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Irish-UK Services Trade and Brexit[1]

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Abstract: This paper examines the determinants of international trade in services using data on total services trade and a breakdown of the component subsectors between 28 reporting countries and over fifty partner countries. Using a gravity model approach, we find that the income level and size of the trading partners and the distance between them affect trade flows in services in a similar manner to trade in goods. In the context of Brexit, we focus on the degree to which the European Union has facilitated trade in services amongst its members compared to trade between other partner countries. EU membership is found to be associated with an overall 26% higher level of trade in services. Furthermore, across the subsectors we find considerable variation in the degree to which EU membership impacts trade flows, ranging from being statistically insignificant or even slightly negative to having positive effects equivalent to a more than doubling of trade. We then relate these findings to potential impacts of Brexit on services trade between Ireland and the UK. Assuming that exiting the EU has symmetric effects to membership, Irish services imports from the UK could decline by 33% and exports almost half in this scenario, driven mainly by reductions in the insurance and telecommunications sectors. In terms of overall services trade, this is equivalent to a 3.5% reduction in imports and a 9% fall in exports, although this estimate does not take account of any potential increases in trade with other countries or policy actions to mitigate the effects of the UK exit from the EU.

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Executive Summary

This paper examines the determinants of international trade in services using data on total services trade and a breakdown of the component subsectors between 28 reporting countries and over fifty partner countries. It estimates the contribution to services trade flows that can associated to common membership of the European Union, both at the level of aggregate trade flows and on a sector-by-sector basis. A counterfactual removal of this EU membership premium is then used to examine the exposure of Irish services sectors to the exit of the UK from the EU. It is important to emphasise that the report cannot provide a forecast of the changes in services trade arising from the UK exit as this will depend on the details of the final exit arrangement and comprehensiveness of a subsequent trade deal. The analysis can however provide a sense of exposures across sectors that may be of value in risk assessment and contingency planning. In addition, the analysis is done on a static basis that does not take account dynamic effects such as diversification that increases services trade with other countries or policy actions to mitigate the effects of the UK exit from the EU.

The key findings of the report are:

- EU membership has had a positive impact on total services trade of around 26% holding all other factors (GDP, market size and so on) constant.

- The strength of this effect, and of several other trade determinants, varies quite considerably across the individual sub-sectors.

- EU membership has a particularly strong impact on the levels of services trade in financial and business services, with the largest effect being more than twice as much trade in direct insurance between EU members compared to trade between EU and non-EU countries or pairs of non-EU members, controlling for other factors such as country size and distance.

- Computer services and audio-visual services are also sectors where EU membership has a considerably larger positive impact on trade than suggested by the aggregate model.

- Irish services trade is concentrated in areas where EU membership has had a positive impact.

- Other major determinants of services trade, such as common language, distance and income levels, all continue to suggest that the UK would be an important trading partner for Irish services even outside of the EU. However, the extent of trade restrictions would be a critical factor in continuing to facilitate that trade.

- Removing the EU effect on Irish-UK trade in services shows trade flow reductions of 33% in for Irish services imports from the UK and a 45% reduction in exports.

- It is notable that these effects using the disaggregated approach are quite a bit higher than the 19% trade enhancing effect estimated using total services trade flows. This demonstrates the heterogeneity of the effect of EU membership on different components of services trade and further shows that Irish-UK services trade is in sub-sectors that have benefited more from EU membership than the average.

- Insurance, financial services and telecommunications are the key sub-sectors driving the overall estimates of the effects of removing EU membership, accounting for approximately half of the total trade reduction. The EU is estimated to have increased insurance trade by around 80% and computer services trade by 50% so the removal of the trade enhancing effects of EU membership could have a large negative impact on services trade flows to and from the UK.

- This assumes a symmetric effect whereby all the trade-enhancing benefits of EU membership are removed from the UK-Ireland trade flows. However, the size of this negative impact could be reduced considerably depending on the level of reciprocal market access agreed in a final trade deal.

- The effects on total Irish services trade could also be mitigated by diversifying trade to other markets.

These findings have the following broad implications for policy-makers in negotiating a trade agreement with the UK and mitigating any negative effects of potential increases in trade restrictions:

- Risk assessment and contingency planning should take into account the wide range of sector-specific exposures.
- Provision to avoid disruption of currently existing services contracts should be a priority.
- Information provision for firms on areas that may be most exposed will be important, particularly as negotiations proceed and more concrete parameters for future trading relationship between the EU and UK emerge.
- A focus on counteracting any negative impact of Brexit through diversification to other markets could help firms identify priority markets by giving focus to which sectors are most sensitive to distance, market size and common language amongst other factors.
- A longer-term policy implication from the model suggests that investment in learning other languages could have large economic returns.

The findings also have potential implications for firms and enterprise strategy, particularly in the event of trade restrictions emerging as a possible outcome from negotiations:

- Ensuring that service contracts are not exposed to changes in trading relationships and continuity of service can be provided are important considerations for both importers and exporters of services.
- For importers, research on alternative supply options will be a priority if market access restrictions emerge as a possibility.
- For exporters, an examination of market diversification options could help to mitigate potential negatives of Brexit, and could be a beneficial contributor to firm growth even if the concerns about UK market access prove unwarranted.

