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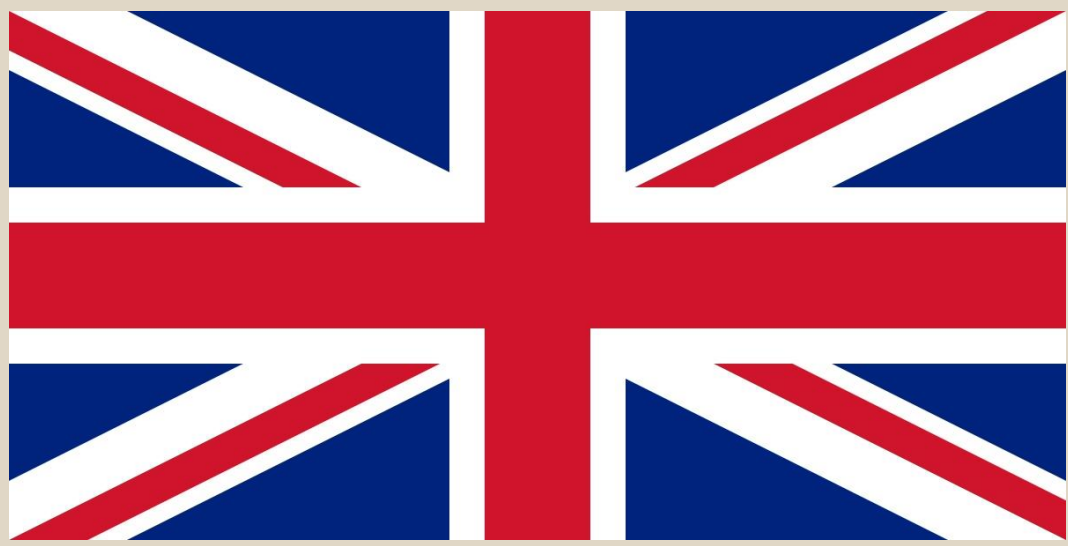
Brexit and UK Agricultural Trade: Sectoral Effects

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BREXIT AND UK AGRICULTURAL TRADE: SECTORAL EFFECTS

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ISSUES

The departure of the UK from the European Union in 2019 will likely result in altered trading relationships between the UK and many of its trading partners. These changes may be particularly important for agricultural trade. The UK trades over 65 percent of its agricultural imports and exports with the EU. In addition, UK, a densely populated island nation, is not food self-sufficient. Their agricultural imports are almost 2.5 times their agricultural imports.

When the UK leaves the EU, it will no longer be in a single market with the other EU countries, which are also its closest neighbors. Tariffs for its imports and exports to the EU may be higher, which may reduce trade (Boulanger and Phillipidis, 2015; IMF, 2016. The UK may eventually enter into negotiations with non-EU nations, altering the policies governing that trade. Those decisions will affect its trading patterns in agricultural product and may have effects that differ across different agricultural sectors (Van Berkum , 2016).

2015 Exports, Top HS Categories	2015 Imports, Top HS Categories	2017 Exports, Top HS Categories	2017 Imports, Top HS Categories
Beverages (\$9.9 billion)	Beverages (\$8.5 billion)	Beverages (\$8.5 billion)	Beverages (\$10.0 billion)
Miscellaneous Edible Preparations (\$2.6 billion)	Fruit and Nuts (\$6.2 billion)	Miscellaneous Edible Preparations (\$2.7 billion)	Fruit and Nuts (\$6.4 billion)
Prepared Cereals (\$2.3 billion)	Meat (\$5.8 billion)	Fish (\$2.3 billion)	Meat (\$5.5 billion)
Meat (\$1.9 billion)	Edible Preparations of Meat (\$4.6 billion)	Dairy (\$2.2 billion)	Edible Preparations of Meat (\$4.6 billion)
Fish (\$1.9 billion)	Vegetables (\$4.3 billion)	Prepared Cereals (\$2.2 billion)	Vegetables (\$4.2 billion)

METHODS AND DATA

We use a gravity model with interactive terms to discern the effects of various policies and structural conditions on agricultural trade overall and on various agricultural sectors for both a large sample of countries. We also use interactive terms to determine the effects on the UK in particular. We note that the UK interactive terms are not significant for some sectors, but they are for a few others. The most likely interactive terms to be significant are1) the variable for contiguity, which, for the UK, essentially measures the effect of trade with Ireland; and 2) the variable for tariffs. The effects of tariff on trade are positive for the UK, in contrast to the large negative coefficients of the sample as a whole, suggesting that the effects of tariffs on UK agricultural trade are smaller.

