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Helga Kristjánsdóttir, Þórhallur Örn Guðlaugsson, Svala Guðmundsdóttir & Gylfi Dalmann Aðalsteinsson

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ARTICLE



Cultural and geographical distance: effects on UK exports

Helga Kristjánsdóttir ^a, Þórhallur Örn Guðlaugsson ^b, Svala Guðmundsdóttir ^b
and Gylfi Dalmann Aðalsteinsson ^b

^aBusiness, University of Akureyri, Akureyri, Iceland; ^bFaculty of Business Administration, University of Iceland, Reykjavík, Iceland

ABSTRACT

This research focuses on how cultural and geographical distance affect trade. The question is whether UK exports are similarly affected by Hofstede national culture distance and geographical distance. OECD data is applied to the United Kingdom's exports as well as Hofstede cultural distance. The research also accounts for the trading countries' economic size, as well as their market size, in order to account for economies of scale. Results indicate that exports are more impacted by geographical distance than the cultural distance between the UK and its main trading partners.

KEYWORDS

Exports; Hofstede national culture; trade; UK; gravity model

JEL CLASSIFICATION

F10; F14; F23; M14; M20

I. Introduction

The outcome of the UK's referendum will shape the future of the country's relationship with its largest trade partner – the European Union (EU). Researchers have considered the value of having membership to trade blocs like the EU in time of crisis (IMF, 2018). Membership in the EU has been argued to reduce trade costs between the UK and the rest of Europe, as the EU is the UK's largest trade partner. It has been argued that leaving the EU will lower trade between the UK and EU because of higher tariff and non-tariff barriers to trade. This is likely to encourage the UK's workers and businesses to look for export opportunities in new markets. This research examines how UK exports are impacted by geographical distance and national culture.

The United Kingdom (UK) faces an interesting trading crossroads with Brexit, and this paper seeks to answer the question of whether cultural distance (Hofstede, 2001; Kristjánsdóttir, 2017, 2019) and Kristjánsdóttir, Guðlaugsson, Guðmundsdóttir, and Aðalsteinsson (2017) and geographical distance (Krugman 1991) have similar effects on trade in the UK. More specifically, the research seeks to analyse whether exports (OECD 2016) are similarly affected by geographical distance and national Hofstede culture dimensions (Hofstede 1980).

Trade flows have been found to increase as areas are geographically closer (Oguledo and Macphee, 1994; Kristjánsdóttir, 2013). Gravity equation is originated in physics; however, it has been applied to economic and business purposes as well. Gravity equation explaining flows between areas was developed by Tinbergen (1962) and Pöyhönen (1963). The economic version of the gravity equation explains how exports are a function of GDPs of countries, as well as the distance between countries (Larue and Mutunga 1993), and studies have been made on trade between OECD countries for different groups of products (Bojnec and Fertő 2009, 2010)

II. Model setup

Bergstrand (1985) explained exports as a function of some economic variables (1):

$$PX_{ij} = \beta_0 (Y_j)^{\beta_1} (Y_i)^{\beta_2} (D_{ij})^{\beta_3} (A_{ij})^{\beta_4} u_{ij} \quad (1)$$

The equation explains exports from country *i* to country *j* as PX_{ij} over time *t*. Variable $Y_{i,t}$ denotes gross domestic product (GDP) of country *i* over time *t*, and $Y_{j,t}$ is the gross domestic product (GDP) of country *j* over time *t*. GDP is included since countries are expected to trade more as they increase in economic size. D_{ij} denotes geographic distance, in kilometres, between the economic centres of country *i* and

CONTACT Helga Kristjánsdóttir  helga@unak.is; dr.helga.kristjansdottir@bc.edu

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country j . Variable A_{ij} denotes factors affecting trade between counties i and j , often having a present population, with ζ_{ij} being a log-normally distributed error term $E(\ln \zeta_{ij}) = 0$.

In Equation (2), the country exporting is denoted with (i), with UK exports denoted as $EXP_{ij,t}$, while the recipient country is denoted with (j).

$$EXP_{ij,t} = e^{\gamma_0} (Y_{i,t})^{\gamma_1} (Y_{j,t})^{\gamma_2} (D_{ij})^{\gamma_3} (A_{ij})^{\gamma_4} e^{\zeta_{ij,t}} \quad (2)$$

Equation (3) sets up the relationship to capture, with Y replaced with UK_GDP to account for economic size of the UK and OTH_GDP to account for the GDP of other countries, and UK_POP to account for population size (market size) of the UK and OTH_POP to account for population of other countries. Also, DIS_GEO_{ij} presents the geographical distance of the UK from other countries, not changing over time. Distance is here measured as geographical distance, in kilometres.