1.   Introduction

Since the decision of the UK to exit the European Union, a number of estimates of the potential effects this could have on the UK, Irish and European economies have been undertaken (e.g. Barrett *et al,* 2015; Bergin *et al,* 2016; Lawless and Morgenroth, 2016; Dhingra *et al,* 2016). In examinations of how Brexit might affect goods trade, the option of reverting to the tariff schedule registered by the EU at the WTO has provided a clear benchmark to anchor scenarios (e.g. Lawless and Morgenroth, 2016). Services trade has no such clear fall-back position so setting parameters of how large trade impacts could be is less obvious. Services trade restrictions are typically not determined by tariffs, but rather by permissions, recognition of standards and various other non-tariff barriers to trade which are extremely difficult to measure. As a result there has been more limited analysis to provide an evidence base on which to assess the potential impact of Brexit on services trade flows and how this might vary across types of services. This report aims to fill part of this information gap by presenting estimates on the contribution that EU membership has made to services trade and using this calculation of an EU membership premium to construct a counterfactual potential impact on services trade if the UK were to leave the EU.

The importance of market access agreements (such as the "passporting" of financial services in particular) and mutual recognition in services can lead to a potentially binary outcome when they are put in place – i.e. in some cases a service can either be provided to the foreign market or not and there is no intermediate state. In contrast, for goods trade there is a range of outcomes that can result from a given percentage price increase that a tariff might impose, where the price sensitivity of the product, level of competition faced by the firm and their margins all need to be considered in deciding if the market continues to be viable. With services trade, the extreme "hard" Brexit scenario includes the possibility that market access is lost entirely if service recognition is removed. The facilitation of services trade is one aspect of the EU single market that takes it much further than any other existing free trade agreement, most of which involve relatively limited opening up of markets to services.

This paper examines the structure of Irish-UK services trade and uses a gravity model approach in order to estimate the potential effect of Brexit on these services trade flows. The approach taken is to estimate the overall determinants of services trade flows, both at the level of total services trade flows and also using more disaggregated sub-sector data, and within this structure establish how much additional trade is associated with trading partners both being members of the EU. This EU increase in trade is then assumed to be removed following Brexit, giving a clear scenario of the potential extent of not being part of the single services market on trade flows between Ireland and the UK.

This broadly follows the approach of Ebell (2016) for UK trade overall and rests on the critical assumption that the size of the loss of membership would be symmetric with the gains, which generates an estimate of the extent of trade falls. It is important to emphasise that the report cannot provide a forecast of the changes in services trade arising from the UK exit but does aim to provide a sense of exposures across sectors that may be of value in risk assessment and contingency planning.

The effects estimated focus entirely on a calculation of the trade-enhancing premium associated with EU membership and the scenario where this membership effect is removed assumes that no other policy change is made concurrently. Policy actions to mitigate the effects, such as support for market diversification, are not taken into account. The focus here is on Irish-UK services trade and, along with providing the first estimates of potential effects of Brexit on these flows, we also go in more depth on the determinants of services trade in general than much of the previous literature by applying the estimation methodology at a much more disaggregated level.

The gravity model in international trade has been demonstrated to be an extremely robust empirical method. The method links trade between country pairs to the factors that work either to attract or to restrict trade using fundamental factors such as the size of the economies (capturing supply and demand) and the distance between them (as a broad proxy for transport costs). The gravity model tends to be applied to total trade but previous work focusing on services has found that it also applies well to services trade (Walsh, 2006). A substantial literature has built up on this approach, with many papers adding additional factors to more thoroughly capture different trade costs. Membership of free trade agreements is one such factor as used by Ebell (2016) in her work on Brexit.

In order to assess the determinants of services trade, we use international balance of payments data on total services and its component subsectors between 28 reporting countries and over fifty partner countries. EU membership is found to be associated with 26% higher trade in total services. However, we find considerable variation in the impact that EU membership has had on individual components of services trade, ranging from being statistically insignificant or even slightly negative to having positive effects of more than doubling trade in some sectors.

Financial services, insurance in particular, and computer services are found to have been the largest beneficiaries of EU membership when comparing trade flows with other comparable sets of trading partners. Removing the EU membership estimated premium, we find that Irish services imports from the UK could decline by 33% and exports by 45%, driven mainly by reductions in the insurance and telecommunications sectors. The effect of exports in particular is considerably larger than the aggregate estimate of EU membership, showing how the different effects across sectors matters and

also that Irish services exports to the UK are concentrated in areas where EU membership has had a particularly strong positive impact.

The paper is structured as follows: Section 2 describes the structure of Irish-UK services trade overall and how it is distributed across sub-sectors. Section 3 discusses the empirical specification of the gravity model and the data on determinants of services trade used. Section 4 describes the results for the estimates of what drives services trade. Section 5 uses the coefficients on the increased trade associated with EU membership to estimate a counter-factual in which this factor is removed from Irish-UK trade and what level of trade fall would result in such a scenario. Finally Section 6 concludes.

2.   Patterns of Irish-UK Services Trade

This paper uses services trade flows between countries from Eurostat's Balance of Payments database. The data cover the period from 2010 to 2014 and provide the most detailed breakdowns available on services flows by partner country and by item, although the level of detail on subcomponents of trade can vary across countries depending on confidentiality of returns. Throughout the paper, we use the most granular breakdowns possible for Irish trade.

