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Estimating the Potential Impact of Brexit on Commonwealth Tourism, Remittances and Aid

Abstract

This paper analyses the responsiveness of Commonwealth tourism, remittances and aid to changes in UK macroeconomic indicators, in particular, to UK GDP and the UK exchange rate, using a panel data gravity model approach. It finds a negligible impact from Brexit on these Commonwealth sectors and suggests that all sectors are more responsive to changes in UK income than to changes in the UK exchange rate and that remittances are the most resilient sector of the three. The paper finds that positive externalities from improving the Commonwealth trading relationship could increase financial flows across the respective sectors.

JEL Classification: F24; F35; F62; Z32

Keywords: Brexit, tourism, remittances, aid

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Estimating the Potential Impact of Brexit on Commonwealth Tourism, Remittances and Aid

Policy Summary

The economic importance of the UK to Commonwealth countries, beyond its imports of Commonwealth-traded goods, rests on the country's large imports of tourism services, its external financing by remittances and aid, and foreign investment. Brexit has provided the impetus for reinvestigating UK–Commonwealth linkages, particularly as a means of assessing the potential opportunities and challenges of a post-Brexit world.

In a previous policy note on Brexit,[1] it was shown that the tourism, remittance and aid sectors were among the main channels through which countries in the Commonwealth membership could be impacted. These conclusions were drawn from an analysis of the proportion of the UK's contributions in each of these sectors.

In this study, the analysis is deepened by using an econometric exercise to establish the responsiveness of Commonwealth tourism, remittances and aid to changes in UK macroeconomic indicators, in particular, to UK GDP and the UK exchange rate. This analysis was conducted using a panel data gravity model approach with data for 2010–14; 2010–15 and 1960–2014 for tourism, remittances and aid, respectively.

The models estimated, in conjunction with a scenario analysis, confirm a negligible impact from Brexit on these Commonwealth sectors and reveal other interesting results. For example, evidence suggests that all sectors are more responsive to changes in UK income than to changes in the UK exchange rate, although the responsiveness of these sectors is small. For each 1 per cent improvement in UK per capita income, the results imply that tourist arrivals, remittance receipts and aid would grow on average by approximately 0.3 per cent, and vice versa.

There is also no real risk from any further depreciation and volatility in the pound sterling, as the historical data show that feedback from changes in the value of pound sterling to these sectors is also likely to be small.

Therefore, there seems to be no need for concern. Instead, Commonwealth countries can focus on improving their UK trade relationships, as this study shows evidence of positive externalities above and beyond the trade sector. Specifically, positive externalities from improving the Commonwealth trading relationship could increase financial flows across the respective sectors. This is because a stronger trade relationship could foster increased familiarity between Commonwealth nations, leading to welcomed spill-overs. This has been recognised in the aid for trade literature, for example, where it has been found that countries tend to trade more with countries that provide them with aid.

On aggregate, it is interesting to note that distance is an important determinant of Commonwealth tourism and aid, but not remittances. Commonwealth income movements are significant in this context, but the level of influence on tourism, remittances and aid flows is relatively small. The same is true for fluctuations in Commonwealth exchange rates, on average. Remittances are clearly the most resilient sector. In addition, policies that could help countries capitalise on commonalities, including the Commonwealth's shared colonial history and language, could bring further benefits, especially in small states.

1. Introduction

The economic importance of the UK to Commonwealth countries, beyond its imports of Commonwealth-traded goods, rests on the country's large imports of tourism services, its external financing by remittances and aid, and foreign investment. Brexit has provided the

impetus for reinvestigating UK–Commonwealth linkages, particularly as a means of assessing the potential opportunities and challenges of a post-Brexit world.

In a previous policy note on Brexit,[2] it was shown that the trade, tourism, remittance and aid sectors were among the main channels through which countries in the Commonwealth could be affected by Brexit. These conclusions were drawn from an analysis of the proportion of UK contributions to Commonwealth countries in each of those sectors.