$$UK_EXP_{ij,t} = e^{\zeta_0} (UK_GDP_{i,t})^{\zeta_1} (OTH_GDP_{j,t})^{\zeta_2} (UK_POP_{i,t})^{\zeta_3} (OTH_POP_{j,t})^{\zeta_4} (DIS_GEO_{ij})^{\zeta_5} e^{\eta} \quad (3)$$

Equation (4) setup is the same as for Equation (3), except Equation (4) measures cultural distance (DIS_CULT), including the Hofstede cultural distance between countries, also constant over time.

$$UK_EXP_{ij,t} = e^{\omega_0} (UK_GDP_{i,t})^{\omega_1} (OTH_GDP_{j,t})^{\omega_2} (UK_POP_{i,t})^{\omega_3} (OTH_POP_{j,t})^{\omega_4} (DIS_CULT_{ij})^{\omega_5} e^{\xi} \quad (4)$$

The Hofstede cultural distance has been applied before to estimate culture impact on international trade. Davies, Ionascu, and Kristjánssdóttir (2008) have estimated the impact of the Hofstede cultural distance as a time-invariant variable on foreign direct investment as one form international trade. The definition of the Hofstede cultural distance is provided in Table 1, with the different measures summarised with weighted average. This is common in the gravity model presentation (Bergstrand 1985). Variables applied in this current research are defined in Table 1.

Table 1. Variable definition.

$UK_EXP_{ij,t}$	Exports of the UK (United Kingdom) (i) going to country (j), over time (t). Exports are presented in US Dollar, USD. Obtained from the OECD (2016) on the web page stats.oecd.org.
$UK_GDP_{i,t}$	Gross Domestic Product (GDP) of the UK (United Kingdom) as country (i) running over time (t). Reported in US Dollars, current prices. Millions. Obtained from the OECD (2016) on the web page stats.oecd.org.
$UK_POP_{i,t}$	Population in the UK country (i) over time (t). All ages. All persons. Annual. Obtained from the OECD (2016) on the web page stats.oecd.org.
$OTH_GDP_{j,t}$	Gross Domestic Product (GDP) of OECD countries (j) other than UK, running over time (t). Reported in US Dollars, current prices. Millions. Obtained from the OECD (2016) on the web page stats.oecd.org.
$OTH_POP_{j,t}$	Population (POP) of OECD countries (j) other than UK. All ages. All persons. Annual. Obtained from the OECD (2016) on the web page stats.oecd.org.
DIS_GEO_{ij}	Geographical distance from the UK to other countries. Measured as distance in km from the United Kingdom's capital city, London, to other capital cities of countries, except that in the US, New York City is used rather than Washington, D.C. (Distance Calculator, 2016; Kristjánssdóttir, 2017).
DIS_CULT_{ij}	Cultural distance. This the normalized ¹

III. Data

The United Kingdom recently accepted Brexit in a referendum, so the UK is leaving the European Union at some point. This makes UK exports an interesting subject for study. The dataset analysed covers exports from the UK to other OECD countries, based on the OECD database (OECD, 2018) which provides information on UK exports to individual trading partner countries on yearly basis Summary statistics for the sample is provided in Table 2.

The OECD countries receiving exports from the UK include Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea (Republic of South Korea), Luxembourg, Mexico, The Netherlands, New Zealand, Norway, Poland,

Table 2. Summary statistics for the basic sample.

Variable	Obs	Mean	Std. Dev.	Min	Max
$\ln(UK_EXP_{ij,t})$	705	19.67726	1.493289	16.40446	22.79829
$\ln(UK_GDP_{i,t})$	1176	14.28597	.3124355	13.77242	14.68813
$\ln(OTH_GDP_{j,t})$	804	12.59501	1.539574	8.574854	16.59776
$\ln(UK_POP_{i,t})$	1176	17.89607	.0274194	17.85989	17.9564
$\ln(OTH_POP_{j,t})$	814	16.37921	1.524325	12.44014	19.56526
$\ln(DIS_GEO_{ij})$	1152	7.777442	1.059243	5.771441	9.841612
$\ln(DIS_CULT)$	696	4.457049	.8364267	.7442554	5.237164

¹Where it holds that:

HOFSTEDEi = Pow_dis+ind+Mas+Uncer+Ori. Pow_dis = (pow_dis/104)*100. Mas = (mas/110)*100. Uncer = (uncer/112)*100. Ori = (ori/118)*100.weighted average Hofstede value for the UK minus the same value for other trading countries.

Table 3. Geographical distance effects on UK exports, based on Equation (3).