Table 1 shows total Irish services trade across three broad regions. Overall, Ireland imported slightly more services than it exported and CSO aggregate data shows that this gap widened somewhat in 2015 driven mainly by higher imports from the US.[2] Looking at the importance of the UK in overall Irish services trade, we see that the UK accounts for slightly over 10% of Irish services imports and just under 20% of exports. Comparing the UK to services trade with the EU overall, the UK accounts for about one-quarter of Ireland's services imports and 35% of exports. The divergence between imports and exports is largely accounted for by the scale of R&D licence imports originating in the US.

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[2] http://www.cso.ie/en/releasesandpublications/er/its/internationaltradeinservices2015/
The full breakdown by partner country and subsector is not yet available for 2015 so this is not included in the data analysed in this paper.

Table 1: Irish Services Trade, 2014

€millions	UK	EU28	RoW	Total
Imports	11,361	46,566	62,810	109,376
Exports	20,176	58,282	43,470	101,752

Share	UK	EU28	RoW	Total
Imports	10%	43%	57%	100%
Exports	20%	57%	43%	100%

Source: Eurostat Balance of Payments

Key Finding 1	*Overall, Ireland imports more services than it exports.*
Key finding 2	*The UK accounts for twice as big a share of Irish services exports as of imports.*

Table 2 looks at how services trade with the UK is distributed across a number of different subsectors. The first column calculates the UK share of imports in each of the subsectors and the second column reports the importance of that subsector in terms of total services imports. The third and fourth columns present the same calculation for services exports. The UK accounts for a considerable share of Irish imports across transport services with a similar pattern for transport services exports also evident with the UK being the dominant trading partner. In terms of total services trade however these are relatively small sectors accounting for a total of 1.7% of services imports and a somewhat more substantial 5.2% of exports (mainly in air transport).

Overall services imports are notably dominated by licences for use of R&D outcomes which accounts for close to 45% of the total. However, very little of the imports in this category originate in the UK. The dominant export subsector is telecommunications and computer services which makes up close to half of services exports and in this category the UK is a substantial trading partner with 29% of imports and 13% of the sector's exports destined for that market. The UK also makes up a considerable portion of trade (both in terms of imports and exports) in insurance, financial services and business services.

Table 2: Irish-UK Service Sector Shares (2014)

	Imports		Exports	
	UK share of total Irish imports	Sector share of total Irish Imports	UK share of total Irish Exports	Sector share of total Irish Exports
Transport by Sea	30%	1%	42%	0%
Transport by Air	32%	1%	81%	5%
Other Transport	29%	0%	25%	4%
Accommodation & Travel Services	18%	4%	n.a	n.a
Travel for Health & Education Services	19%	0%	30%	0%
Direct Insurance	11%	3%	23%	9%
Reinsurance	36%	3%	n.a	n.a
Other Financial Services	0%	6%	33%	8%
Licences for use of R&D outcomes	2%	43%	7%	5%
Telecommunications & computer services	29%	2%	13%	49%
Research and development services	5%	6%	0%	2%
Professional and management consulting	15%	5%	0%	1%
Technical, trade-related & other business	16%	24%	18%	17%
Personal, cultural and recreational	71%	0%	7%	0%
Government & other services	56%	3%	82%	0%
Total	10%	100%	20%	100%

Note: n.a. not available. Source: Eurostat Balance of Payments

The large share of R&D licences in Irish services imports brings up an important issue regarding the contribution of imports to economic activity. As discussed in more detail in Lawless (2018), imported inputs can play an important role in exporting. The foreign value-added share in Irish exports has been estimated as being one of the highest in the OECD at 46% of final value added and this is spread over all sectors including services (OECD, 2017). Any effect of Brexit that disrupts imports from the UK could therefore have the additional risk of impacting on Irish exports to other markets.

Key Finding 3	*Imports of R&D licences dominate Irish services imports but very little of this originates in the UK.*
Key finding 4	*Trade, business and financial services are main sectors for Irish-UK services flows.*

3.   Gravity Model and Services

The empirical basis for the analysis is the gravity model, which relates trade flows between countries to the size of their markets and the cost of moving goods between them. The gravity approach to modelling trade has a long history, being first used in the 1960s by Tinbergen (1962). The technique acquired its name from the parallel with the physical force of gravity determined by the combined mass of two bodies and the (inverse square) of the distance between them. In economics, the gravity approach was initially essentially atheoretical but proved extremely successful empirically in explaining a large proportion of trade flows. The method was also used to explain other types of international flows, most notably migration. The gravity approach was placed on a firmer theoretical basis by Anderson (1979) and Bergstrand (1985) and more recently developed further by Anderson and van Wincoop (2004). These derivations of the gravity model demonstrate that it is not merely an *ad hoc* data method but is a reduced-form version of a theoretical representation of world trade.

The baseline gravity equation to be estimated for aggregate export sales *S* from country i to country *j* is:

$$ln(S_{ij}) = \beta_0 + \beta_1(Supply\ factors) + \beta_2(Demand\ factors) + \beta_3 ln(Distance_{ij}) + \beta_4 ln(TradeCosts_{ij}) + u_{ij}$$

The fundamental components of the gravity model are variables to capture supply (GDP and GDP per capita of the source country), those to capture demand in the destination market (GDP and GDP per capita), and the distance between the two countries. In the traditional gravity model of goods trade, distance is treated as a broad proxy for transportation costs but evidence from work on services trade such as Walsh (2006) suggests that it captures a range of other costs and potentially picks up some common preferences with the result that it also has strong predictive power for trade in services. The final term in the equation above, $\beta_4 ln(Trade\ Costs_{ij})$, is a vector of coefficients for other trade cost variables with the main variable of interest in the paper being the potential cost reducing effect of common membership of the EU. The error term is *uj*. The empirical specification is in logs, which results in the coefficients for each of the continuous variables being interpreted as elasticities.

