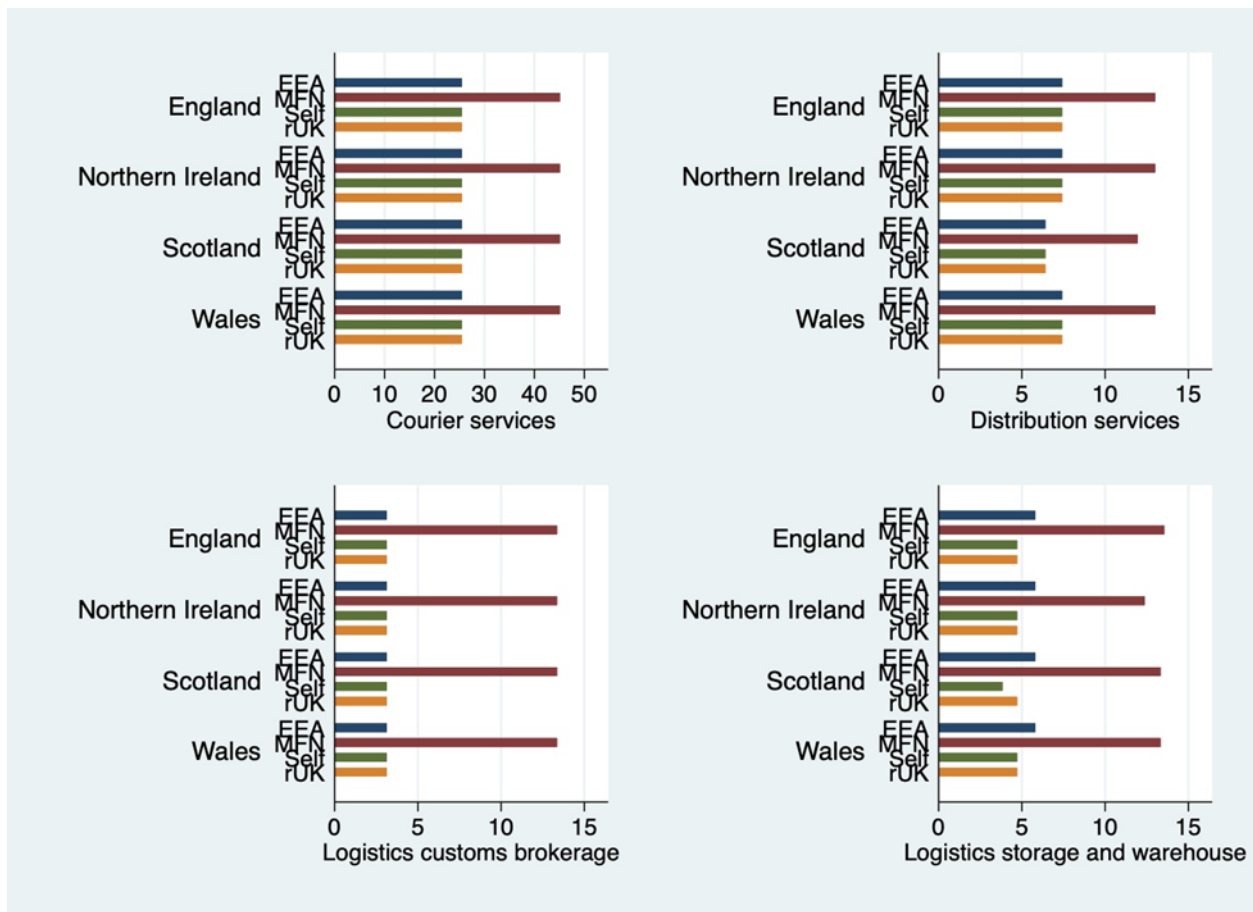
The STRI's measures are typically also relevant to internal trade within a country, in the sense that restrictions in these areas would similarly limit the ability of firms to contest markets across internal boundaries. However, given that the internal market is much more integrated than most international markets, it may be the case that business is facing constraints and burdens that are simply not captured in the STRI at this stage. Having shown here that there are relatively few barriers to internal trade relative to external trade in most sectors, we believe it is important to continue the work of developing data on internal market completion. In particular, we believe there is a case for using this analysis as a starting point for an ongoing dialogue with business and professional associations to identify cases of significant frictions in the internal market.

Figure 4: AVEs of STRI scores in selected sectors (percent).



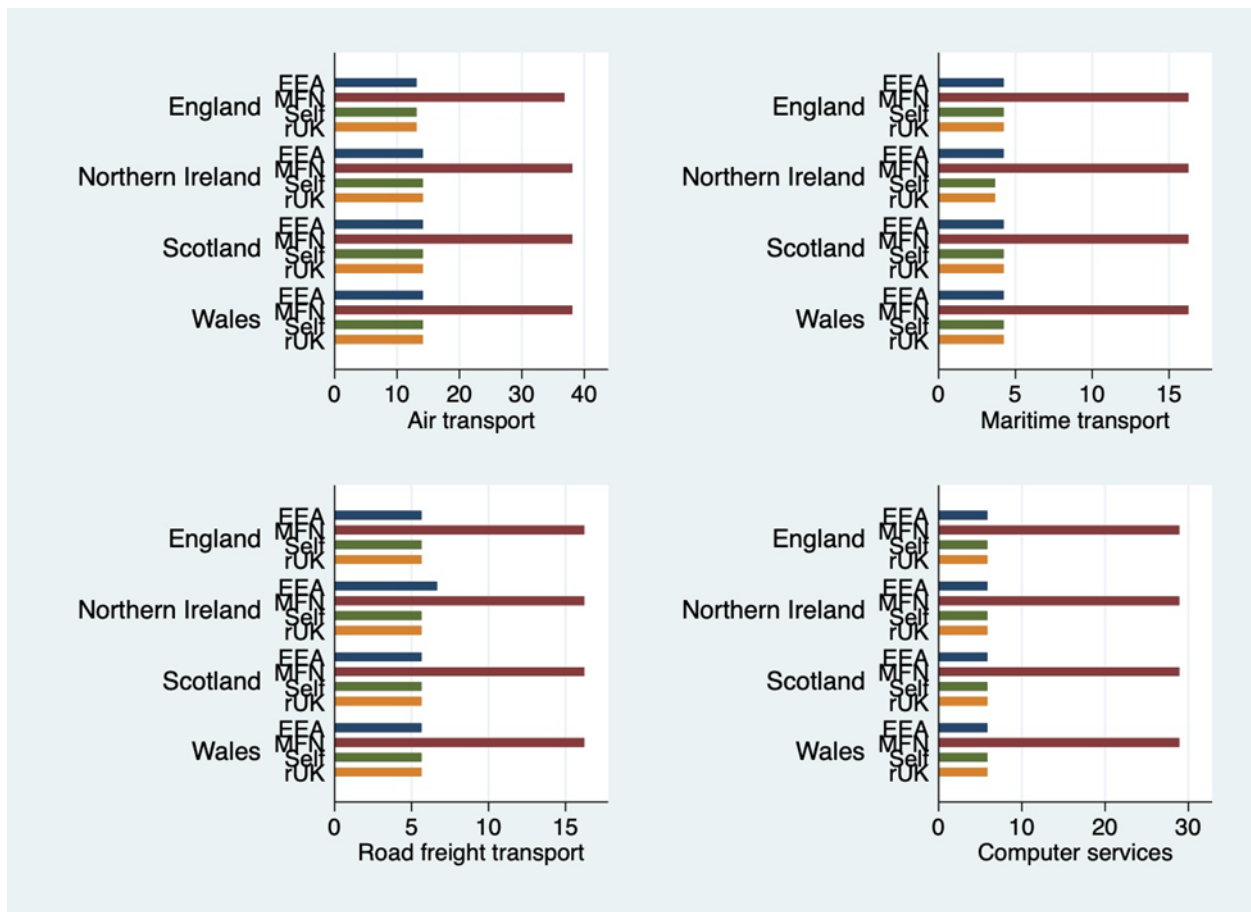
Source: Authors' calculations. Note: Each graph is on a different scale, so readers should exercise caution when comparing AVEs across sectors.

Figure 5: AVEs of STRI scores in selected sectors, continued (percent).

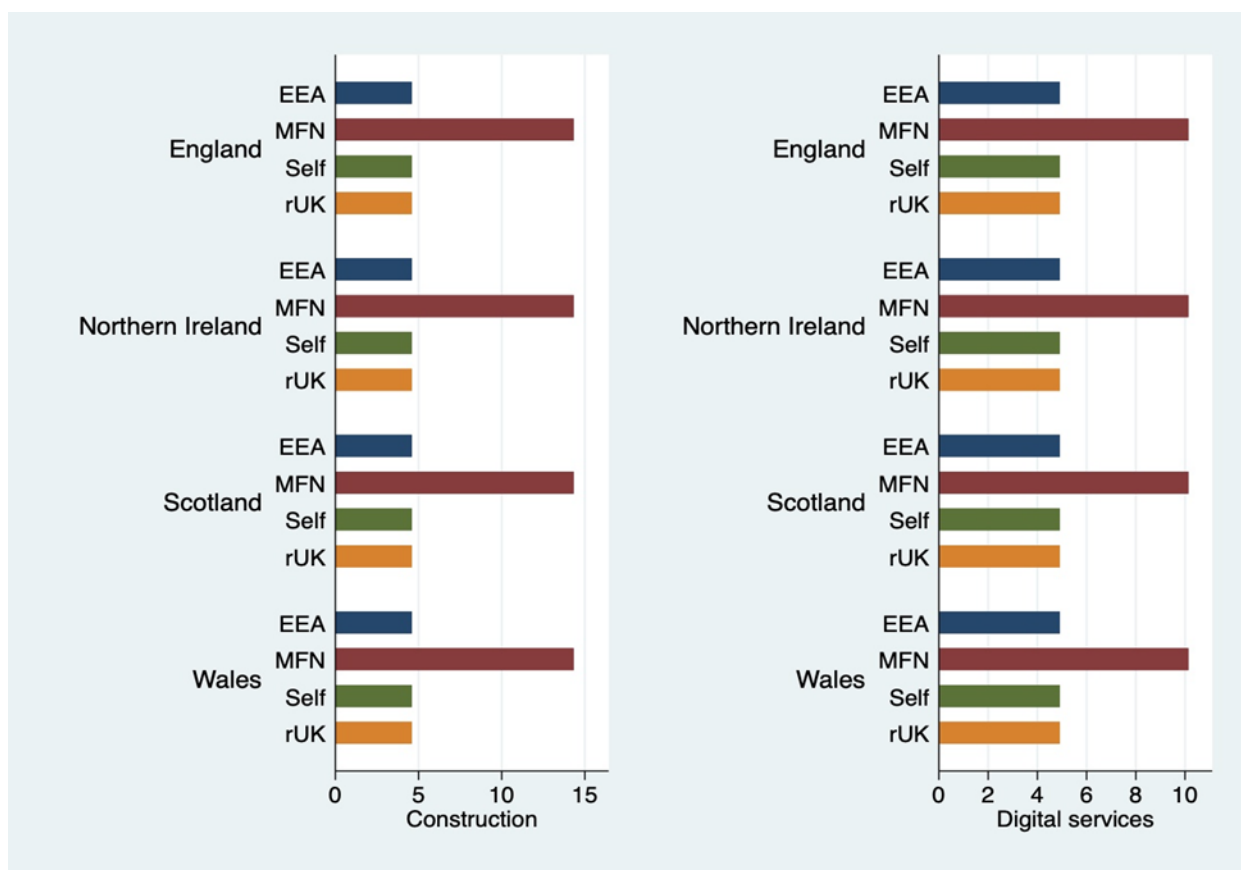


Source: Authors' calculations. Note: Each graph is on a different scale, so readers should exercise caution when comparing AVEs across sectors.

Figure 6: AVEs of STRI scores in selected sectors, continued (percent).



Source: Authors' calculations. Note: Each graph is on a different scale, so readers should exercise caution when comparing AVEs across sectors.

Figure 7: AVEs of STRI scores in selected sectors, continued (percent).


Source: Authors' calculations. Note: Each graph is on a different scale, so readers should exercise caution when comparing AVEs across sectors.

In terms of assessing the degree of integration of the UK internal market for services, the above results suggest that there are indeed relatively few obstacles to the free flow of services among UK constituent nations. There are almost no instances of overt discrimination of the type that is frequently seen in international trade, where the playing field is explicitly tilted in favour of local firms. Naturally, there are, however, regulatory differences across constituent nations that could give rise to trade costs. In addition, some regulatory measures inherently come with costs attached, and they are also captured by our measure. A relatively integrated internal market does not require AVEs of zero across sectors; indeed, even trade within a single geographical location is not subject to an AVE of zero: it is always necessary to incur some level of cost in order to connect buyers with sellers. Rather, we would expect to see AVEs that are substantially lower than MFN AVEs, and which do not vary substantially according to whether it is intra-jurisdictional transactions or cross-jurisdictional transactions that are in question. That is exactly what we in fact observe in the results.