It was recognised that, although the historical dominance of the UK as a major trading partner has waned, the UK still plays a significant role. The UK is the fourth largest trading partner for Commonwealth countries on aggregate, and it is a major importer of specific traded goods from Commonwealth countries. These goods include sugar, knitted and non-knitted clothing, and other manufactured goods. The UK is particularly important as a sender of remittances and aid, with the later more significant to African Commonwealth countries (Commonwealth 2016). For example, between 2010 and 2014, of the remittances contributed by Commonwealth countries, remittances originating from the UK represented a quarter of Pacific remittance inflows and half of African remittance inflows. Bilateral development assistance provided by the UK was also substantial in Asia and Africa, when compared with their total intra-Commonwealth aid flows.

The most prominent evidence of the UK's current influence is in small states. On average, between 2010 and 2014, the UK contributed a quarter of intra-Commonwealth tourist arrivals, remittance flows and bilateral aid to these countries (see Table 1). The UK's importance to Commonwealth least-developed countries (LDCs), as it pertains to the country's contributions to their inflows of remittances, tourism and aid, is not as prevalent.

In this study, the previous analysis is extended by using an econometric exercise to establish the responsiveness of Commonwealth tourism, remittances and aid to changes in UK gross domestic product (GDP) and the UK exchange rate, technically termed the income and price elasticity of Brexit. The working assumption employed is that UK GDP and the UK exchange rate represent the primary links through which changes in the UK's circumstances can filter through to Commonwealth countries.

In summary, the paper seeks to investigate what is likely to happen to growth in these Commonwealth sectors when there is a change in UK GDP or the UK exchange rate. These estimates are then used to draw some conclusions on what could be expected given a 'soft', 'medium' or 'hard' Brexit. The analysis is conducted using a panel data

Table 1. Official Development Assistance (ODA), Remittance Receipts, and Tourism Arrivals within the Commonwealth

Origin	Gross ODA receipts % of total receipts		Remittance receipts % of total receipts		Tourist arrivals % of total arrivals	
	CW Origin	UK Origin	CW Origin	UK Origin	CW Origin	UK Origin
Commonwealth	14.0	8.4	31.9	8.6	37.1	4.9
Asia	12.8	9.7	29.2	6.2	54.2	4.7
Africa	10.9	8.2	35.9	18.0	53.2	4.1
Europe	n.a.	n.a.	51.1	2.1	13.7	4.1
Pacific	70.0	0.2	60.0	16.9	54.4	8.9
Caribbean	5.8	3.0	22.0	9.7	13.7	5.8
Small states	45.5	11.1	44.3	12.2	68.3	18.1
Advanced	..	..	47.7	7.2	20.9	5.0
Developing	14.0	8.4	30.7	8.8	54.7	4.8
LDCs	15.5	9.5	51.5	5.7	55.5	3.0

gravity model approach with data for 2010–14, 2010–15 and 1960–2014, for tourism, remittances and aid, respectively.

In the next section, a review of the gravity model's application in the tourism, remittance and aid literature is undertaken. The gravity model with panel fixed effects and random effects is discussed in Section 4. Section 3 provides a description of the data in the study. Section 5 discusses the results, paying special attention to UK income and price (exchange rate) elasticities. It also investigates the differential effects of UK macroeconomic changes on Commonwealth countries compared with a subset of Commonwealth small states. The paper concludes in Section 6.

2. Literature Review

The gravity model is primarily used to estimate trade relationships, and was first applied in the literature by Tinbergen (1962), and by others such as Anderson (1979), Bergstrand (1985, 1989), Krugman (1980) and Deardorff (1998). It has proven to be an extremely stable and flexible tool for empirical research.

The philosophy underpinning this model is borrowed from the Newtonian theory of gravitation and assumes that countries trade in proportion to their respective size and proximity, where size is measured by origin and destination GDPs, and proximity by countries' geographical distance from each other (WTO 2012).

A distinction is drawn between gravity models of trade and of trade in tourism services (Culiuc 2014). Gravity model studies on tourism services seek to estimate the factors driving the flow of either tourist arrivals or expenditure between countries. These studies tend to include the exchange rate as well as other country-specific demand and supply factors (see, for example, Cheung and Saha 2015; Moorthy 2014).