Key Variables:

- *Trade flows*: we use bilateral services trade flows from Eurostat Balance of Payments covering the period 2010 to 2014. We use all available countries, which comprises trade between 28 reporting countries and over 50 partner countries as listed in Table 3.[3] We use total services imports and exports of the reporting countries and also use the components of the Balance of Payments items.

- *GDP per capita* of both countries, capturing income and development levels that might affect the supply and demand of different services. This data comes for the World Bank World Development Indicators.

- *GDP* of both countries, to capture market size, also comes from the World Bank World Development Indicators.

- *Distance,* which provides a broad proxy for trade costs and similarity of the countries. Distance is measured between the capital cities of each pair of countries from the CEPII gravity database.

- *EU membership* is an indicator variable which is set equal to 1 if both countries in a trading pair are members of the European Union and 0 otherwise.

- *Contiguity,* defined as sharing a land border, is also included as a potential trade facilitating factor. This is a binary variable equal to 1 if there is a land border between each pair of countries and 0 otherwise. This comes from the CEPII gravity database.

- *Common language* is another indicator variable which is set equal to 1 if both countries share a common official language and 0 otherwise. This comes from the CEPII gravity database.

- *Colonial link* is set equal to 1 if both countries had a colonial relationship in the past and 0 otherwise. This comes from the CEPII gravity database.

- *Year* dummies are included in each regression to control for overall trends in services trade.

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[3] The countries listed as reporting countries report trade with each of the partners on the partner country list but trade flows are not available on a paired basis between the countries listed only as partners. Therefore, while services trade flows are available between Spain and all the reporting countries for example, we do not have any observations on trade between Spain and other markets such as the USA.

Table 3: Country coverage

Reporting countries		Partner countries			
Austria	Israel	Australia	Finland	Luxembourg	Slovenia
Belgium	Italy	Austria	France	Malta	South Africa
Bulgaria	Latvia	Belgium	Germany	Malaysia	Spain
Croatia	Lithuania	Brazil	Greece	Mexico	Sweden
Cyprus	Luxembourg	Bulgaria	Hong Kong	Morocco	Thailand
Czechia	Malta	Canada	Hungary	Netherlands	Turkey
Denmark	Netherlands	Chile	India	New Zealand	United Kingdom
Estonia	Poland	Switzerland	Indonesia	Nigeria	Uruguay
Finland	Portugal	Croatia	Ireland	Norway	USA
France	Slovakia	Cyprus	Israel	Poland	Venezuela
Germany	Slovenia	Czechia	Italy	Portugal	
Greece	Sweden	Denmark	Korea	Russia	
Hungary	Turkey	Egypt	Latvia	Singapore	
Ireland	United Kingdom	Estonia	Lithuania	Slovakia	

4.   Determinants of Services Trade

This section presents the results of the gravity analysis of services trade flows. We use a standard ordinary least squares (OLS) specification which does not include zero flows. This is due to the difficulty in some of the subsector analysis of identifying true zeros rather than missing information which could risk biasing the results if treated as zero flows. The empirical specification is in logs, which results in the coefficients being interpreted as elasticities. Table 4 reports the main results with the full regression table of output included in the Appendix (Table A1).

For total services trade, panel A of Table 4 shows that a 1% increase in distance reduces trade by 0.82%. This is only slightly lower than the average result of 0.89% found in a meta-analysis of over 1,000 distance coefficients in papers estimating gravity models for goods trade by Disdier and Head (2008). We also note that the fit of the model is very high, with the R^2 indicating that the small number of explanatory variables included here capture 80% of the variation in overall services trade. The signs of the other explanatory variables are as anticipated with the results for origin and destination GDP per capita showing richer countries importing and exporting more services, although the size of this country income effect is considerable larger for the origin GDP per capita suggesting that higher income countries are more likely to be large exporters of services. The total GDP level which is included as a measure of market size is also positive and significant for both origin and destination markets as would be expected with larger countries exhibiting higher overall trade flows.

The other indicators of trade facilitation – contiguity, common language and colonial linkages – all work to increase total services trade flows between countries. The sizes of some of these effects is considerable, with sharing a common language or border increasing trade by close to 50% and colonial linkages more than doubling trade. These effects are broadly in line with those of a survey of the gravity model literature by Head and Mayer (2014) and it should be recalled that the effects are estimated holding other country characteristics constant.

Our main interest is the effect of EU membership which in this initial specification is shown to increase trade by 26% holding all other factors constant. While this is smaller than the effects of some of the other indicator variables, it should be recalled that other characteristics such as geographic closeness and country incomes which would make higher volumes of trade likely between EU member states likely are already controlled for in the other characteristics and the EU effect is estimated as being above and beyond the magnitude of trade that would be expected from these other country characteristics. The size of the EU effect is in line with the large positive effect found by Ebell (2016) in her analysis of trade agreements on services although different methodologies mean that the coefficients are not directly comparable. The size of the effect does however contrast with earlier findings by Walsh (2006) that EU membership had no statistically significant effect on services trade. This may simply reflect the earlier time period being studied by Walsh before much of the integration of the free market in services was in place.