An open question, however, relates to the legal and institutional mechanisms that have given rise to a reasonable degree of completeness of the UK internal market. One hypothesis is that the obligations of the EU Single Market may have played a structuring role in terms of the regulations governing the UK internal market on a sectoral basis. The idea is that since service providers in all UK constituent nations are, under current arrangements, also EU service providers, there may have been a substantial impact on the UK internal market of efforts to complete the EU Single Market by removing undue burdens on cross-border service provision within the EU. To investigate this possibility, we conducted an ex post analysis of our regulatory database to identify instances where EU law is cited among the regulatory sources used for coding individual measures. We focus in particular on the rest of UK (or rUK) basis for coding,

which captures the key measures that structure the internal market, in the sense of regulatory measures that govern movements of services across constituent nations within the UK. This exercise makes it possible to provide summary statistics on the number of individual measures in the database that are sourced from EU law, as opposed to those that are UK only. Given that the exercise was conducted ex post, results are necessarily imperfect. Readers should exercise considerable caution in interpreting this analysis, as it is necessarily impressionistic and approximate; a more detailed analysis may well produce different results. Moreover, without examining in detail the legislative history of each measure, it is impossible to identify the full range of cases in which EU law has played a structuring role. Nevertheless, tallying indicators where an EU Regulation or Directive is listed as among the legislative sources enables us to put a lower bound on the extent to which individual sectors have been structured, over time, by EU legal obligations.

Results are in Table 2. While there is considerable variance across sectors in terms of the percentage of recorded measures that come from EU law, we can provide two general findings. The first is that in all areas, EU law has indeed played a substantial role in terms of structuring the UK internal market. The market access conditions governing cross-jurisdictional movements of services within the UK use EU law as an important source, over 50% of all relevant measures in the case of computer services and air transport (except Northern Ireland). The second finding is that the proportion of measures sourced from EU law is quite comparable across constituent nations within the UK, as would be expected based on the fact that member states are required to enact the provisions of EU law. Although there are differences, they are usually relatively small and could reflect the inexactness of the measure, as mentioned above. Caveats are in order in terms of interpreting these results, but a clear implication is that the evidence currently available suggests that EU law has played a relatively similar role in structuring cross-jurisdictional services trade in all UK constituent nations. The hypothesis put forward above—that in the absence of a general legal obligation to preserve free trade, EU law may have filled at least part of the role typically played by written constitutions in other countries—seems to be supported by the data. The role of EU law is partial, but consistent across jurisdictions and significant.

Table 2: Percentage of measures by jurisdiction (rUK basis) and sector that are sourced from EU law.

Accounting services	11%	12%	12%	12%
Air transport	50%	47%	54%	53%
Architecture services	29%	31%	31%	31%
Computer services	78%	56%	56%	52%
Construction	17%	13%	13%	13%
Courier services	13%	13%	15%	17%
Distribution services	21%	22%	22%	22%
Engineering services	9%	13%	13%	13%
Legal services	9%	22%	22%	22%
Logistics	16%	17%	16%	16%
Maritime transport	18%	26%	19%	19%
Road freight transport	35%	35%	35%	35%

Source: Authors' calculations.

We have also calculated regulatory heterogeneity measures, using the methodology in Nordas (2017). Taking England as the benchmark jurisdiction and comparing its regulations with those prevailing in other UK constituent nations, we find that regulatory heterogeneity is only present in legal services (AVE of 5%) with Scotland and Northern Ireland, distribution services (1%) with Scotland, and air transport services (1%) with all three other constituent nations. Given the lack of internal market data for other countries, it is impossible to make a direct comparison. But we can put the UK results in context by looking at the degree of regulatory heterogeneity between countries with very close historical linkages. For instance, the degree of heterogeneity between England and Scotland in distribution is 0.010 index points, while for intra-EEA policies in Belgium and Luxembourg, it is 0.03, or for the Czech Republic and the Slovak Republic it is 0.04. This comparison, which is admittedly imperfect, suggests that the degree of heterogeneity among UK constituent nations is substantially less than what is observed between EU member states with close historical connections that could be expected to translate into low regulatory heterogeneity scores. Similar findings are apparent for air transport, whereas for legal services, the degree of regulatory heterogeneity observed within the UK is approximately the same as between Belgium and Luxembourg. We conclude from this review that despite the use of distinct legal instruments

in individual constituent nations in some cases, the UK internal market typically displays very little regulatory heterogeneity, as there is no apparent difference in key regulatory structures in most sectors. Where differences are apparent, they are usually relatively slight, although the case of legal services is one where a more substantial degree is present. Combining relatively little regulatory heterogeneity with a near absence of overt discrimination leads to the conclusion that the UK internal market in services is quite integrated relative to benchmarks like the extent of completeness of the EU Single Market, focusing on closely linked countries where markets can be assumed to be more integrated than in other cases.

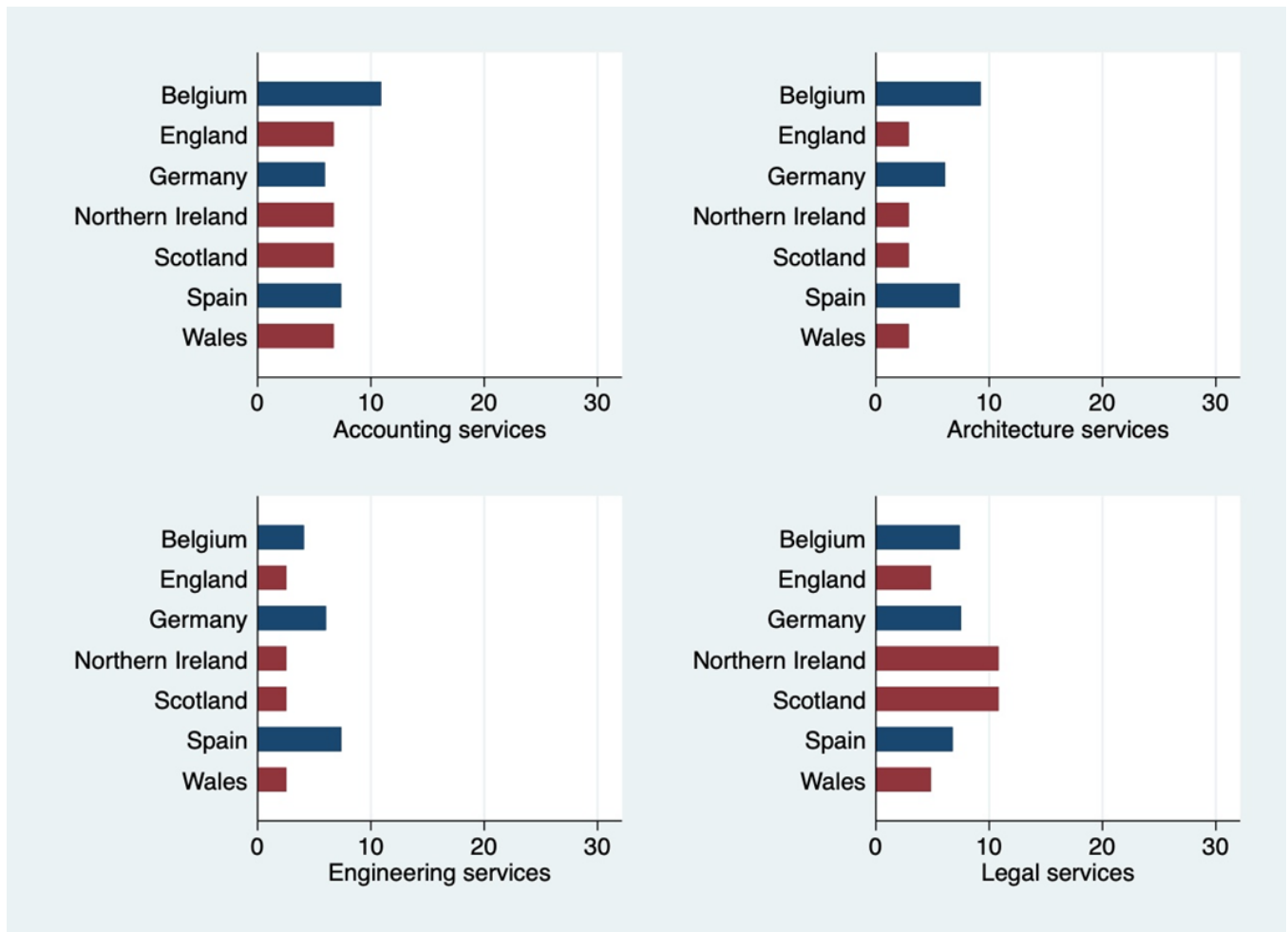
2.7 International Comparison

It is impossible to compare services trade restrictiveness within the UK, or regulatory heterogeneity, with the situation that pertains within other countries, due to a lack of relevant data. However, given the very strong similarities we have observed between regulatory measures affecting trade with EU partners and those affecting trade within the UK, it is not unreasonable, especially given the core tenets of the EU Single Market, to assume that a similar situation may pertain in other EU member states. As such, it could be informative to compare what we have termed the EEA basis for UK constituent nations with similar measures for comparator countries. We focus on countries that have legislative decentralization as a feature of their institutional makeup, namely: Germany and Belgium (both federations), and Spain (a unitary country with substantial decentralization). We compare treatment of EEA-based service providers in each of these countries with the same treatment in UK constituent nations. For this step of the analysis, we use the treatment of EEA nationals as a proxy for the treatment of service providers from other jurisdictions within the country under consideration. We recognize that this is a somewhat crude measure, but draw on the findings for the UK to pose this proxy as a working assumption. Subject to these caveats, this exercise can provide a very preliminary indication of the degree of completion of the UK internal market relative to the internal markets in the comparator countries.

Figures 8 through 11 present results, where all STRI scores have been transformed to AVEs using the methodology described elsewhere. In accounting services, air transport, computer services, courier services, construction, distribution, the two logistics sectors, and maritime transport, policy restrictiveness in the four UK constituent nations is quite similar to what is observed in the three comparators. To the extent that EEA policies are informative as to the internal markets of the comparators, it would follow that the degree of integration of the UK internal market—again, framed by the EU Single Market—is very comparable. In architecture and engineering, policy restrictiveness in the four UK constituent nations is notably lower than in the comparators, so under the same reasoning, that would tend to indicate a more integrated UK internal market relative to the three comparators. In road freight transport and legal services, however, the opposite is true.

In painting these broad conclusions, it is important to stress that the three comparators serve as a group, but in fact there are some sectors where policy restrictiveness can differ markedly across them. For instance, in courier services, Germany has a noticeably less restrictive policy environment than the other constituent nations considered. In other words, there are cases where even though the integration of the UK's internal market appears comparable to at least one of the comparators, taking the group individually suggests that there could be room for achieving a higher degree of internal market integration. Again, we do not directly observe the state of cross-jurisdictional but intra-national policies in the comparators, so we use EEA policies as a proxy. The analysis therefore shows that in an overall sense, the level of integration of the UK's internal market is comparable to what is observed in other countries with somewhat similar internal situations, but there are individual examples where it could be possible to promote greater market integration within the UK.

Figure 8: AVEs of STRI scores vis-à-vis EEA service providers in selected sectors (percent), UK and comparisons



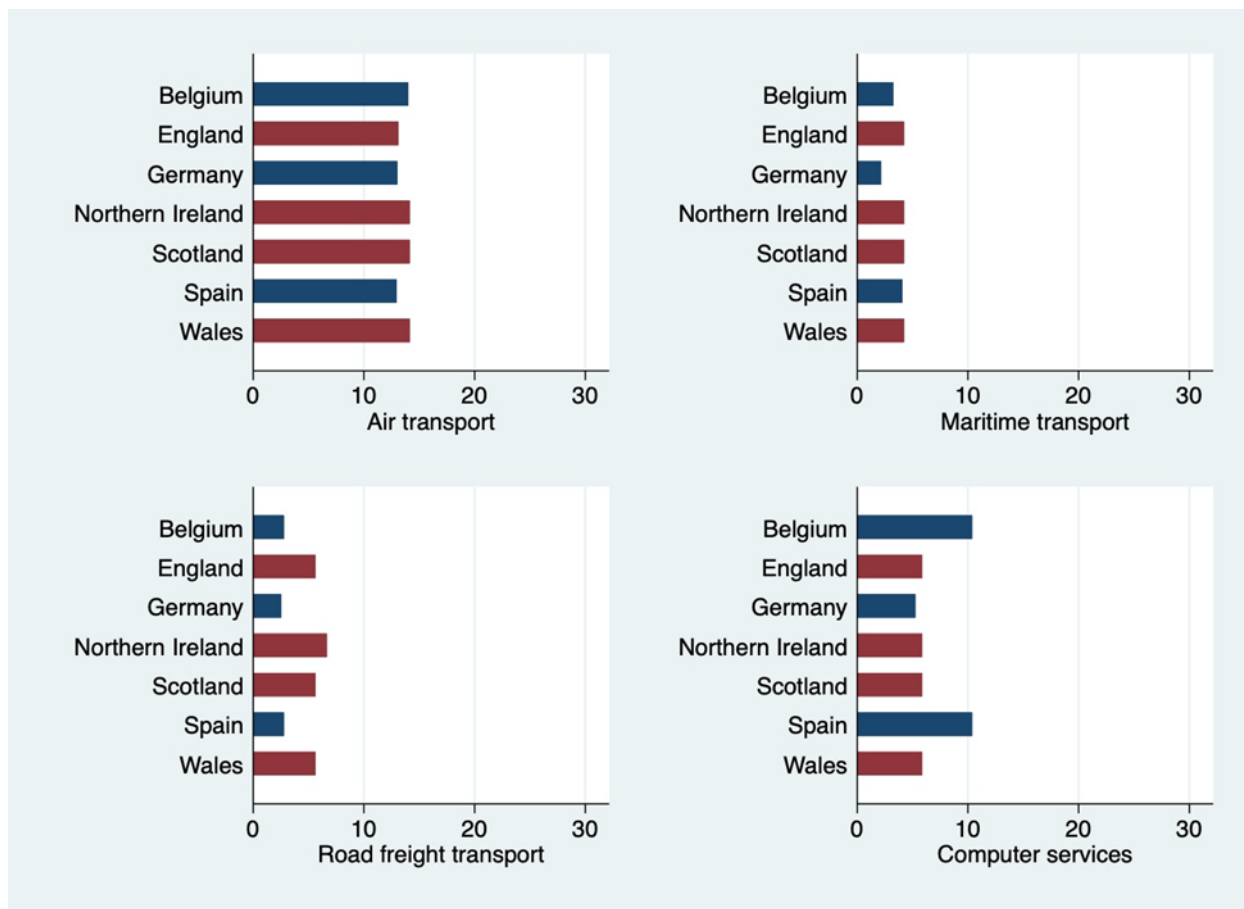
Source: Authors' calculations.