Leitão (2010) tests whether or not there is a link between trade and tourism in Portugal, based on data for 1995–2006. As has been found by several others, including Phakdisoth and Kim (2007), Mervar and Payne (2007) and Vogt (2008), he finds that the trading relationship is one of the major determinants of tourism for Portugal.

Kimura and Lee (2006) and Culiuc (2014) show that the gravity model performs better in predicting the flow of trade in services than trade in goods (see also Keum 2010). The results of Culiuc (2014) further suggest that the elasticity of tourism with respect to GDP of the origin country is lower than that of trade in goods, and that tourism flows respond strongly to changes in the destination's real exchange rate.

Based on several accounts, the gravity model as a predictor of remittance flows also performs well. However, a major hurdle in this field is the paucity of consistent data on workers' remittances.

When creating the first dataset of bilateral remittance flows for a limited set of developing countries, Lueth and Ruiz-Arranz (2006) find that more than 50 per cent of the variation in bilateral remittance flows can be explained by a few gravity variables, including partner countries' GDP, distance, shared border and common language. When adding macroeconomic variables (inflation, growth, exchange rate, trade) and transaction costs (financial sector development, dual exchange rates, current account restrictions), the explained variation in remittances rises to 70 per cent.

With respect to the importance of distance as a determinant of remittances, Ahmed and Martínez-Zarzoso (2014) find different results. Comparing a measure of remittance transaction costs versus distance as an alternative, their investigation suggests that geographical distance does not play a substantial role in driving remittances to Pakistan. Rather, economic conditions in the receiving country, Pakistani migrant stock in the source country, financial development and the political stability of the recipient country are most important in determining the flow of remittances. Havolli (2009) studied the case of Kosovo using data from a survey conducted in Kosovo in 2006 and also concluded that economic conditions, particularly the business environment, are a significant determinant of remittances.

In contrast to the work on tourism and remittances, the aid literature has mainly employed the gravity equation to determine whether or not aid plays a significant role in driving trade (Skärvall 2012). Typically, however, studies on the determinants of aid use variables that are similar to

the gravity literature, suggesting that the gravity model could be appropriate for modelling aid. For example, in his paper on the determinants of bilateral aid distribution, Watanabe (2006) uses GDP per capita, population, exports and a historical relationship in the list of independent variables. The same variables were included in a study by Cooray and Shahiduzzaman (2004), who also added distance and a measure of imports in their paper on Japanese aid allocation.

3. Estimation Method

This section discusses the specification of the empirical gravity equation used to model Commonwealth tourism, remittances and aid.

3.1 Cross-section gravity model

$$Y_{ij} = A\frac{M_i M_j}{D_{ij}} \qquad (1)$$

The gravity model of trade assumes that the flow of goods between two countries *i* and *j*, denoted by Y_{ij}, is directly proportional to these countries' economic masses, M_i and M_j, and inversely proportional to their distance, D_{ij}. A is held to be a constant term accounting for some minimum level of trade.

Size captures countries' capacity to trade, and distance is a proxy for trade barriers. Both these variables have been found to be statistically significant in trade gravity models, and the size of GDP coefficients has generally been in line with theoretical assumptions.[3]

$$LogY_{ij} = \alpha + \beta_1 LogM_i + \beta_2 LogM_j - \beta_3 LogD_{ij} + E_{ij}$$
$$\text{where } E_{ij} \sim N(0, \sigma^2) \qquad (2)$$

A logarithmic transformation and the addition of a white noise error term, E_{ij}, are needed to estimate the gravity model. This converts (1) into log-linear form with coefficients β_1, β_2, β_3 measuring the percentage change in Y_{ij} for every 1 per cent change in each of the explanatory variables – otherwise known as elasticities. Equation 2 is basically a cross-section version of a 'bare bones' gravity model. That is a model including only variables reflecting flows, economic mass and distance.

In a review of 103 studies using the gravity model, Disdier and Head (2008) find that gravity models' GDP elasticity coefficients are generally stable and close to 1. However, they suggest that elasticity estimates for distance tend to vary, with 90 per cent of coefficients lying between 0.28 and 1.55, or at least a half of a percentage point above or below that (–1) predicted by the theoretical model.