Table 4: Determinants of Services Trade		
	A: Total Services Trade	B: Pooled Sector-level Results
1% increase in:	Affects trade flows by:	
Distance	-0.82%	-0.45%
GDP per capita (origin)	0.87%	0.71%
GDP per capita (destination)	0.49%	0.30%
GDP (origin)	0.68%	0.46%
GDP (destination)	0.75%	0.43%
Change from 0 to 1 in indicator:	Affects trade flows by:	
EU Member	26%	19%
Contiguity	49%	51%
Common Language	43%	152%
Colonial Link	137%	15%

Source: Author's calculations based on data from Eurostat, World Bank and CEPII

Panel B runs a similar specification but rather that total services trade flows uses disaggregated subsectors as listed in the description of the data in Table 1. This was the most granular breakdown available for Ireland. Pooling over the subsectors in this way introduces considerable additional variation and the fit of the pooled model is therefore lower than that of the first panel on total services trade. The broad pattern of the coefficients for the determinants are however extremely consistent. The most notable changes in magnitude are a lower effect of distance and a higher impact of common language, two variables that we will see vary considerably across the services components when we look at them individually next. The effect of EU membership does not change dramatically, although it is somewhat lower at 19% for this pooled effect. These changes in magnitude suggest heterogeneity in the strength of how the different determinants operate for different components of trade. To examine this further, we next look at each of the sub-sectors individually.

Key Finding 5	*Services trade flows are higher between larger and higher income countries and reduce with distance. Common language and historic links increase trade.*
Key finding 6	*EU membership has significant positive effect on services trade, increasing total flows by 26%.*

To examine in more depth what determines trade in services, we next run separate gravity models for a broad range of services sub-sectors. We keep the set of explanatory variables the same throughout. Table 5 presents the percentage changes implied for each sub-sector by the EU membership indicator variable. The full set of results are reported in Table A2 in the appendix and show the considerable variation across sub-sectors in the relative strengths of the different drivers, including the EU membership effect.

The largest positive effects of EU membership in increasing trade are in a number of financial and business services. Direct insurance trade is found to be 125% higher amongst EU members than amongst other comparable pairs of countries and reinsurance (50%), general financial services (54%) and other business services (51%) are amongst those where higher trade flows most strongly associated with EU membership. Computer services (70%) and audio-visual services (55%) are the other sectors where EU membership has a considerably larger positive impact on trade than suggested by the aggregate or pooled gravity models presented in Table 4.

Table 5: EU Membership Estimated Effect on Trade by Sub-sector		
	Estimated percentage increase in trade	Statistically significant?
Accommodation	13%	No
Advertising and publishing	41%	Yes
Architectural, engineering	0%	No
Audio-visual services	55%	Yes
Computer services	70%	Yes
Financial Services	54%	Yes
Freight	42%	Yes
Legal, accounting, management	49%	Yes
Licences for R&D outcomes	-23%	No
Manufacturing services	56%	Yes
Operational leasing services	39%	Yes
Other business services	51%	Yes
Direct insurance	125%	Yes
Other personal services	13%	No
Personal, cultural and recreational	5%	No
Other services	22%	No
Passenger transport by air	36%	Yes
Passenger transport on sea	14%	No
Reinsurance	50%	Yes
Research and development services	36%	Yes
Supporting and other services	-9%	No
Trade-related services	6%	No
Waste and agricultural	-27%	Yes
Direct R&D	54%	Yes

Note: Coefficients from full model reported in Appendix table A2.
Statistical significance at 1% level reported as "Yes".
Source: Author's calculations based on data from Eurostat, World Bank and CEPII

The positive effects of EU membership are more muted for services related to trade and transport. This is potentially because these are sectors where demand may be larger when facilitating trade between more unfamiliar or more difficult to access markets. The lowering of trade barriers within the EU may therefore have reduced the need for some of these support services. Accommodation, cultural and personal services are also not significantly associated with EU membership. Trade in licences for R&D services show a moderately significant negative effect, potentially coming from the dominance of the US in this particular sector. Direct R&D services in contrast are 36% higher amongst EU members compared to trading pairs.

In the appendix table we see that while variation across the effects of the other explanatory variables at this subsector level is considerable - which would be expected given the disaggregated nature of the data - the broad patterns in terms of the direction of the effects is very robust across all of the

estimations. Distance has an almost uniformly negative effect on the level of trade in services, with the exception of passenger transport by air, where greater distance is associated with higher flows. In terms of magnitudes, freight transport is the most strongly effected of all services with a doubling of distance more than halving the trade flow, much as would be expected in the classic gravity model of goods where distance is generally considered largely in terms of acting as a proxy for transport costs.

Key Finding 7	*Determinants of trade vary considerably across sectors. EU membership effect ranges from insignificant to more than doubling trade flows.*

In simulating the effects of Brexit in the next section, we focus on the reversing of the effect of the EU membership variable but this large effect of distance on freight services could also raise concerns related to knock-on effects of increased costs coming from delays or disruption to Irish trade using the UK land-bridge to access other export markets. In such a scenario, an increase in travel time could be considered as analogous to an increase in distance in the standard gravity specification. Lawless and Morgenroth (2017) estimated that approximately half of Irish export volumes to the rest of the world transit the UK so additional time or other administrative costs in using this route could be important.