Figure 9: AVEs of STRI scores vis-à-vis EEA service providers in selected sectors (percent), UK and comparators (continued).



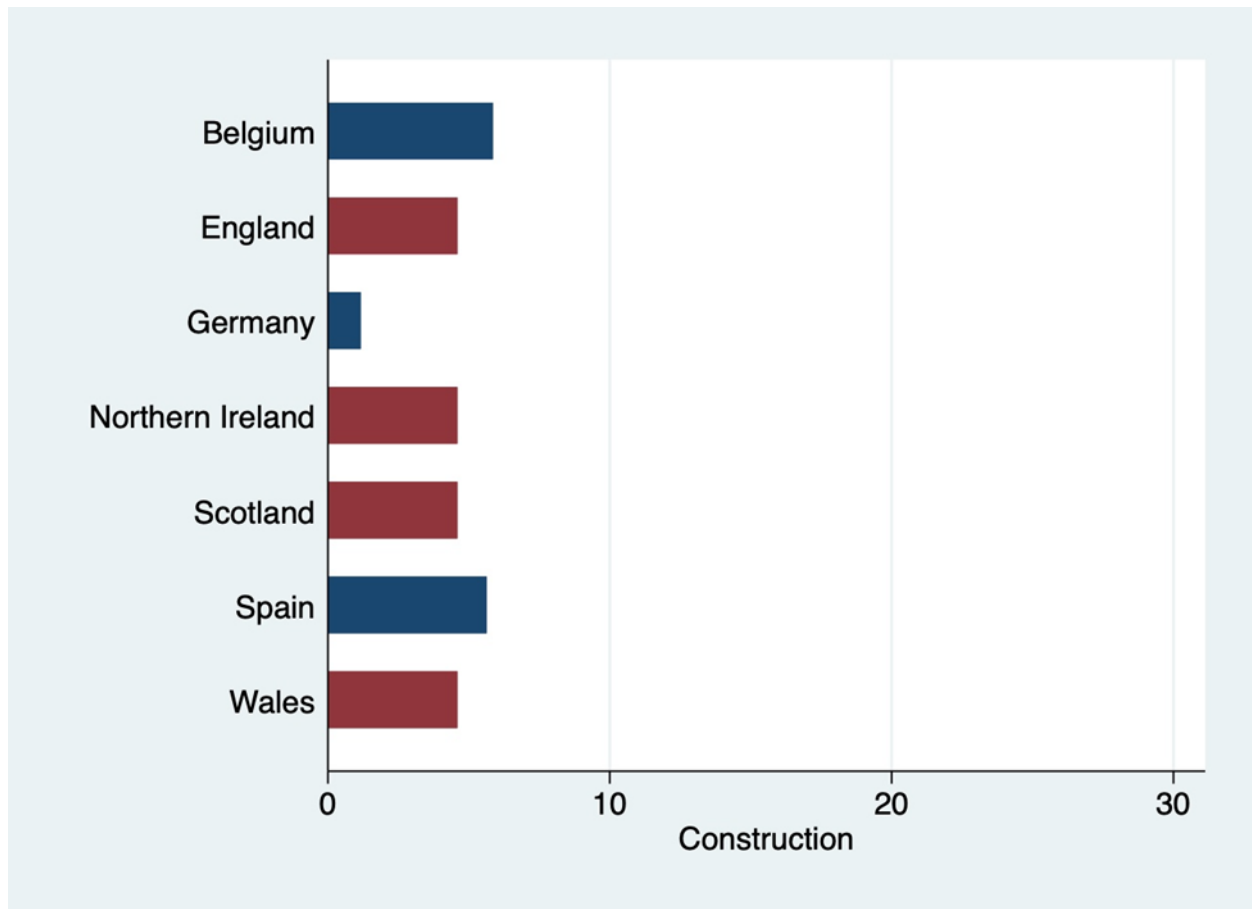
Source: Authors' calculations.

Figure 10: AVEs of STRI scores vis-à-vis EEA service providers in selected sectors (percent), UK and comparators (continued).



Source: Authors' calculations.

Figure 11: AVEs of STRI scores vis-à-vis EEA service providers in selected sectors (percent), UK and comparators (continued).



Source: Authors' calculations.

3 Trade Costs and the UK Internal Market

In a classic paper, Anderson and Van Wincoop (2004) define trade costs as including “all costs incurred in getting the good to a final user other than the marginal cost of producing the good itself” (page 691). In other words, trade costs include some costs that are difficult to shrink significantly through policy action, such as geography-related transport costs, and others that are more amenable to action, such as policy measures that affect the ability of foreign producers to enter local markets. From a purely economic point of view, even domestic market transactions are subject to trade costs: buyers and sellers need to match with each other, which can involve the costly gathering of information, and there is a need to move goods or bring about geographical proximity in services markets. Anderson and Van Wincoop (2004) show that trade costs measured in this way are large, amounting to 170% as an estimate of the trade costs facing a representative high income country in international markets. This result is confirmed by Arvis et al. (2016), who show that trade costs in the developing world are even higher, and by Miroudot et al. (2013) who show that trade costs in services markets are substantially higher than in goods.

Trade costs are an informative summary measure of the degree of integration of different markets: if one pair of markets exhibits lower trade costs than a second comparator pair, it is legitimate to conclude that the first pair is more integrated than the second pair. As an example of this approach, Arvis et al. (2016) show that high income countries are more integrated into the global economy than are low and middle income countries, on the basis that trade costs are lower in the first group than in the other groups. With this approach in mind, this section presents a general methodology for measuring trade costs, and applies it to the UK internal market in an effort to analyse the extent of integration among the four UK constituent nations.

3.1 Overview of Approach

As noted above, trade costs is a very broad concept, covering all costs that must be paid in order to bring a good to market, other than the cost of producing the good itself. As such, trade costs include a range of policy factors, in addition to geographical and historical factors. Trade costs are typically expressed in AVE terms. If it costs £10 to produce one unit of a product but the final consumer price is £20, trade costs are £10 per unit, or 100% in AVE terms.

For the purposes of this report, we are calculating trade costs among UK constituent nations to provide a metric of market integration within the UK: lower intra-UK trade costs would imply a more integrated internal market. The first step in the methodology is therefore to calculate trade costs for each UK jurisdiction. However, the absolute level of trade costs is not necessarily informative for policy purposes: there needs to be a point of comparison. We therefore also calculate trade costs for other countries, focusing on three that are in a reasonably comparable situation as regards legislative decentralization: Belgium and Germany (both federations), and Spain (a unitary state). The reason for focusing on these countries is that we are interested in comparing trade costs, as an indicator of market integration, across countries where internal market integration may be an issue due to legislative decentralization.

Comparing all-inclusive measures of trade costs can be informative of the relative degrees of market integration in different countries. But for policy purposes, it is important to try and isolate the part of trade costs that is due to policy factors. To do that, we use graphical methods and an econometric model to net out the effect of distance, which is the key non-policy determinant of trade costs. This approach allows us to compare trade costs for the UK internal market with those observed in other countries, after controlling for distance. This comparison goes closer to isolating market integration in a policy sense: we would expect to see lower trade costs, after controlling for distance, in markets where policies are more oriented towards integration.

3.2 Methodology

Having described our approach in intuitive terms, we now set out the methodology in greater detail. A more technical presentation is in the Annex.

Standard trade models all incorporate the notion of trade costs. Following Samuelson (1954), trade costs are usually modelled as “iceberg” costs: we envisage an iceberg being shipped from one country to another, but some part of it melts during transit. As a modelling device, iceberg trade costs can easily be converted to AVE terms. The key assumption is that trade costs are a marginal or variable cost, in the sense that they are paid per unit shipped. An alternative and complementary view conceptualizes trade costs as having a fixed component as well, in the sense of a cost that must be paid once in order to access a foreign market, but which then does not recur with each shipment. Modern trade models incorporate both types of cost (e.g., Chaney, 2008), but the research focus in the trade costs literature has been on the identification and quantification of the variable cost component.

In the international trade literature, “top down” or omnibus measures of trade costs have been used to provide an indication of the overall level of integration of countries into the global economy over time. Building on the insights of Novy (2013), Jacks et al. (2008) track international trade costs in the 19th and 20th Centuries to show their connection with ebbs and flows in the process of globalization. This approach is known as “top down” because it infers the level of trade costs based only on observations of trade and production across countries. The inference is based on standard trade models. The contrast is with “bottom up” approaches, where researchers estimate total trade costs based on observable factors believed to influence them, as Anderson and Van Wincoop (2004) do.

Based on this strand of research, we can use a top down methodology to infer trade costs on a regional basis across countries of interest, thereby providing information on trade costs in the UK internal market. This application is a novel one, given that this approach has typically been adopted for the analysis of international trade flows in the past. But there is no reason why it cannot also be adopted for the analysis of trade flows on a regional basis. The basis for this belief is that interregional trade flows, like international trade flows, fit well with a gravity model. For instance, Anderson and Van Wincoop (2003) is another classic paper that successfully applies gravity to trade among American states and Canadian provinces. The gravity model, which now has strong microeconomic foundations in addition to its obvious intuitive appeal, shows that trade flows respond positively to economic size and negatively to trade costs. By rearranging, or “inverting”, the model, it is possible to obtain an expression for trade costs in terms of observed trade and production only. This is the approach taken by Arvis et al. (2016) and Miroudot et al. (2013), based on the original insight of Novy (2013).

Full details of the inverted gravity model are presented in the Annex. The core intuition can be easily summarized: if Wales trades relatively less with Northern Ireland relative to itself, the reason must be that trade costs between them have increased relative to trade costs within each constituent nation. The trade costs measure is very easy to calculate provided that intra-regional trade data can be obtained, typically by taking total regional production and subtracting total exports. Implementation requires appropriately disaggregated data, which are sourced in this case from the PBL EUREGIO database, which is an input-output table at the level of EU NUTS-2 regions. Figures for intra- and inter-regional trade can easily be derived from the input-output table. Analysis focuses on the most recent year only, namely 2010. For ease of interpretation, we consider three macro sectors: agriculture, manufacturing, and services.

The analysis in terms of trade costs proceeds in three stages. First, we present data on trade costs for UK constituent nations with major partners. We then compare intra-UK trade costs with internal trade costs for comparator countries with similar degrees of legislative decentralization, namely Belgium, Germany, and Spain. Finally, we run standard gravity regressions using intra- and interregional trade data to estimate the impact of the UK internal market on trade costs, relative to other EU countries.

3.3 Limitations and Data Constraints

In interpreting results from the application of this methodology, it is important to be aware of its limitations. First, the trade cost measures we report are symmetrical by construction, so trade costs between England and Wales are constant regardless of the direction considered. Second, the measure we report is inter-regional relative to intra-regional trade costs. Changes can come about due to movements in one of those variables, or both simultaneously. Without more information, it is not possible to say what is driving observed changes. Finally, trade costs in AVE terms depend on an assumption as to an economic parameter, the intra-sectoral elasticity of substitution. While significant work has been done on estimating this parameter in goods markets, it has not yet been replicated in services. In line with previous work, we therefore assume a constant value for all sectors. AVEs are very sensitive to this choice, and can move up or down accordingly; however, the ordering of bilateral routes by trade costs is not sensitive to this choice, as rank order is preserved regardless of the parameter value chosen.