Linear regression		Number of obs = 703				
		F(5, 697) = 775.61				
		Prob > F = 0.0000				
		R-squared = 0.7864				
		Root MSE = .69236				
		Robust				
ln(UK_EXP)	Coef.	Std. Err.	t	P > t	[95% Conf.	Interval]
ln(UK_GDP)	-.4626**	.192636	-2.40	0.017	-.8408355	-.0844025
ln(OTH_GDP)	1.9229***	.0796299	24.15	0.000	1.766571	2.079257
ln(UK_POP)	-1.9752	2.01677	-0.98	0.328	-5.934898	1.984447
ln(OTH_POP)	-1.1377***	.0862332	-13.19	0.000	-1.307065	-.9684487
ln(DIS_GEO)	-.5219***	.0211348	-24.69	0.000	-.5633986	-.4804075
Constant	59.8536*	33.73381	1.77	0.076	-6.37846	126.0857

Robust t-statistics are reported in parentheses.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

Portugal, Slovakia (the Slovak Republic), Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

The total number of the OECD countries in the data sample is 34 (OECD, 2018). Data covers the 1989–2012. ('As of 8 September 2016, the Distance Calculator listed the kilometre data applied here on its website'). Some OECD countries are omitted from the sample, as not all five of the Hofstede (2001) cultural distance are reported for particular sample countries. The countries eliminated in this current research, as they only report four dimensions, are the following: Chile, Greece, Slovenia and Turkey.

The UK Hofstede culture difference, referred to as the DIS_CULT variable, is defined as each sample country culture measure minus the UK cultural distance. As for the UK distance, it is calculated as the distance from London to the other OECD countries' capital cities, with the

exception of the United States, where New York City is used rather than Washington, D.C.

Some previous research (Carr, Markusen, Maskus, 2001) has applied skilled labour differences when estimating international activities. This current research applies distance differences and culture differences when estimating international activities.

IV. Regression results

Table 3 presents Equation (3) results' measuring geographical distance effects on exports from the UK to OECD countries.

The importing countries' gross domestic product GDP is found to positively impact UK exports but not, however, the UK GDP. UK exports are found to be negatively affected by the population size of the UK and the population of the importing countries.

Table 4 presents Equation (4) Hofstede culture effects on UK exports. They are found to have

Table 4. Hofstede culture effects on UK exports, based on Equation (4).

Linear regression		Number of obs = 577				
		F(5,571) = 258.54				
		Prob > F = 0.0000				
		R-squared = 0.6904				
		Root MSE = .75696				
		Robust				
ln(UK_EXP)	Coef.	Std. Err.	t	P > t	[95% Conf.	Interval]
ln(UK_GDP)	-.6073***	.2260781	-2.69	0.007	-1.051368	-.1632753
ln(OTH_GDP)	2.1364***	.0901161	23.71	0.000	1.959466	2.313465
ln(UK_POP)	-1.5108	2.541438	-0.59	0.552	-6.502564	3.48085
ln(OTH_POP)	-1.5417***	.0910624	-16.93	0.000	-1.720575	-1.362859
ln(DIS_CULT)	-.1133**	.0199366	-5.69	0.000	-.1525136	-.0741974
Constant	54.3111	42.8795	1.27	0.206	-29.90969	138.5319

Robust t-statistics are reported in parentheses.

*** Significant at the 1% level.

** Significant at the 5% level.

* Significant at the 10% level.

significantly less impact on exports than the distance effects, as indicated by sign and size of the variable coefficient together with the *t* value obtained. However, when economic and market size effects are combined, the *per capita* effects [that is $\ln(\text{GDP}) - \ln(\text{POP}) = \ln(\text{GDP}/\text{POP})$] are found to negatively affect UK exports, since $-\ln(\text{UK_GDP}) - \ln(\text{UK_POP})$ can be interpreted to have a negative sign, that is $-\ln(\text{UK_GDP}/\text{UK_POP})$.

V. Summary and conclusions

The estimations of UK exports are twofold. First, exports are estimated as a function of geographical distance together with economic size and market size, as in the conventional model of gravity. Second, the research continues by estimating exports in the gravity model setting, this time estimating the culture distance effects on exports together with the economic variables.

The main finding is that the geographical distance is found to affect UK exports more than the culture distance does.

As for other variables, accounting for market size and economic size, UK exports are found to be driven more by the economic size of the importing countries than by the economic size of the UK or the market size of the UK.

Disclosure statement

No potential conflict of interest was reported by the author.

ORCID

Helga Kristjánsdóttir  <http://orcid.org/0000-0002-8857-8063>

Þórhallur Örn Guðlaugsson  <http://orcid.org/0000-0002-1131-510X>

Svala Guðmundsdóttir  <http://orcid.org/0000-0002-8331-2055>

Gylfi Dalmann Aðalsteinsson  <http://orcid.org/0000-0003-3044-8378>

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