The income level and size of the origin and destination markets, measured by GDP per capital and GDP level, have fairly consistently positive effects on services trade flows with somewhat more variation in the magnitude of the effects for the origin country measures. This potentially implies some specialisation in what countries export as services whereas larger, higher income destinations are correlated with increased demand across all of the subsectors in a somewhat more balanced way. Sharing a common border has a significantly positive effect on most services types, with passenger transport a notable exception. Licences for R&D are also unaffected by contiguity. The largest effect is for accommodation services, where sharing a border increases services trade almost fourfold. Consistent with the importance of distance already highlighted above for freight services, sharing a border also has a particularly strong effect for this category, more than doubling trade compared to flows between other comparable country pairs.

One area where the effects on trade flows in services appear considerably larger than those generally found for gravity models of goods trade is in the effect of a common language. In most of the specifications for individual subsectors, we find that having a common official language almost or

more than doubles the trade flows. This is about twice the size of the effect of common language on goods trade found by Meltiz and Toubal (2014). This makes intuitive sense given that services trade in many instances will rely much more heavily on personal interactions and communication than exchanges of goods.

Within goods, Melitz and Toubal (2014) found that the importance of common language was higher for differentiated goods than for homogenous products, which demonstrates the increased importance of common language as exchanges become more complex as would be expected to be an even greater factor in services interactions. They also examine a range of other language measures, such as commonly spoken second languages and measures of linguistic similarity, and conclude that this effect of a simple dummy variable for a common official language actually understates the importance of ability to communicate easily on increased trade by finding higher effects when facility with similar or widely spoken languages are included in their model. Unlike many models of goods trade, common colonial linkages have a limited and inconsistent effect when compared across the services subsectors suggesting that this is a much less important factor in services trade when the other determinants are controlled for.

Key Finding 8	*Common language is an extremely important facilitator of services trade flows, although size of effect varies by sector.*

5. Impact of Removing EU Membership Effect

Having established the trade-increasing effects of EU membership on services trade overall and how these can vary across different types of services, this section calculates a hypothetical scenario of the magnitude of the trade flow change between Ireland of removing the EU benefit effect. This is not a projection as the final outcome of negotiations is unclear but rather is aimed at giving a sense of the broad magnitudes that may be involved and, in particular, the distribution of exposure across sectors within services.

A number of assumptions are made which should be borne in mind in interpreting the results. The first assumption is that the UK's exit from the EU has a symmetric effect on reducing trade as being a member has been estimated to have increased it. Here the fact that final terms of market access have yet to be decided is particularly important and could mitigate the effects of exit on services trade but could also increase them particularly for sectors such as financial services where market access could be more severely restricted.

A second key assumption is that the EU parameter estimated is symmetric: in other words that the same percentage reduction is applied to Irish imports and exports being traded with the UK. However, once it has exited the EU, the UK will be in a position to determine its own market access rules for firms seeking to supply services into the UK and these may not necessarily mirror those that the EU might apply to imports coming from the UK. The effects, both overall and on individual sectors, could therefore vary more across imports and exports than this model implies.

In terms of the assumption of symmetry, the limited examples of departing from a free trade agreement means this has not been tested. However, while research by Rose (2000) found that membership of a currency union could double the trade volume between two countries, Thom and Walsh (2002) found little negative effects of the Irish break with sterling in 1979 suggesting the effects are not automatically symmetric. Thom and Walsh argued that this result was because, unlike many of the currency unions examined by Rose, both countries were developed and stable and the exchange rate break was not accompanied by any other change in free trade arrangements between the two countries. Symmetry appears to be the most reasonable assumption but final effects will depend on what exact regime replaces the current arrangements.

The overall benefit of services trade we found in the initial aggregate gravity model was that EU membership increased services trade flows by 26%. In Tables 6 and 7, we apply the reductions in each sector to Irish-UK services trade for imports from the UK and Irish exports to the UK respectively, using the subsector estimates (where they are statistically significant). The estimated trade flow reductions using this disaggregated approach estimates falls of 33% in imports and 49% in exports. That this reduction is higher than the aggregate 26% estimate shows that Irish-UK services trade is in sub-sectors that have benefited more from EU membership than the average. Insurance and financial services stand out as drivers of much of the total reduction in both directions with large reductions in telecommunications exports also a major contributor to the higher fall in exports than in imports.

Table 6: Brexit Effect on Irish Imports from UK			
	Current trade flow (€m)	Model Estimated EU effect (%)	Reduction in trade by removing EU effect (€m)
Manufacturing services	12	56%	7
Freight transport by sea	32	42%	13
Sea transport support services	24	-9%	-2
Passenger transport by air	84	36%	30
Freight transport by air	78	42%	33
Air transport support services	42	36%	15
Other transport modes	817	36%	292
Life/freight insurance	180	125%	180
Other insurance	1,013	125%	1,013
Financial services	770	54%	415
Telecommunications	92	55%	50
Computer Services	362	70%	253
R&D services	17	36%	6
Accounting, auditing, tax	124	49%	60
Business consultancy	701	51%	354
Advertising and market research	30	41%	12
Operational leasing services	2,727	39%	1,051
Total affected – using model estimates	7,105		3,784
Total trade with UK	11,361		
Estimated reduction in UK imports: 33%			
Estimated reduction in total services imports: 3.5%			

Note: No reduction applied where estimate of EU effect is statistically insignificant.