The model starts with a standard gravity model, following Silva and Tenreyro (2006), assuming that trade between two nations is a function of the distance between them , shared border, shared languages, free trade agreement memberships, and tariffs. Binary fixed effects variables for importers and exporters account for further country heterogeneity. We use the ppml specification of the Poisson estimator.

To this standard model of 75 countries, we add interactive terms for the UK as an exporter and as an importer to determine whether UK agricultural trade has any idiosyncratic characteristics.

We use import data from the Global Trade Atlas, distance and language data from CEPIL, and trade agreement membership from the WTO. Tariff data is taken from WITS for the aggregate of agricultural goods, and from the ITC’s MacMaps database for the 2 digit HS sectoral categories.

RESULTS

Variable names	Agricul-tural Goods	Meat	Dairy	Beverages	Fish	Fruit	Vegetables	Prepared Meat	Misc. Edible Preparation s	Prepared Cereal
Log Distance	-0.22 (-3.96)***	-0.06 (-0.61)	-.47 (-4.93)***	-0.68 (-9.01)***	-0.52 (-5.41)***	-0.71 (-8.15)***	-0.87 (-8.96)***	-0.53 (-6.65)***	-0.69 (-12.39)***	-0.72 (-9.28)***
Contiguity	1.16 (9.21)***	1.15 (7.29)***	1.05 (5.66)***	0.64 (3.30)***	0.91 (4.60)***	0.47 (2.68)***	0.45 (2.19)**	0.88 (6.28)***	0.72 (7.16)***	0.94 (6.41)***
Common Language	0.26 (2.56)***	0.60 (3.79)***	0.34 (1.74)*	0.30 (2.07)**	0.30 (1.28)	-0.30 (-1.65)*	-0.12 (-0.41)	0.64 (3.73)***	0.53 (4.29)***	0.53 (2.94)***
EU members	0.49 (2.12)**	-0.97 (-1.57)	-0.84 (-1.29)	0.52 (1.03)	0.94 (2.81)***	-0.33 (-1.30)	-0.74 (-2.15)**	-2.26 (-4.29)***	0.75 (4.08)***	0.74 (2.42)**
EFTA members	1.58 (6.82)***	1.42 (3.08)***	1.20 (2.54)**	-0.72 (-1.47)	1.07 (3.34)***	2.26 (7.41)***	2.78 (8.80)***	2.34 (5.70)***	0.66 (2.99)***	0.29 (0.83)
Log Tariffs	0.27 (0.27)	-8.62 (-6.77)***	-7.92 (-4.91)***	-3.39 (-3.35)***	-3.83 (-1.69)*	-9.63 (-6.66)***	-8.47 (-4.28)***	-10.43 (-8.57)***	-2.82 (-2.92)***	-5.97 (-3.57)***