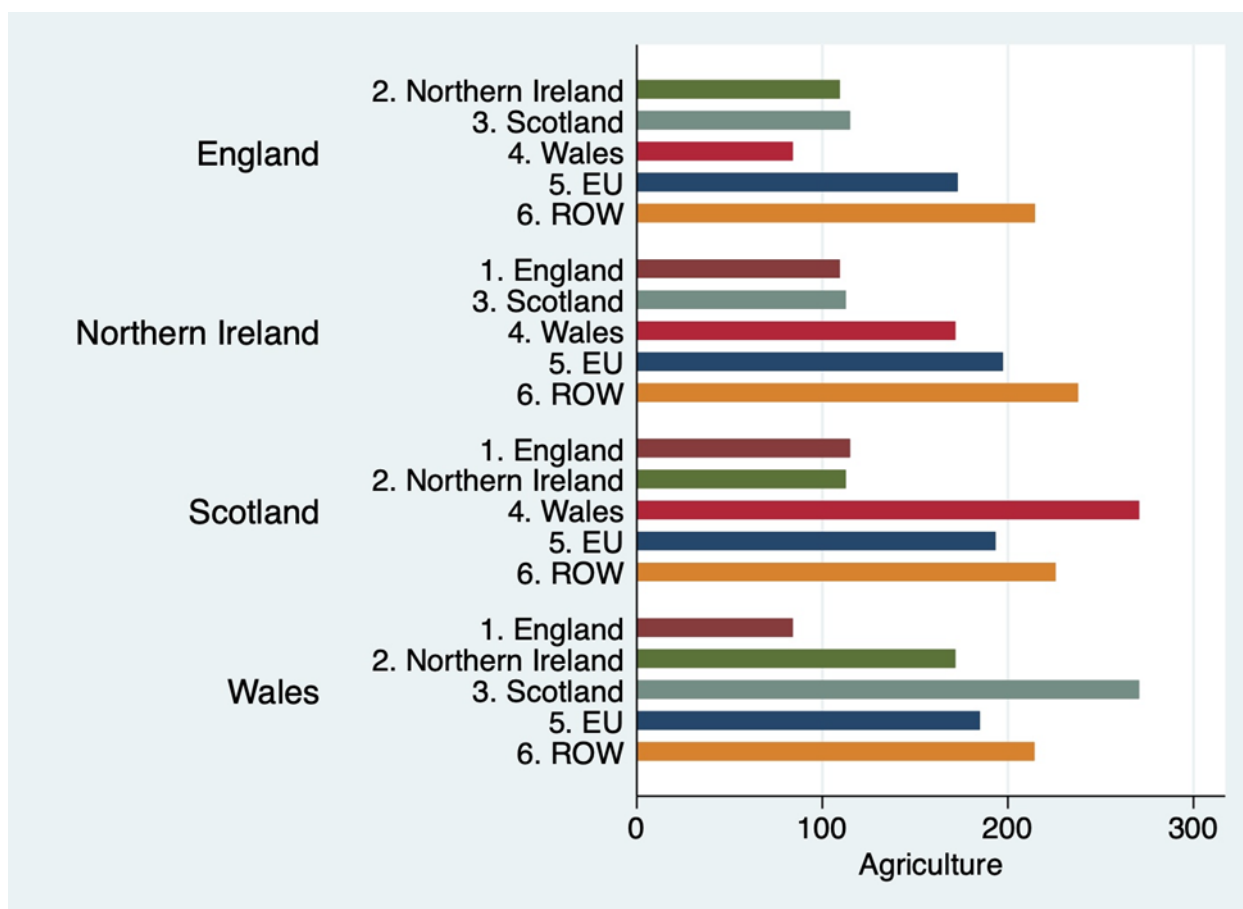
In addition to these inherent limitations of the methodology, it is also important to stress the limitations of the data used for the analysis. We use the EUREGIO database, which is an input-output table showing the production and use of goods and services at the level of NUTS-2 regions. Distribution of national data on trade in goods and services across sub-national regions requires considerable use of assumptions and modelling. While we are confident that EUREGIO represents the best available source, we do not believe that it is as reliable as international data for EU countries and the UK. In particular, we have had to exclude data on inventory adjustments, as they frequently result in negative numbers for production or trade, which is implausible. Similarly, around 5% of the total dataset on services is accounted for by zeros, which is on the high end relative to previous work, given the level of aggregation of the data. We therefore present the results in this section for informational purposes, but subject to the caveat that the availability of better quality data in the future may make it possible to undertake a more refined analysis.

3.4 UK Internal Trade Costs

Figures 12 through 14 show results from the application of the above methodology to data on trade and production for UK constituent nations, EU countries, and an aggregate ROW (Rest of the World) region, consisting of a small number of selected non-EU countries according to coverage the EUREGIO database. We report results by bilateral pair, using the full set even though measures are symmetric, as discussed above.

From the perspective of the UK internal market, we can see that trade costs are substantial, in line with previous work, but lower within the UK than with other markets. We believe the most reliable results are for manufacturing, so use them as an example here. For England, trade costs are lowest with Wales (72%), followed by Scotland (79%), then Northern Ireland (92%); the EU is substantially higher (114%), and the rest of the world is higher again (140). For Northern Ireland, trade costs are lowest with England (92%), followed by Scotland (93%), then Wales (120%), with the EU (138%) and the rest of the world (159%) substantially higher. For Scotland, trade costs are lowest with England (79%), followed by Northern Ireland (93%), but then with a slight difference between the EU (132%) and Wales (136%), with the rest of the world (160%) substantially higher. Finally, for Wales, trade costs are lowest with England (72%), followed by Northern Ireland (120%), then the EU (135%) and Scotland (136%) at approximately the same level, and the rest of the world (161%) much higher.

Figure 12: Trade costs for selected bilateral pairs, agriculture, percent AVE.

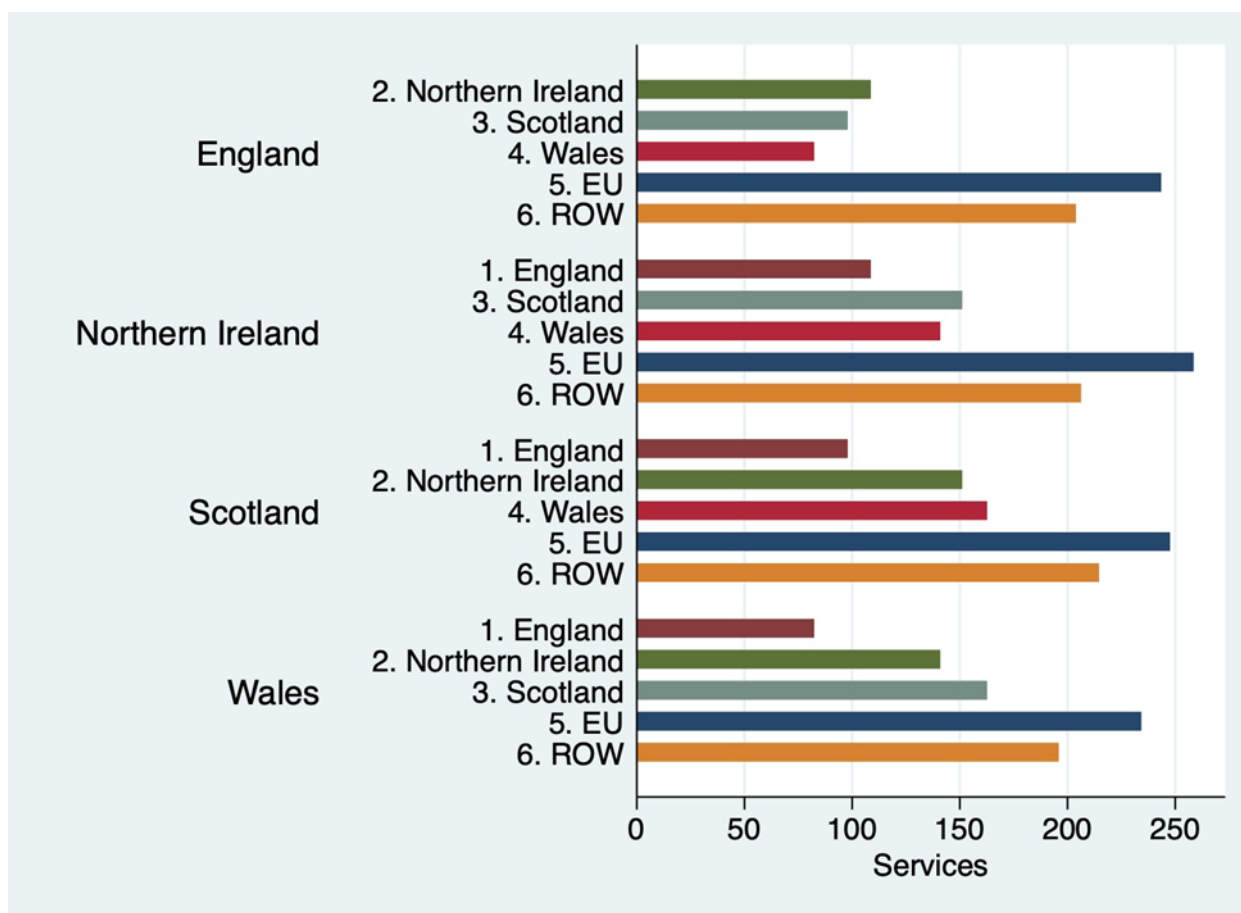


Source: Authors' calculations.

Figure 13: Trade costs for selected bilateral pairs, manufacturing, percent AVE.



Source: Authors' calculations.

Figure 14: Trade costs for selected bilateral pairs, services, percent AVE.


Source: Authors' calculations.

To put these results in comparative perspective, we can use benchmarks for international trade costs calculated by aggregating trade and production data from EUREGIO to the country level. We consider a small number of country pairs believed to have relatively integrated markets in global comparison, and limit consideration to the manufacturing sector, as in the previous paragraph. Among European countries, we can consider Belgium and the Netherlands (61%), Spain and Portugal (80%), France and Germany (87%), and Germany and Switzerland (129%). In comparison, trade costs in the UK internal market are higher than those for small countries like Belgium and the Netherlands, broadly comparable to what is seen in Spain and Portugal or Germany and France, and lower than the observation for Germany and Switzerland. Lower trade costs in small countries are likely partly due to the effect of distance.

In terms of cross-sectoral heterogeneity, our results show that trade costs are lowest in manufacturing, followed by agriculture and services, with the order of the last two sectors depending on the pair of constituent nations considered. The manufacturing result is in line with previous work such as Arvis et al. (2016) using international data. Given that geographical factors are broadly similar in agriculture and manufacturing, the result could well reflect a higher level of policy interventions in agricultural markets. The finding that services trade costs are higher than those in manufacturing also accords with previous work, such as Miroudot et al. (2013). But given assumptions in the public sphere that services can be traded without restriction, it perhaps requires some explanation. In fact, it is by no means costless for a service provider to enter the market in another jurisdiction: it is not as simple as just opening communication lines to foreign orders, which can then be supplied without cost. Information costs in accessing foreign markets are substantial. In addition, even small differences in

regulation can require a service provider to alter its production methods, essentially changing technology, as economists use that term, to comply with multiple regulatory requirements. In some sectors, licensing can make it more difficult to enter other markets. As a result, it is not at all surprising that services trade costs are substantial, even within the UK or the EU. A similar situation is evident within the USA, based on a detailed examination by Gervais and Jensen (2013).

A second finding that emerges from the table is that trade costs within the UK are typically quite comparable, although not exactly the same, between different jurisdictional pairs. There is evidence that trade costs between England and Wales are typically lower than for other pairs, likely due in part to the shorter distances involved, but also likely due to the intertwined legal systems of these two constituent nations. Analysis of these results does not enable us to say which of those factors has played the largest role in shaping trade costs, so we focus only on the possible explanations and the general pattern of results.

Third, trade costs with the EU are somewhat higher than those among UK constituent nations, although the difference is typically not large in terms of what is seen between other country pairs at the international level (Arvis et al., 2016). The difference tends to be largest in agriculture and smallest in manufacturing. Although it is important to keep in mind the impact of distance on these results, one implication is that the pattern of trade costs suggests that it is easier for UK goods producers and service providers to access markets across jurisdictional boundaries within the UK than it is to access foreign markets even under the deep integration provided by the EU Single Market.

The final finding of note is that in agriculture and manufacturing, there is a clear ordering of trade costs: intra-UK trade costs are lowest, followed by trade costs with the EU, with trade costs with the Rest of the World highest. This ordering is intuitive, no doubt driven in part by distance, but also potentially influenced by the degree of integration of the relevant markets, ranging from the most integrated (UK internal market) to the least complete (extra-EU market). In services, however, the ordering for the EU and the Rest of the World is reversed. This finding is implausible in light of previous work such as Mayer et al. (2018), which shows that EU membership has a clear trade promoting effect in services. It is also inconsistent with the evidence presented in the previous section to the effect that intra-EU services policies are much more liberal than extra-EU services policies, including within the UK. We believe the EUREGIO database is much noisier in services sectors as compared to goods markets. The reason is that services trade data are notoriously incomplete, which means that stronger assumptions are required to complete the input-output table. A curious feature of the data is the large number of zero observations for trade with external partners, and even in a substantial number of intra-EU cases. The reasons for these patterns are not clear: some number of zero observations are expected in any trade matrix, but the extent and distribution of them in this case seems problematic. We therefore caution against over-interpreting Figure 14 as it relates to the Rest of the World category.