Key Finding 9	*Removing EU membership effect reduces services imports from UK by 33%, equivalent to 3.5% fall in total services imports.*
Key Finding 10	*Impact is driven by insurance, operational leasing and other financial services sectors.*
Key Finding 11	*The effects are unevenly spread and some sectors may see no impact.*

Table 7: Brexit Effect on Irish Exports to UK			
	Current (€m)	EU effect (%)	Implied reduction (€m)
Manufacturing services	41	56%	23
Freight transport by sea	20	42%	8
Passenger transport by air	8	36%	3
Freight transport by air	274	42%	115
Other transport modes	906	36%	324
Life/freight insurance	1309	125%	1309
Other insurance	2736	125%	2736
Financial services	311	54%	168
Telecommunications	6279	55%	3441
R&D services	98	36%	35
Advertising and market research	545	41%	225
Operational leasing services	2004	39%	772
Total affected	14531		9159
Total trade with UK	20176		
Estimated reduction in exports to UK: 45%			
Estimated reduction in total services exports: 9%			

Note: No reduction applied where estimate of EU dummy insignificant

Key Finding 12	*Removing EU membership effect reduces services exports to UK by 49%, equivalent to 10% fall in total services exports.*
Key Finding 13	*Financial services (particularly insurance) and telecommunications would be the most affected sectors.*

6.   Conclusions

This paper examines the determinants of total services trade flows and dis-aggregates the effects across a range of service types using a standard gravity model formulation. Our particular interest is in establishing the extent to which EU membership has had an effect on bilateral trade in services. This EU bonus is then subtracted from Irish-UK services trade to provide a broad indication of potential trade reductions following the UK's exit from the EU. We take this approach because restrictions on services trade tend to take the form of non-tariff barriers such as limits on market access or specific requirements in terms of licencing and recognition of standards and these are more difficult to measure than tariffs. In the context of Brexit, it also means that there is no equivalent to WTO-registered tariffs that operate as a fall-back positon when considering the extent of the possible changes in trade costs. It should be noted that this approach rests on a number of important

assumptions, most particularly that exiting the EU has a symmetric effect on trade flows as being a member and that the market access conditions the EU applies to UK trade are mirrored by the UK itself.

When we estimate the EU membership premium for aggregate services trade, find that it has a positive impact of around 26% holding all other factors constant. When we examine in more depth what determines trade in different component of services trade, we find that the strength of this effect, and of several other trade determinants, vary quite considerably across the individual sub-sectors. EU membership has a particularly strong impact on the levels of services trade in financial and business services, with the largest effect being a more than doubling of trade in direct insurance between EU members compared to other similar pairs of countries. Computer services and audio-visual services are also sectors where EU membership has a considerably larger positive impact on trade than suggested by the aggregate or pooled gravity models and are sectors in which Irish services exports to the UK are reasonably highly concentrated. One major services import for Ireland, trade in licences for R&D services, shows a slight negative relationship with EU membership, which is likely to come from the dominance of the US in this particular sector. Other major determinants of services trade, such as common language, distance and income levels, all continue to suggest that the UK would be an important trading partner for Irish services even outside of the EU although the extent of trade restrictions would be a critical factor in continuing to facilitate that trade.

Having established the trade-increasing effects of EU membership on services trade, we measure the size of removing this effect on Irish-UK trade in services using the estimates from the disaggregate sectors. This scenario shows trade flow reductions of 33% in for Irish services imports from the UK and a 45% reduction in exports. It is notable that these effects using the disaggregates approach are quite a bit higher than the 19% trade enhancing effect estimated using total services trade flows. This demonstrates the heterogeneity of the effect of EU membership on different components of services trade and further shows that Irish-UK services trade is in sub-sectors that have benefited more from EU membership than the average. Insurance, financial services and telecommunications are the key sub-sectors driving the overall estimates of the effects of "removing" EU membership.

As emphasised in the introduction, the broad range of potential outcomes to negotiations means that this report is not attempting a forecast of the changes in services trade. The motivation of the approach is to give context to the contribution of the EU to services trade and thereby provide some evidence of overall exposure of services trade to a hard Brexit and, more particularly, how this exposure could vary across sectors. This may be of value to policy-makers and firms in developing both ex ante risk assessment and contingency planning and plans for mitigation as more information

emerges. One key finding that may be of relevance in developing policy priorities is that the impact of Brexit as estimated by this approach is concentrated quite substantially in a small number of sectors, where more in-depth analysis of links and exposures would be warranted. Further examination of the extent to which these sectors are also exposed to Brexit in other European countries could be used to develop common priorities and identify sectors where maintaining trade flows are mutually beneficial.

In terms of planning for mitigation of the impacts of market access restrictions for Irish firms trading in services with the UK, a number of policy approaches could be considered. Of most immediate concern would be to ensure that a transition deal would be put in place to that currently existing contracts could continue to the end of their duration without any sudden stop in service provision. This would be a crucial feature in avoiding widespread disruption as the impact would be staggered over time as contracts ended rather than market access being lost on a fixed day. Policy support in information provision for firms on areas that may be most exposed and where firms should concentrate efforts at sourcing alternative suppliers or at diversifying market access for exporters is likely to come to the forefront as more specific information becomes available on the nature and extent of any new trading restrictions. In terms of counteracting any negative impact of Brexit through diversification to other markets, the other results of the gravity model may help identify priority markets by giving focus to which sectors are most sensitive to distance, market size and common language amongst other factors. A longer-term policy implication from the model suggests that investment in learning other languages could have large economic returns.