FTA	0.49 (4.99)***	0.16 (0.81)	0.22 (1.07)	0.12 (0.70)	-0.31 (-1.72)*	0.22 (1.30)	0.34 (1.59)	-0.25 (-1.62)	0.27 (2.47)**	0.28 (2.01)**
UK Importer Distance	0.06 (0.42)	-0.12 (-0.35)	0.05 (0.20)	0.42 (3.02)***	0.27 (0.98)	0.18 (1.38)	0.14 (0.83)	-0.04 (-0.18)	0.18 (1.31)	-0.01 (-0.04)
UK Importer Contiguity	0.36 (0.80)	0.64 (0.83)	1.60 (1.93)*	-0.30 (-0.59)	-0.66 (-0.94)	2.86 (4.40)***	2.73 (4.69)***	1.48 (2.04)**	0.55 (1.53)	0.20 (0.34)
UK Importer Common Language	-.01 (-0.02)	-0.54 (-0.77)	-1.26 (-1.71)*	-0.04 (-0.08)	-0.27 (-0.50)	1.16 (2.94)***	1.55 (3.64)***	-0.39 (-0.58)	-0.78 (-2.63)***	-0.72 (-1.66)*
UK Importer EU members	-0.24 (-0.55)	-2.89 (-2.03)**	6.79 (3.67)***	2.46 (3.31)***	-0.40 (-0.34)	-0.29 (-0.40)	-0.78 (-1.05)	3.38 (2.11)**	0.54 (1.43)	1.10 (1.57)
UK Importer Tariffs	-9.75 (-1.50)	-4.47 (-1.35)	21.13 (3.59)***	41.97 (2.54)**	-2.46 (-0.19)	-12.62 (-1.65)*	-7.83 (-1.83)*	16.32 (2.46)**	13.51 (1.16)	16.32 (2.85)***
UK Importer FTA	-0.32 (-1.01)	-1.32 (-1.17)	0.74 (0.85)	0.56 (1.02)	-0.89 (-0.78)	0.09 (0.16)	-0.57 (-1.05)	1.99 (3.14)***	-0.50 (-1.22)	-0.33 (-0.68)
UK Exporter Distance	0.13 (0.54)	-1.00 (-3.90)***	-0.81 (-4.95)***	0.33 (1.99)**	-0.63 (-2.74)***	0.42 (2.39)**	0.34 (1.26)	-0.32 (-0.82)	-0.15 (-1.24)	0.07 (0.45)
UK Exporter Contiguity	1.62 (3.29)***	0.69 (0.74)	0.51 (1.02)	1.25 (2.43)**	1.72 (2.20)**	3.50 (4.30)***	5.82 (6.93)***	1.61 (1.59)	1.11 (2.85)***	1.48 (3.01)***
UK Exporter Common Language	0.36 (1.29)	0.11 (0.13)	1.50 (3.67)***	-0.22 (-0.64)	-0.18 (-0.28)	-0.61 (-0.81)	-2.37 (-3.21)***	-0.16 (-0.20)	0.15 (0.51)	0.21 (0.59)
UK Exporter EU members	-0.23 (-0.59)	-1.76 (-1.83)*	-0.64 (-1.46)	0.56 (1.73)*	-2.08 (-2.98)***	3.04 (5.64)***	-2.77 (4.69)***	-0.80 (-0.92)	-0.05 (-0.21)	0.25 (0.64)
UK Exporter Tariffs	-1.15 (-0.75)	-1.29 (-1.47)	0.32 (0.53)	2.30 (3.73)***	1.07 (0.15)	6.84 (2.44)**	-17.83 (-4.05)***	-1.55 (-0.65)	0.90 (1.65)*	-0.95 (-0.58)
UK Exporter FTA	-0.09 (-0.40)	-0.71 (-0.72)	0.26 (0.52)	0.52 (1.76)*	-0.80 (-1.62)	0.17 (0.22)	1.68 (3.50)***	1.48 (1.64)	-0.26 (-0.84)	-0.22 (-0.73)

*** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level. Z statistics are in parentheses.

HIGHLIGHTS FOR DISCUSSION

Sectoral Gravity Model

- Several variables performed as expected. **Contiguity, or shared borders**, raises trade in all sectors. **Tariffs** have a very negative effect on trade across all sectors. **Shared EFTA Membership** raises trade in categories other than prepared cereal.
- Distance** has a negative and significant effect on trade for the sample overall, for all sectors except meat. Coefficients are largest for vegetables.
- Shared Language** has a positive effect on agricultural trade in most categories except for fish, fruits ,and vegetables. Production of these latter goods is heavily dependent on geographic comparative advantage, so importers may have few choices of suppliers.
- FTAs** other than the EU have little importance for agricultural trade additional to those of reduced tariffs. Their effects for the sample as a whole are limited to prepared cereal, and misc. edible preparations.
- Shared EU Membership** has a dampening effect on trade in some categories, like vegetables and particularly prepared meats, but raises trade in fish, prepared cereals and misc. edible preparations. It may be that the EU’s zero tariffs have a larger effect for some agricultural trade sectors than single market membership.

Differences between the Entire Sample and the UK, by Sector

- Meat** - Distance and shared EU membership don’t affect meat trade for the sample as a whole, but distance affects trade negatively for UK exporters, and EU membership does the same for both UK imports and exports.
- Dairy** – For the sample as a whole, EU membership doesn’t affect trade. For the UK, import tariff effects are smaller, and border, distance, and language effects are disparate.
- Beverages** – No RTAs are significant here, but tariffs are. However, for the UK, tariffs and distance affect trade less, and borders and EU membership affect exporters more.
- Fruits** – Language takes an unexpected sign and EU membership isn’t significant for the sample as a whole. However, for the UK, there is a more positive language effect on imports, which reduces or reverses the negative effect, and EU membership has a positive effect on exports. There are also large border effects, larger import tariff effects, and smaller distance and tariff effects on exports.
- Vegetables** - EU membership has a negative effect on trade here, which is even larger for UK exporters. The UK terms also indicate large additional border effects, disparate language effects, and for importers, tariff effects are magnified.
- Fish** – Language is not significant and FTAs take an unexpected sign. EU membership is positive, but for UK exporters, the term is negative. Border and distance effects are larger for UK exporters.
- Prepared Meats** - EU membership has a negative effect on trade here, but not for UK importers. UK importers also exhibit a larger border effect, smaller negative tariff effects, and a positive effect from FTAs.
- Misc. Edible Preparations** – The conventional gravity mode holds for the sample as a whole, even FTA membership. For the UK, there are smaller language effects for importers, smaller negative effects due to tariffs on UK exports, and a larger border effect for exporters.
- Prepared Cereals** – The conventional gravity mode holds for the sample as a whole, the exception of EFTA membership. This sector is one of the few where FTA membership has a significant effect. For the UK, there are smaller language effects for importers, the negative effects on exporters due to FTAs may negate the effect in this sector for the whole sample, and a larger border effect for exporters.

POTENTIAL BREXIT EFFECTS

- The Irish Border Effect** : The border between Ireland and Northern Ireland, which is part of the UK, is the UK’s only shared border, and it has been a sticking point in the UK’s negotiations with the EU. This turns out to have a significant effect on trade, as measured by the UK interactive terms for contiguity. For all sectors except meat and beverages, the UK experiences a larger effect from the shared border than the sample as a whole on either imports, or exports, or both. For fruits and vegetables imports and vegetables exports, contiguity, as well as common language, has an especially large effect on trade, which may reflect the Irish border as well. If the UK ends up having to reduce cross-border trade for structural reasons, this may have a larger effect than would be expected from its other connections with Ireland via the EU or current tariff regimes.
- EU Membership vs Tariff Effects:** When we consider the combined effects of tariffs and EU membership, as well as UK interactive terms, on agricultural sectors, we note that some sectors are more responsive to tariff effects and others more to effects from EU membership. Some may experience both or neither.
 - Sectors that may see reduced trade with loss of EU membership:** These include UK beverage imports and exports, UK fruit exporters, UK misc. edible preparations exports, and UK fish importers.
 - Some may see effects that ultimately depend on eventual negotiated tariffs:** Trade in the UK meat sector, the UK vegetable sectors, and prepared meat exports are actually negatively affected by EU membership, with very negative tariff effects. UK fish exporters and fruit importers experience large negative tariff effects with smaller EU effects.
 - Some experience both effects:** The UK’s miscellaneous edible preparations imports, prepared meat exports, and prepared cereals sectors are affected by both tariffs and EU membership.
 - Some do not experience either effect** - The UK dairy sector, and prepared meat importers, with trade unaffected or less affected by EU membership and exhibiting muted tariff effects, may be affected via this route.
- We see few independent effects of non-EU FTAs at the sectoral level:** The miscellaneous edible preparations sector, UK prepared meat and cereal importers, and UK vegetable exporters may be exceptions here. Other FTAs may largely impact trade via effects on tariffs regimes and TRQs.

A NOTE ON CALCULATING ELASTICITIES WITH INTERACTIVE TERMS

Future work will include explicit calculation of elasticities. However, Shang et al. (2018) point out that coefficients for interactive terms cannot always simply be added to the coefficients for the interacting variables in order to obtain the elasticity for the full effect of each variable. They note that when the interactive terms are the products of two binary variables, they are inconsistent estimators of the interaction, since the true value of the additional effects of each variable depends on the base value of the other interacting term. The additional elasticity of a provided by the regression coefficient of term $a*b$ depends on the value of b at which that coefficient is evaluated.

Formulae provided by Shang et al (2018) enable calculation of the elasticity, but assumptions must be made for the mean value of the interacting variable in order to evaluate the total elasticity

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