3.5 Comparison with Belgium, Germany, and Spain

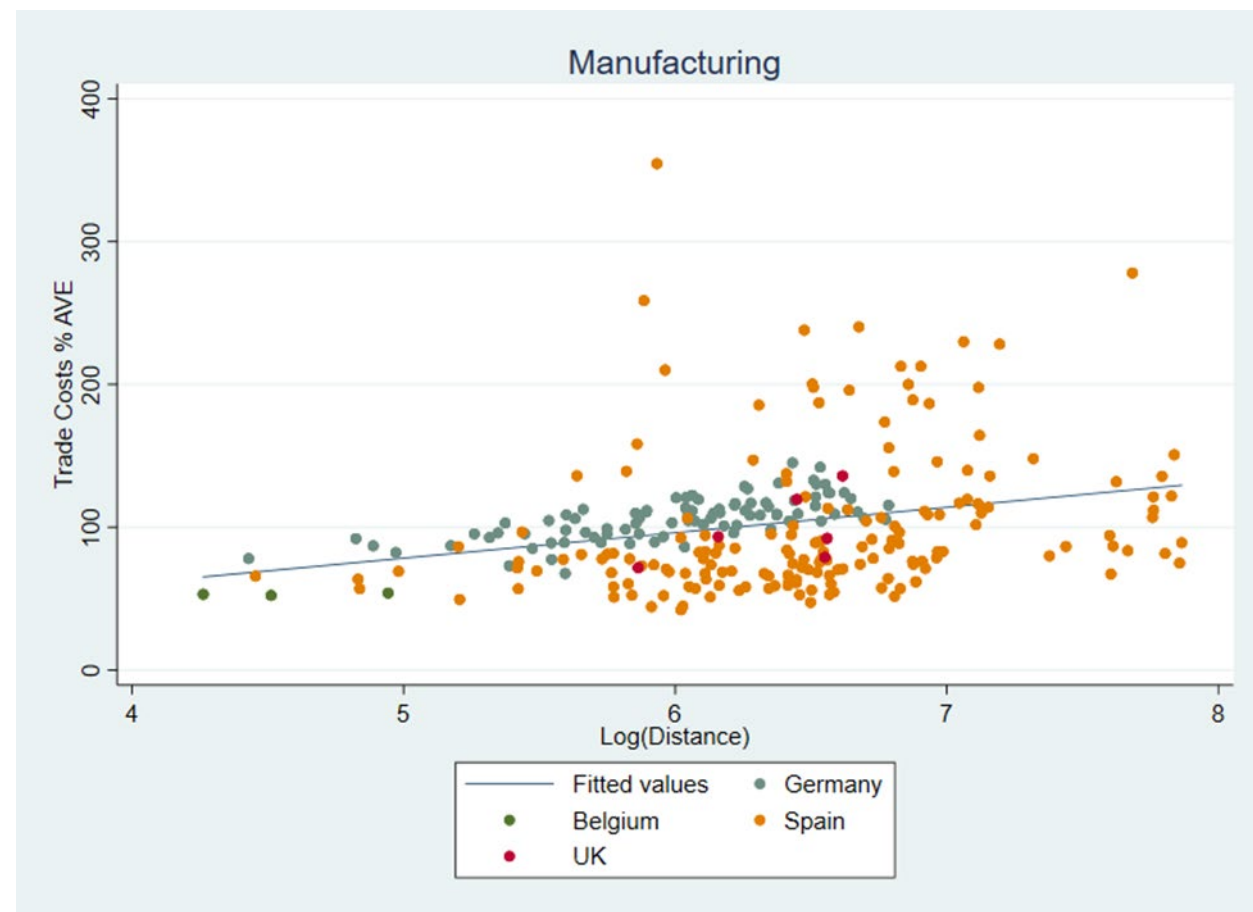
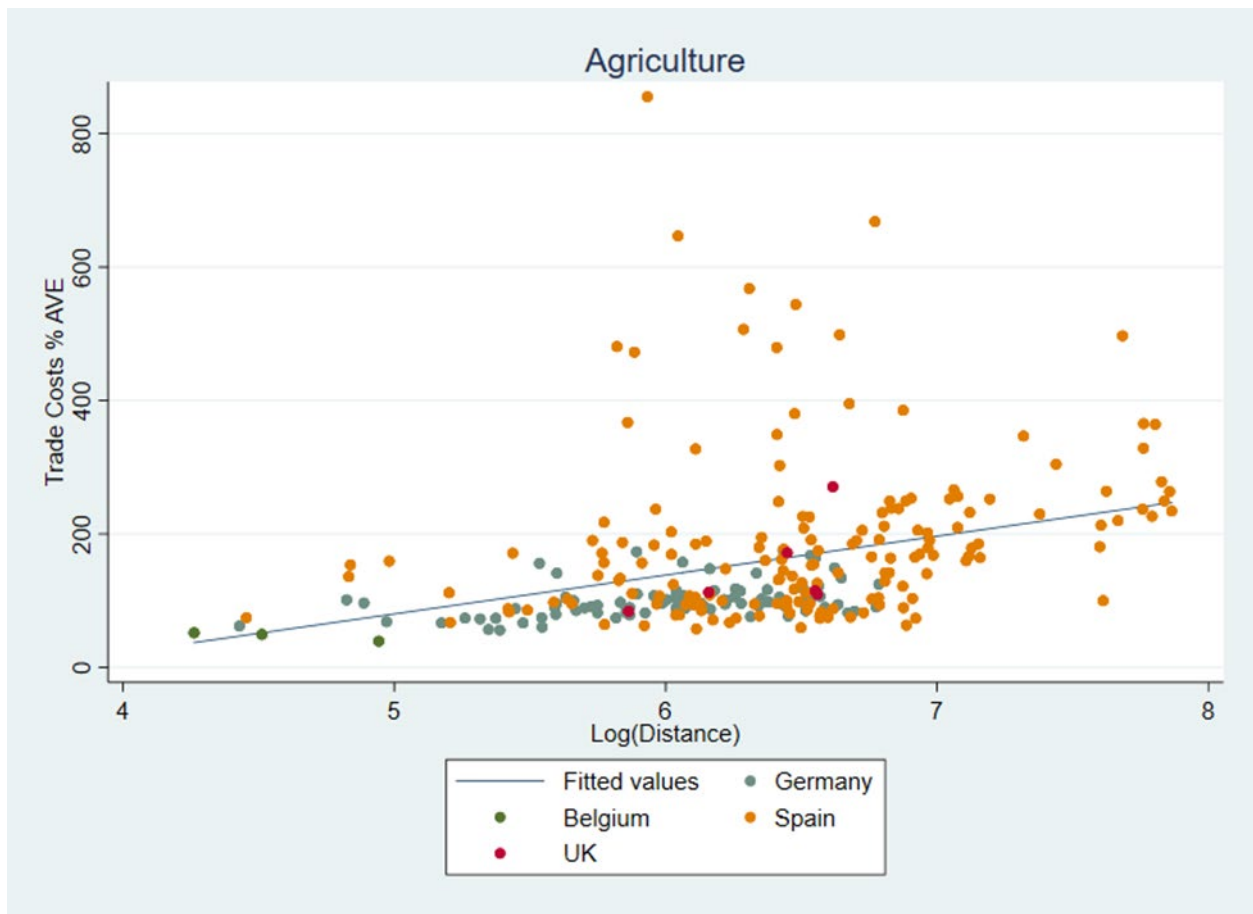
As noted above, countries like Belgium, Germany, and Spain have significant similarities to the UK from an internal market perspective, in the sense that they all have some degree of legislative decentralization. Although they have different constitutional structures, all three countries consist of economic and legal entities that have considerable autonomy in terms of regulatory policy. Comparing trade costs within the four countries can therefore provide some further evidence on the integration of the internal market in each. To compare like with like in so far as possible, we examine trade costs between NUTS1 regions in Belgium and Germany, NUTS2 regions in Spain, and the four UK constituent nations. We only consider intra-national trade flows, but pool all countries together.

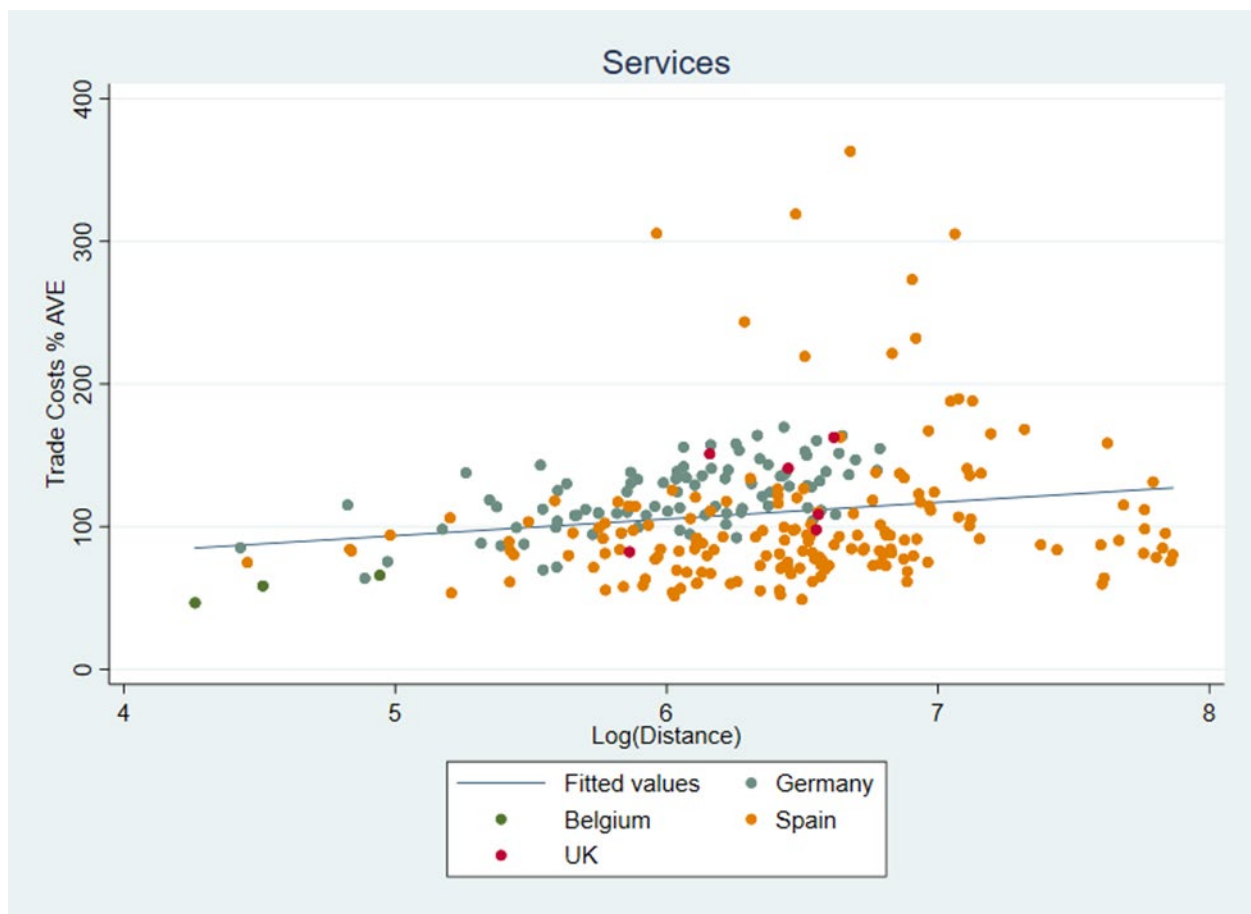
Figure 15 plots AVE trade costs against distance. The regression line in the plot indicates the level of trade costs we would expect to see for a given pair of regions based only on the distance between them. The relationship between distance and trade costs is an average one across regions, but is specific to each sector.

The results clearly suggest that distance is a good predictor of trade costs, as most points are clustered relatively closely around the regression line in all three graphs, albeit with some exceptions. In agriculture and manufacturing, the UK jurisdictional pairs fall very close to the regression line, which means that trade costs are approximately what we would expect to observe based on the distance between them. Comparing the UK pairs with those for the comparator countries suggests that the level of trade costs after adjusting for distance is quite comparable to what is seen elsewhere, somewhat higher than Belgium in agriculture and than Spain in manufacturing, but broadly comparable to the group considered as a whole. The degree of dispersion of the UK observations is little different than what is observed for the comparators.

The case of services requires more discussion. Three of the six UK pairs are more noticeably above the regression line than is the case for the other sectors; in other words, for three out of six pairs, trade costs are higher than we would expect to see based on the distance between constituent nations and the average relationship between distance and trade costs. In general, the UK observations are above the regression line, whereas the Belgian and Spanish observations have a greater tendency to lie below it. The first interpretation that this panel of Figure 15 could support is that services markets in general are subject to more regulatory differences, a source of trade costs, than is the case for goods. There is more diversity among the comparator countries after controlling for distance, which is in line with this interpretation. The second interpretation that is possible is that the UK internal market is less complete relative to the comparators in services as opposed to goods sectors, in particular manufacturing. While the difference between the third panel and the first two could not be described as stark, it is nonetheless suggestive of a possible dynamic that could be investigated further.