From a firm perspective, considering the length of contracts entered into and ensuring that alternatives are available for continuity of service would be important considerations. For importing firms, this may be a relatively simple process if their source in the UK has a parent, subsidiary or affiliate companies elsewhere in the EU. If this is not the case, a broader search for alternative suppliers may be necessary. For exporting companies, the emphasis may be on ensuring that contracts entered into do not leave them exposed if they are no longer able to deliver their service and to examine routes that would help them maintain access, although this may be difficult until the precise details of new requirements become clear for each sector (e.g. a new registration requirement). In addition to looking to minimising reductions in trade with the UK, exporters may also mitigate the impact by examining potential for market diversification, particularly elsewhere in the EU.

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Appendix A1: Determinants of Services Trade Regression Output

	A. Total Services			B. Pooled Sub-sectors		
	Coefficient	Std. Error	Significance	Coefficient	Std. Error	Significance
Distance	-0.82	0.015	***	-0.45	0.01	***
GDP per capita (origin)	0.87	0.018	***	0.71	0.01	***
GDP per capita (dest.)	0.49	0.012	***	0.30	0.01	***
GDP (origin)	0.68	0.008	***	0.46	0.00	***
GDP (destination)	0.75	0.007	***	0.43	0.00	***
EU Member	0.23	0.034	***	0.17	0.02	***
Contiguity	0.40	0.051	***	0.41	0.02	***
Common Language	0.36	0.053	***	0.92	0.03	***
Colonial Link	0.86	0.058	***	0.14	0.03	***
Year controls				Yes		
Constant	-40.47	0.328	***	-29.56	0.18	***
Observations	11,306			105,897		
R^2	0.80			0.34		
*** indicates significance at 1% level.						

Note that the variables entered into the regression as indicator variables (equal to 1 when both countries share the characteristic and 0 otherwise) have the coefficients converted into a percentage change in the main text tables using the following standard calculation:

$$(\exp(\widehat{EU}) - 1) \times 100\%$$

Table A2: Determinants of Services Trade by Sector[4]

	EU Member	Distance	GDP/capita (origin)	GDP/capita (destination)	GDP (origin)	GDP (destination)	Contiguity	Common Language	Colonial Link
Accommodation	0.119	-0.660***	1.019***	0.119**	0.619***	0.929***	1.755***	1.086***	-0.593***
Advertising and publishing	0.345***	-0.773***	0.417***	0.450***	0.556***	0.577***	0.623***	0.888***	-0.083
Architectural, engineering	0.000	-0.705***	0.563***	0.192***	0.704***	0.822***	0.493***	0.329***	0.2471**
Audio-visual services	0.437***	-0.174**	0.019	0.220***	0.556***	0.699***	0.649***	1.434***	-0.732***
Computer services	0.530***	-0.606***	0.676***	0.479***	0.665***	0.647***	0.370***	0.700***	0.2068*
Financial Services	0.431***	-0.476***	1.641***	0.631***	0.524***	0.222***	0.718***	1.281***	0.3410***
Freight	0.350***	-1.212***	0.080**	0.232***	0.588***	0.543***	0.844***	0.172	-0.066
Legal, accounting, management	0.396***	-0.717***	0.504***	0.542***	0.631***	0.707***	0.459***	0.956***	0.2164**
Licences for R&D outcomes	-0.26*	-0.384***	1.099***	0.661***	0.722***	0.684***	-0.00	0.961***	0.2567
Manufacturing services	0.447***	-0.637***	-0.53***	0.264***	0.574***	0.761***	0.708***	1.011***	0.2441
Operational leasing services	0.326***	-0.299***	0.955***	0.437***	0.379***	0.269***	1.018***	1.196***	-0.090
Other business services	0.409***	-0.663***	0.367***	0.458***	0.644***	0.760***	0.568***	0.460***	0.5858***
Direct insurance	0.810***	-0.080*	0.673***	0.392***	0.413***	0.323***	0.420***	1.556***	-0.254
Other personal services	0.123	-0.239***	0.435***	0.059	0.268***	-0.05	0.284*	1.409***	0.0464
Personal, cultural and recreational	0.050	-0.546***	0.229***	0.304***	0.514***	0.357***	0.610***	0.761***	0.3908***
Other services	0.198	-0.638***	1.879***	0.237***	0.479***	0.371***	2.092***	-0.69	-1.217***
Passenger transport by air	0.306***	0.0362***	0.186***	0.224***	0.593***	0.684***	-0.03	1.154***	0.7233***
Passenger transport on sea	0.127	-0.717***	0.476***	0.261***	0.278***	0.148***	0.182	0.372	0.2301
Reinsurance	0.406***	-0.362***	0.084	0.388***	0.536***	0.639***	0.589***	1.495***	0.1868
Research and development services	0.307**	-0.436***	0.636***	0.358***	0.630***	0.258***	0.032	0.886***	-0.004
Transport Support & auxiliary	-0.09*	-0.404***	0.728***	0.230***	0.399***	0.494***	-0.00	0.724***	0.2004**
Trade-related services	0.055	-0.655***	0.347***	0.391***	0.557***	0.813***	0.577***	0.922***	0.0558
Waste and agricultural	-0.32***	-0.457***	0.248***	0.089*	0.409***	0.537***	0.478***	0.905***	0.2226
Direct R&D	0.433***	-0.429***	0.589***	0.351***	0.851***	0.743***	0.183	1.566***	0.0430

* indicates significance at 10%, ** at 5% and *** at 1%

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[4] For brevity, the table does not present standard errors, the regressions' constant or measure of fit but these are available on request.

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