Figure 15: Trade costs versus distance in the UK, Belgium, Germany, and Spain, by sector.





Source: Authors calculations.

3.6 Summarizing and Comparing Internal Markets

Visual methods, such as those used in the previous sub-section, can provide important preliminary results. But to draw stronger conclusions as to the degree of UK internal market integration relative to what is seen elsewhere, a more formal approach is needed. To that end, we estimate a standard gravity model of regional trade, following the approach set out in detail in the Annex. The basic model relates bilateral trade flows between NUTS-2 regions to the distance between them (a negative relationship), their economic size (a positive relationship), and average trade costs (a negative relationship). For each country with more than one NUTS-2 region in the dataset, we also include a variable to capture intra-national trade flows that cross a regional border. In other words, this variable indicates, for example, exports from England to Scotland or from Northern Ireland to Wales, but not trade of any UK region with a Spanish region, or domestic sales in England. We convert the estimated coefficients of these variables to AVEs using the approach set out in the Annex. The interpretation is that the AVE indicates the effect on trade costs of an observation crossing a regional border within a single country, relative to all other observations. A larger negative impact on trade costs would be consistent with a greater degree of market integration.

Table 3 presents results. They are expressed as AVEs, with the negative sign indicating a reduction in trade costs due to being part of the same country. There are three cases—Germany, Belgium, and Ireland in manufacturing—where the AVE is estimated to be positive. These findings are counterintuitive, and suggestive of problems in the underlying data. We do not place any reliance on them. Other than these cases, however, signs are consistently negative.

In terms of results for UK constituent nations, we find that trade costs in agriculture are 51 percentage points lower than would be expected based on distance, economic size, and average trade costs alone. This figure is comparable to the one for Belgium, and is larger in absolute value than the corresponding figures for Germany and Spain. For manufacturing, the reduction in trade costs is 22 percentage points, which is considerably larger in absolute value than what is observed for Spain; results for Belgium and Germany are not reliable. In the case of services, the reduction in trade costs is 76%, which is the same as Belgium, and larger in absolute value than either Germany or Spain.

In all three sectors, we find that the UK's figure is approximately mid-range in terms of what is observed elsewhere, neither the highest nor the lowest. In other words, in all three sectors, there is evidence that the UK's internal market is integrated to a level comparable to what is seen in EU countries. This evidence is quite consistent with the graphical approach, using a restricted comparator set, presented above. In addition, the data show that the impact of internal markets is typically higher in services than in goods sectors.

Table 3: AVE trade cost reduction for region pairs within the same country, by sector, percentage points.

Austria	-56	-17	-72
Belgium	-49	12	-76
Czech Republic	-57	-16	-75
Denmark	-66	-20	-81
Finland	-65	-69	-82
France	-33	-11	-59
Germany	-31	48	-58
Hungary	-60	-28	-76
Ireland	-62	25	-76
Italy	-62	-37	-82
Netherlands	-27	-2	-76
Poland	-39	-15	-65
Portugal	-63	-40	-79
Slovak Republic	-61	-27	-80
Spain	-26	-6	-69
Sweden	-58	-6	-69
UK	-51	-22	-76

Source: Authors' calculations.

4 Conclusion

This report has presented quantitative evidence on the degree of integration of the UK internal market, against the backdrop of a future change in the UK's trade-related policies due to EU exit. In particular, we have conducted a detailed review of services policies in 13 sectors and one cross-cutting area for all four UK constituent nations. Using the OECD's STRI methodology, we have shown that treatment of intra-UK services trade is relatively free from overt discrimination, and regulatory heterogeneity is quite limited. We have also shown that treatment of intra-UK services trade is very similar, and in many cases identical, to treatment of transactions between UK entities and EU service providers. EU law is a substantial source for the regulatory measures captured by the OECD, although its importance varies by sector.

In addition, we have used data on trade among EU regions, including UK constituent nations, to calculate trade costs in goods and services markets. This analysis showed that trade costs between UK constituent nations are broadly comparable to what is seen in other EU countries with legislative decentralization, and that they are largely in line with the average relationship between trade costs and distance disclosed in the data. A formal model backs up this picture: there is clear evidence that trade costs are lower for intra-UK trade relative to trade with other partners, as is the case for other EU countries; the degree of diminution of trade costs is quite comparable to what is seen elsewhere. Based on the data and model, we conclude that the evidence broadly supports a picture of a relatively integrated UK internal market, notwithstanding the possibility of regulatory divergence under the Devolution Settlements.

The relationship between the UK internal market and EU exit has received relatively little attention to date. This report does not in any way represent the last word on this important subject. Rather, our intention has been to show how it is possible to bring data and analysis to bear on the question, and to draw preliminary conclusions. As we have noted, our main finding is that in goods and services, and in the subsectors we considered, the evidence so far suggests that the UK internal market is relatively integrated by international standards. However, it is important to be aware of the limitations of our work, and the data available, in assessing that statement. In particular, our findings do not in any way preclude the existence of local preferences or discrete regulatory differences at a micro-level: the STRI was designed for application in international settings, and so focuses on the types of regulations that are most relevant to that context. It may be that imperfections in the UK internal market are only visible at a much finer level of analysis than is allowed for by the STRI. This point is all the more true in the case of goods, where we have only conducted a very aggregate review based on trade and production data. We have previously noted the difficulties inherent in conducting an analysis of NTMs in the internal market for goods, but that is not to say that it is impossible to improve on the current state of data availability. Going forward, we believe that further work, at a very fine level of disaggregation, is likely to bear real fruit in both the goods and services spaces.

From a methodological standpoint, further work in this area is by no means straightforward. Economists and policy professionals typically lack the detailed sectoral understanding necessary to identify impediments to the free flow of goods and services at a very micro level. It is therefore important to enlist the private sector going forward as a source of information. The UK is by no means alone in being concerned to ensure that goods and services flow as freely as possible within its borders. This issue has received prominence in some federations, for example. In Australia, the Hilmer and Harper Reviews examined this question from the standpoint of competition policy. This may indeed be a point of view that could be of use in the UK, given the high level of development of institutions to ensure a level competitive playing field. In the Australian case, public inquiries proved to be useful ways of starting a long process of

information exchange, government coordination, and reform that is in some senses still underway.

As this analysis makes clear, a key question for policymakers in the UK going forward relates to the legal and institutional mechanisms that could be used to ensure continued integration of the internal market. The question is all the more pertinent in the context of EU exit, as we have shown that EU law has to some extent played a structuring role for the UK internal market. The question of the legal and institutional mechanisms that can support continued integration between UK constituent nations post-EU exit has real pertinence from the point of view of market actors, namely businesses and consumers. We do not express any concluded view on this issue, as it is outside the scope of our engagement, but we note that the solution in other countries with substantial legislative decentralization is to have some kind of central legal mechanism to ensure, at a minimum, that obvious trade barriers and discriminatory measures cannot be enacted by sub-national entities. From a purely economic standpoint, there would be merit to considering ways in which this outcome could be supported, taking account of the unique constitutional circumstances of the UK.

While there is an economic case for looking at mechanisms to support continued internal market integration going forward, it is important to stress that to date, the substantial regulatory autonomy enjoyed by the devolved administrations has not translated into overt discrimination or significant regulatory heterogeneity. In part, this may be due to the influence of EU legal obligations. The current period poses numerous challenges for regulatory infrastructure in the UK. Our findings suggest that a consideration of internal market dynamics should be part of this ongoing conversation.

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Annex 1: Inferring Trade Costs from the Inverted Gravity Model

The current standard for gravity modelling (Anderson et al., 2018) takes the following form (omitting sectoral notation):

$$(1) X_{ij} = t_{ij} \Pi_i P_j^{1-\sigma} Y_i E_j$$

$$(2) P_j^{1-\sigma} = \sum_i \left(\frac{t_{ij}}{\Pi_i} \right)^{1-\sigma} Y_i$$

$$(3) \Pi_i^{1-\sigma} = \sum_j \left(\frac{t_{ij}}{P_j} \right)^{1-\sigma} E_j$$

$$(4) p_j = \frac{Y_j^{1-\sigma}}{\gamma_j \Pi_j}$$

Where: X is exports in value terms from country i to country j ; E is expenditure in country j ; Y is production in country i ; t captures bilateral trade costs; σ is the elasticity of substitution across varieties; P is inward multilateral resistance, which captures the dependence of bilateral shipments into j on trade costs across all inward routes; Π is outward multilateral resistance, which captures the dependence of bilateral shipments out of i on trade costs across all outward routes; p is the exporter's supply price of country i ; and γ is a positive distribution parameter of the CES function.

We can consider a pair of countries, i and j . Iterating subscripts through equation (1) gives three additional equations for the other directions of trade, namely j to i , i to i , and j to j :

$$(5) X_{ji} = \left(\frac{t_{ji}}{\Pi_j P_i} \right)^{1-\sigma} Y_j E_i$$

$$(6) X_{ii} = \left(\frac{t_{ii}}{\Pi_i P_i} \right)^{1-\sigma} Y_i E_i$$

$$(7) X_{jj} = \left(\frac{t_{jj}}{\Pi_j P_j} \right)^{1-\sigma} Y_j E_j$$

Multiplying equations (1) and (5), dividing by the product of equations (6) and (7), and cancelling terms gives the following expression:

$$(8) \frac{X_{ij} X_{ji}}{X_{ii} X_{jj}} = \left(\frac{t_{ij} t_{ji}}{t_{ii} t_{jj}} \right)^{1-\sigma}$$

Rearranging, taking a geometric average, and expressing results as an AVE gives the final expression for trade costs:

$$(9) \left(\frac{t_{ij} t_{ji}}{t_{ii} t_{jj}} \right)^{1/2} - 1 = \left(\frac{X_{ij} X_{ji}}{X_{ii} X_{jj}} \right)^{1/2(1-\sigma)} - 1$$

From this expression, it is clear that our measure of trade costs has the following properties:

1. It is symmetric, even though trade flows and underlying bilateral trade costs (unobserved) may be asymmetric.
2. The measure expresses inter- relative to intra-regional trade costs, so a change in the measure can be due to a change in intra-regional trade costs, inter-regional trade costs, or both simultaneously.
3. The mapping is influenced by the elasticity of substitution. We assume it is 7 in all calculations, in line with previous work like Arvis et al. (2016) and Miroudot et al. (2014).
4. Analogous measures can be derived from most standard gravity models albeit with changes in parameter interpretation, including Ricardian models (Eaton and Kortum, 2002) and heterogeneous firms models (Chaney, 2008).

As indicated in the main text, we apply this methodology to data on intra- and inter-regional sales of goods and services in 2010, sourced from the EU REGIO database. For results using aggregate regions and sectors, we first sum over components to obtain aggregate flow information, then apply the calculation as above with regions and sectors defined accordingly.

Annex 2: Estimation of AVEs using the Gravity Model

The current standard for gravity modelling (Anderson et al., 2018) takes the following form (omitting sectoral notation):

$$(1) X_{ij} = \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma} Y_i E_j$$

$$(2) P_j^{1-\sigma} = \sum_i \left(\frac{t_{ij}}{\Pi_i} \right)^{1-\sigma} Y_i$$

$$(3) \Pi_i^{1-\sigma} = \sum_j \left(\frac{t_{ij}}{P_j} \right)^{1-\sigma} E_j$$

$$(4) p_j = \frac{Y_j^{1-\sigma}}{\gamma_j \Pi_j}$$

Where: X is exports in value terms from country i to country j ; E is expenditure in country j ; Y is production in country i ; t captures bilateral trade costs; σ is the elasticity of substitution across varieties; P is inward multilateral resistance, which captures the dependence of bilateral shipments into j on trade costs across all inward routes; Π is outward multilateral resistance, which captures the dependence of bilateral shipments out of i on trade costs across all outward routes; p is the exporter's supply price of country i ; and γ is a positive distribution parameter of the CES function.

The model is typically estimated using fixed effects, and so collapses into the following form:

$$(5) X_{ij} = \exp(T_{ij} \beta + \pi_i + \chi_j)$$

Where: T is a vector of observables capturing different elements of trade costs; π is a set of exporter fixed effects; χ is a set of importer fixed effects; and e is a standard error term.

We use this gravity model in two different forms. The first one, in Section 2, is a regional gravity model, where each exporter and importer corresponds to a NUTS-2 region or UK jurisdiction. The data source for trade flows is the PBL EUREGIO database, while distance information comes from Eurostat. The second version of the model we use is in Section 3, and is an international gravity model, where each exporter and importer corresponds to a country. The data source is the OECD-WTO TiVA dataset, using trade data in gross value terms.

Other than the data source, and corresponding level of disaggregation, the two models differ in terms of the trade costs function. In both cases, it is specified in terms of observables, but the list is considerably longer in the international case relative to the regional case, due to limitations on data availability and pertinence.

For the region model, the trade costs function can be specified as follows:

$$T_{ij} \beta = \beta_0 \log(\text{dist}_{ij}) + \beta_1 \text{intr}_{ij} + \sum_{i=1}^C \beta_{i+1} \text{Both}_{ij}$$

Where $dist$ is bilateral distance and $intr$ is a dummy taking the value of one where the exporting and importing regions are not the same. The final term is a collection of dummies equal to unity for trade flows that cross an internal jurisdictional boundary but not an international border. In other words, a “both” dummy is equal to one where the importing and exporting regions are both within the same country, but they are not the same region.

By contrast, for the international trade model, the trade costs function can be specified as follows:

$$T_{ij}\beta = \beta_0 \log(dist_{ij}) + \beta_1 contig_{ij} + \beta_2 colony_{ij} + \beta_3 comcol_{ij} + \beta_4 comlang_off_{ij} + \beta_5 intl_{ij} + \beta_6 STRI_j * intl_{ij} + \beta_7 rta_{ij}$$

where $dist$ is bilateral distance, $contig$ is a dummy taking the value of one where countries share a common land border, $colony$ is a dummy equal to unity when one country was a colony of the other, $comcol$ is a dummy equal to unity when the two countries had a common colonizer, $comlang_off$ is a dummy equal to unity where countries have a common official language, $intl$ is a dummy equal to one for international transactions (exporter and importer are different countries), $STRI$ is the indicator of services trade restrictiveness, and RTA is a dummy equal to one if the two countries are members of the same RTA. $STRI$ data come from our calculations and OECD data, while geographical and historical data come from the CEPII distance database, and the RTA dummy comes from De Sousa (2012).

Then following Benz (2017), the AVEs of the variables of interest in percentage terms are calculated as follows:

$$AVE = 100 * \left(\exp\left(\frac{-Both_{UK} * \beta_2}{\sigma - 1}\right) - 1 \right)$$

$$AVE = 100 * \left(\exp\left(\frac{-STRI_j * \beta_6}{\sigma - 1}\right) - 1 \right)$$

The elasticity parameter is not observed, so we follow the OECD in setting it equal to 3. Final values of the AVEs are sensitive to this choice, but the ordering of countries is not.

Table 5 presents estimation results for the regional gravity model, with fixed effects suppressed for brevity. The distance coefficient is negative and statistically significant in all three sectoral regressions, though higher than is typically observed in international gravity models. The both dummies are also precisely estimated, and carry the expected positive sign in most cases. R^2 indicates that the models fit the data very well.

Table 4: Regional gravity model estimates

Log(dist)	-0.832 ***	-1.040 ***	-0.708 ***
	(0.044)	(0.037)	(0.075)
both_AT	2.440 ***	0.557 **	3.865 ***
	(0.137)	(0.217)	(0.160)
both_BE	2.021 ***	-0.190 *	4.240 ***
	(0.169)	(0.115)	(0.163)
both_CZ	2.395 ***	0.477 ***	4.186 ***
	(0.145)	(0.140)	(0.175)
both_DE	1.102 ***	-1.149 ***	2.592 ***
	(0.069)	(0.073)	(0.107)
both_DK	3.167 ***	0.663 ***	4.886 ***
	(0.215)	(0.172)	(0.179)
both_ES	0.919 ***	0.042	3.584 ***
	(0.124)	(0.142)	(0.140)
both_FI	2.416 ***	3.275 ***	4.248 ***
	(0.434)	(0.384)	(0.195)
both_FR	1.163 ***	0.342 ***	2.664 ***
	(0.084)	(0.092)	(0.151)
both_HU	2.735 ***	0.983 ***	4.249 ***
	(0.161)	(0.176)	(0.166)
both_IE	2.887 ***	-0.665 **	4.248 ***
	(0.177)	(0.274)	(0.206)
both_IT	2.875 ***	1.414 ***	5.054 ***
	(0.274)	(0.241)	(0.227)
both_NL	1.131 ***	0.030	4.174 ***
	(0.209)	(0.148)	(0.164)
both_PL	1.487 ***	0.494 ***	3.124 ***

	(0.095)	(0.129)	(0.129)
both_PT	2.862 ***	1.543 ***	4.471 ***
	(0.185)	(0.298)	(0.281)
both_SE	2.612 ***	0.226	3.690 ***
	(0.224)	(0.246)	(0.221)
both_SK	2.628 ***	0.831 **	4.640 ***
	(0.245)	(0.358)	(0.193)
both_UK	2.129 ***	0.759 ***	4.275 ***
	(0.176)	(0.185)	(0.167)
Intr	-4.027 ***	-2.039 ***	-6.520 ***
	(0.125)	(0.119)	(0.205)
Constant	11.500 ***	14.438 ***	14.980 ***
	(0.201)	(0.160)	(0.346)
Observations	31684	31684	31684
R2	0.908	0.896	0.986

Source: Authors. Note: Estimation is by PPML in all cases, with exports as the dependent variable. Robust standard errors adjusted for clustering by country pair are in parentheses below the parameter estimates. Statistical significance is indicated as follows: * (10%), ** (5%), and *** (1%)

In the international trade model, we take two approaches to estimating AVEs. First, we estimate an aggregate model on total services exports, using an average STRI score across all sectors as the policy variable. Second, we estimate sectoral models where it is possible to concord trade data with STRI data. That is only possible for a few sectors because internationally comparable trade data are only available for relatively aggregate sectors, whereas the STRIs are sometimes very disaggregated. Where possible, we calculate AVEs using sector-specific results. For sectors where that is not possible, we use results from the aggregate model to construct AVEs. In including the STRI in the gravity estimations, we innovate relative to the previous literature by using the OECD's EU-specific STRIs for intra-regional trade among the EU-28 and EEA members. Previous work has only used MFN policies, sometimes with a dummy interaction term to take account of EU specificities.

Table 6 reports estimation results. All models presented in Table 6 show a negative and statistically significant coefficient on the sectoral STRI, which accords with intuition: a higher STRI score means a more restrictive policy environment, which should correlate with lower observed trade, keeping all other factors constant. The magnitude of the effect varies across sectors, which again is as expected. The only sector for which we do not report results is transport: the STRI coefficient is statistically insignificant, likely because the sectoral definition of the trade data (all transport) is much more aggregate than that of the STRIs themselves (transport by mode), which makes it difficult to obtain an overall indication of the restrictiveness of the transport sector.

Table 5: International gravity model estimates.

	Aggregate	Construction	Distribution	Financial	Computer	Communications
STRI*Intl	-2.362 ***	-2.559 *	-2.916 ***	-3.620 ***	-3.937 ***	-6.134 ***
	(0.440)	(1.395)	(0.569)	(1.171)	(0.986)	(1.256)
Log(dist)	-0.504 ***	-0.947 ***	-0.511 ***	-0.504 ***	-0.482 ***	-0.735 ***
	(0.044)	(0.142)	(0.044)	(0.087)	(0.078)	(0.115)
Contig	0.141	0.288	0.457 ***	-0.693 *	0.106	0.246
	(0.127)	(0.267)	(0.117)	(0.363)	(0.251)	(0.259)
Colony	0.405 **	0.504 *	0.407 ***	0.179	0.120	0.321
	(0.166)	(0.274)	(0.154)	(0.395)	(0.197)	(0.241)
Comcol	0.538 ***	0.561	0.431 **	-0.215	2.025 ***	1.178 ***
	(0.156)	(0.387)	(0.189)	(0.434)	(0.341)	(0.344)
Comlang	0.530 ***	-0.213	0.247 *	1.420 ***	0.610 ***	0.553 **
	(0.178)	(0.349)	(0.129)	(0.355)	(0.215)	(0.224)
Intl	-4.480 ***	-6.176 ***	-3.628 ***	-4.891 ***	-3.965 ***	-3.936 ***
	(0.101)	(0.273)	(0.114)	(0.259)	(0.221)	(0.283)
RTA	-0.005	-0.192	0.299 ***	-0.772 ***	0.171	0.005
	(0.119)	(0.207)	(0.085)	(0.291)	(0.183)	(0.142)
Observations	2772	2772	2772	2772	2772	2772
	0.990	0.990	0.965	0.978	0.945	0.971

Source: Authors.

Note: Estimation is by PPML in all cases, with exports as the dependent variable. Robust standard errors adjusted for clustering by country pair are in parentheses below the parameter estimates. Statistical significance is indicated as follows:

* (10%), ** (5%), and *** (1%)

Annex 3: Estimated Ad Valorem Equivalents

Table 6: Ad valorem equivalents of STRI scores by sector, MFN treatment.

	England	Northern Ireland	Scotland	Wales
Accounting services	22	22	22	22
Air transport	37	38	38	38
Architecture services	14	14	14	14
Computer services	29	29	29	29
Construction	14	14	14	14
Courier services	45	45	45	45
Digital services	10	10	10	10
Distribution services	13	13	12	13
Engineering services	11	11	11	11
Legal services	15	84	21	15
Logistics customs brokerage	13	13	13	13
Logistics storage and warehouse	14	12	13	13
Maritime transport	16	16	16	16
Road freight transport	16	16	16	16

Source: Authors' calculations.

Table 7: Ad valorem equivalents of STRI scores by sector, EEA treatment.

	England	Northern Ireland	Scotland	Wales
Accounting services	7	7	7	7
Air transport	13	14	14	14
Architecture services	3	3	3	3
Computer services	6	6	6	6
Construction	5	5	5	5
Courier services	25	25	25	25
Digital services	5	5	5	5
Distribution services	7	7	6	7
Engineering services	3	3	3	3
Legal services	5	11	11	5
Logistics customs brokerage	3	3	3	3
Logistics storage and warehouse	6	6	6	6
Maritime transport	4	4	4	4
Road freight transport	6	7	6	6

Source: Authors' calculations.

Table 8: Ad valorem equivalents of STRI scores by sector, Self treatment.

	England	Northern Ireland	Scotland	Wales
Accounting services	7	7	7	7
Air transport	13	14	14	14
Architecture services	3	3	3	3
Computer services	6	6	6	6
Construction	5	5	5	5
Courier services	25	25	25	25
Digital services	5	5	5	5
Distribution services	7	7	6	7
Engineering services	3	3	3	3
Legal services	4	10	10	4
Logistics customs brokerage	3	3	3	3
Logistics storage and warehouse	5	5	4	5
Maritime transport	4	4	4	4
Road freight transport	6	6	6	6

Source: Authors' calculations.

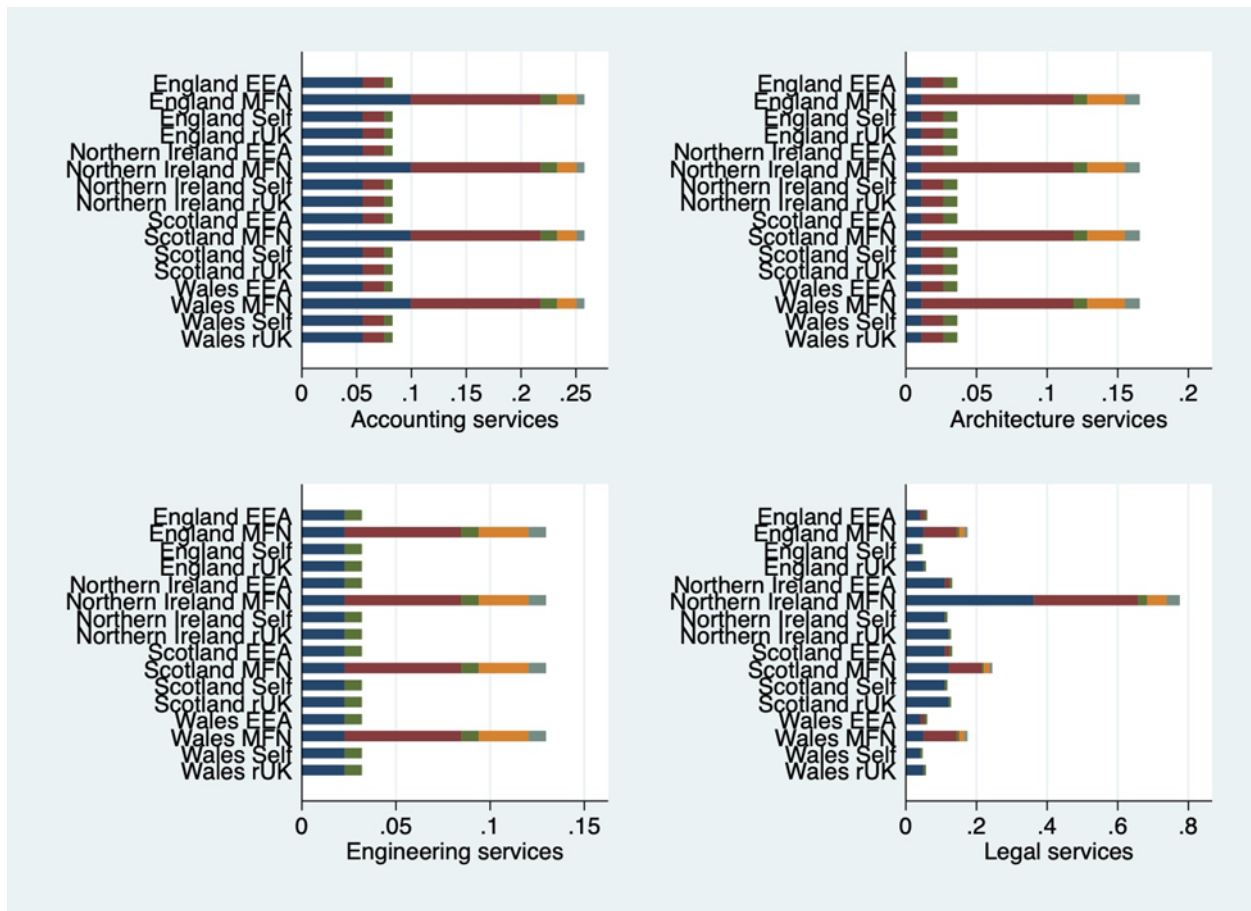
Table 9: Ad valorem equivalents of STRI scores by sector, rUK treatment.

	England	Northern Ireland	Scotland	Wales
Accounting services	7	7	7	7
Air transport	13	14	14	14
Architecture services	3	3	3	3
Computer services	6	6	6	6
Construction	5	5	5	5
Courier services	25	25	25	25
Digital services	5	5	5	5
Distribution services	7	7	6	7
Engineering services	3	3	3	3
Legal services	5	11	11	5
Logistics customs brokerage	3	3	3	3
Logistics storage and warehouse	5	5	5	5
Maritime transport	4	4	4	4
Road freight transport	6	6	6	6

Source: Authors' calculations.

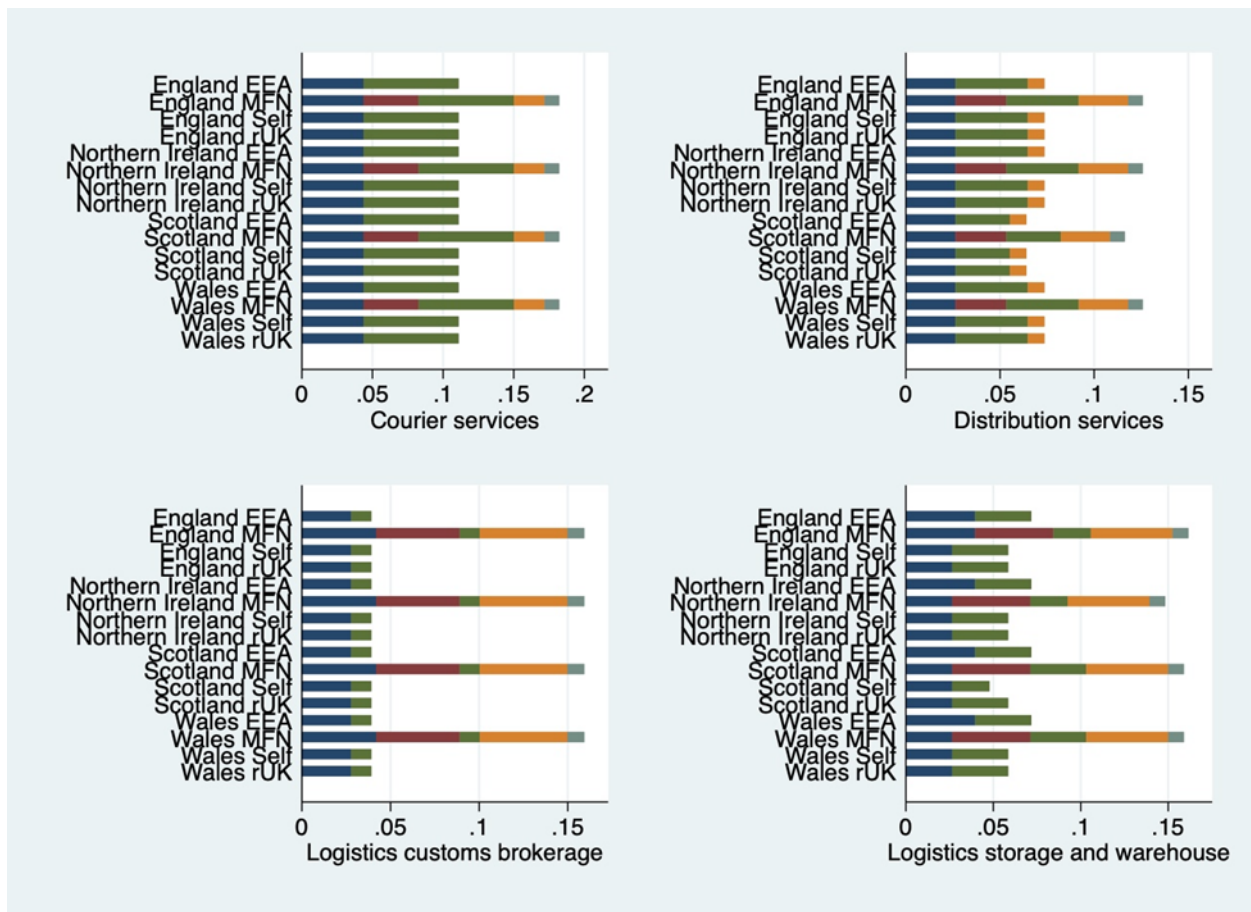
Annex 4: STRI Components

Figure 16: STRI scores by component in selected sectors (index number).



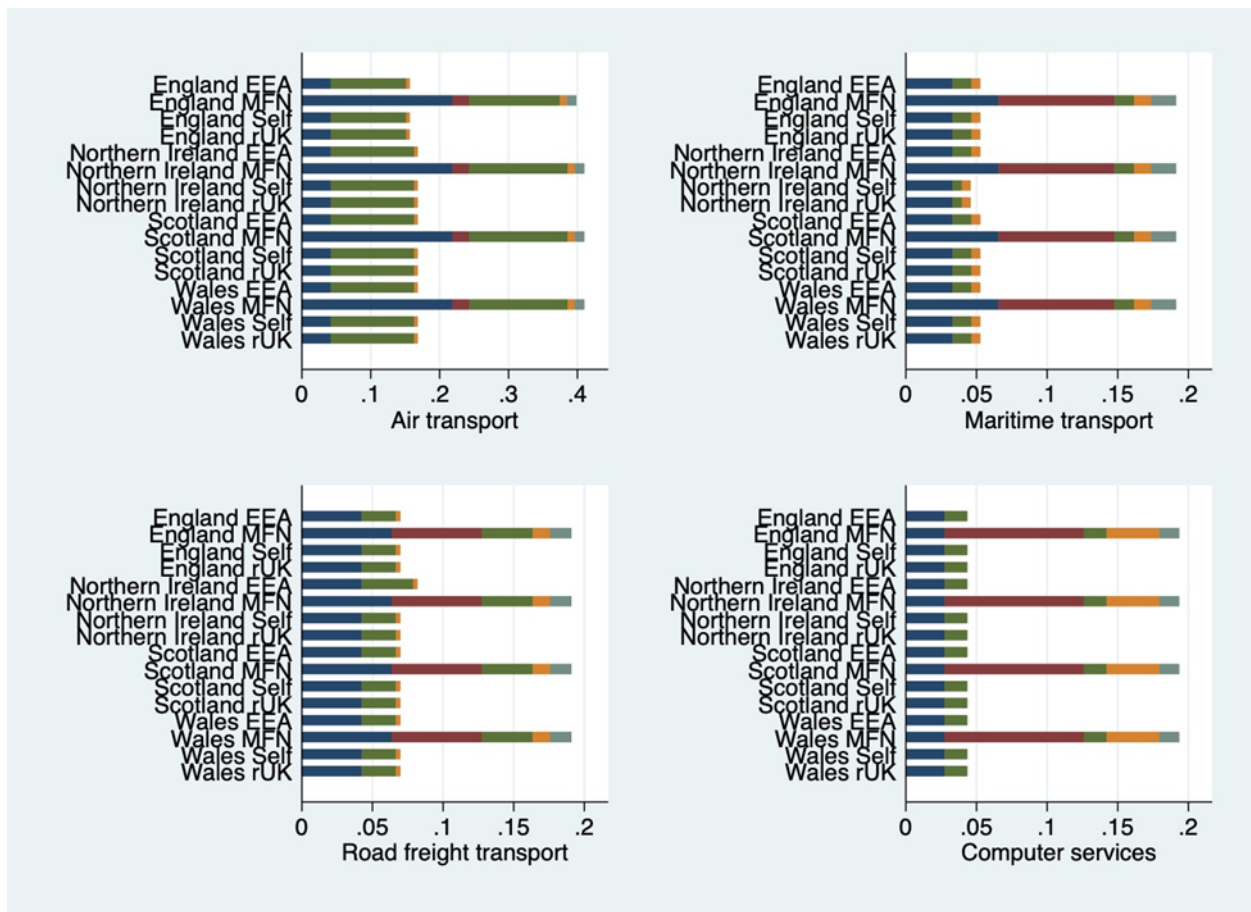
Source: Authors' calculations. Note: Components stack in the following order, from the axis moving up vertically—restrictions on foreign entry, restrictions on the movement of people, barriers to competition, regulatory transparency, and other discriminatory measures.

Figure 17: STRI scores by component in selected sectors (index number).



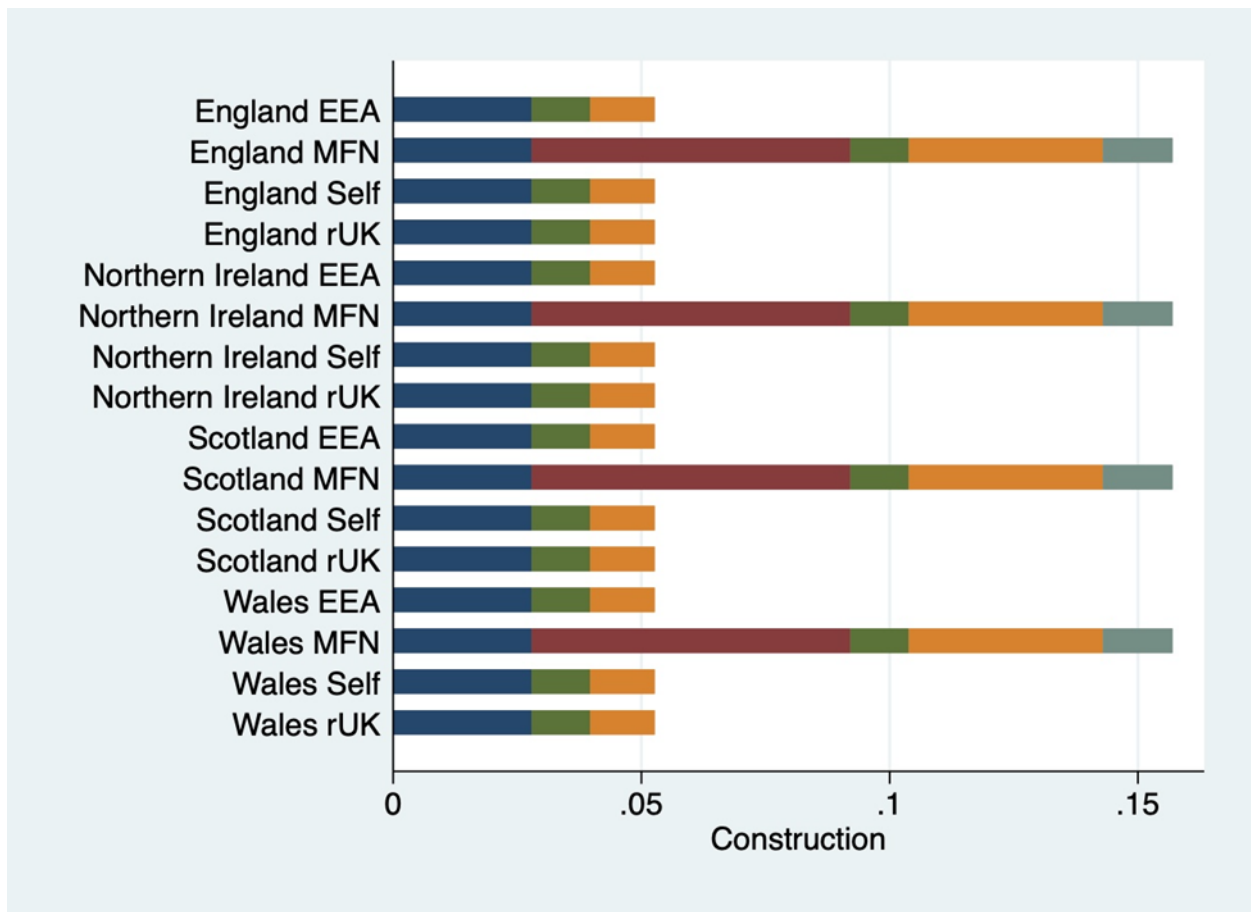
Source: Authors' calculations. Note: Components stack in the following order, from the axis moving up vertically—restrictions on foreign entry, restrictions on the movement of people, barriers to competition, regulatory transparency, and other discriminatory measures.

Figure 18: STRI scores by component in selected sectors (index number).



Source: Authors' calculations. Note: Components stack in the following order, from the axis moving up vertically—restrictions on foreign entry, restrictions on the movement of people, barriers to competition, regulatory transparency, and other discriminatory measures.

Figure 19: STRI scores by component in selected sectors (index number).



Source: Authors' calculations. Note: Components stack in the following order, from the axis moving up vertically—restrictions on foreign entry, restrictions on the movement of people, barriers to competition, regulatory transparency, and other discriminatory measures.

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