3.2 Gravity model with panel data

The cross-section gravity model suffers from estimation bias due to omitted variables (Cheng and Wall 2005). The fixed effects panel data version (Equation 3) of the gravity model corrects for this estimation bias and is more useful for testing propositions across countries and time. The problem with omitted variables is caused by unobserved heterogeneity. This is the unexplained part of the model, which has a correlation with the regressors and, by extension, is important in explaining changes in $LogY_{ij}$. The panel fixed effects deal with unobserved heterogeneity by omitting it from the model or accounting for it by the estimation of a least squares dummy variable (LSDV) specification.

$$\dot{Y}_{ijt} = a_o + \alpha_t + \alpha_{ij} + \beta X_{ijt} + E_{ijt} \qquad (3)$$

In the panel data set-up, observations on country flows (the cross-sections) are stacked over time, *t*.[4] $\dot{Y}_{ijt}$ is an $n \times 1$ vector of flows, in this case tourism, remittances and aid. $\dot{X}_{ijt}$ is a $k \times 1$ vector of variables, including M_i and M_j and other gravity variables, some of which are time invariant, including distance, language and colony.

The variables distance, language and colony, as well as common language, common legal system, etc., are captured by dummies, and they proxy relative trade costs. Anderson and van Wincoop (2003) helped shape the gravity literature by showing that it is important to control for relative trade costs. The authors illustrate that its inclusion is crucial for a well-specified gravity model. Specifically, distance reflects transaction costs, while dummies capturing differences in language and other cultural features reflect information costs borne by trading partners (WTO 2012).

The constant term has three parts: one common to all years and country pairs, α_0; one specific to

year *t*, α_t; and one specific to the country pairs and common to all years, α_{ij} (Cheng and Wall 2005).

The term α_{ij} represents the fixed effects. It is normally proxied in gravity model studies by importer and exporter dummies. α_t introduces time effects. Estimating the model in first differences or by transforming the variables to differences in means eliminates the fixed effects and gives a well-specified model. However, these techniques preclude inclusion of distance in the gravity model because of the variable's time invariance. The LSDV model generates estimates for pairwise time-invariant variables, such as distance, but precludes estimation of coefficients for observable time-invariant country specific characteristics. This is because the inclusion of these variables leads to perfect collinearity with α_{ij}.

In contrast, a random effects model provides a more flexible estimation. Both distance and observable country-specific effects can be estimated by means of random effects regression, but with the drawback that the estimated coefficients are inconsistent.

This inconsistency stems from the underlying assumption of zero correlation between unobserved heterogeneity and the regressors $E(\alpha_{ij}|\dot{X}_{ijt}) = 0$, the direct opposite of that assumed when using fixed effects. It is instructive to note here that 'fixed' does not imply that the effects are constant. Instead, it means that unobserved differences between countries are assumed to be fixed or systematic. In the case of random effects, country differences are assumed to be random.

A gravity model in the form above is helpful but does not permit the researcher to identify UK-specific effects, in particular, UK income and exchange rate effects on the dependent variables. To retrieve these estimates, the panel data model can be re-specified as follows:

$$\dot{Y}_{ijt} = \alpha_o + \alpha_t + \alpha_{ij} + \beta_1'\dot{X}_{ijt} + \beta_2'\dot{Z}_{ijt} + E_{ijt}$$
$$\text{where } Z_{ijt} = D'X_{ijt} \text{ and}$$
$$D = 1 \text{ if UK, } 0 \text{ otherwise.} \qquad (4)$$

The interaction term, $\dot{Z}_{ijt}$, is a vector of variables capturing UK economic mass/income and exchange rate. The coefficients in matrix β_1 on origin GDP and the exchange rate no longer represent the direct impact of these explanatory variables. Instead, they measure the impact of each of these variables on $\dot{Y}_{ijt}$ in the absence of UK-specific effects when all other variables are held constant. β_2 identifies UK-specific slope effects.

It should also be noted that, in the chosen model, regional destination fixed effects rather than country origin and destination fixed effects are utilised. This is equivalent to applying a restriction on the fixed effects. In this context, it is assumed that any unobserved heterogeneity is adequately captured at the regional level. Given the small datasets on remittances and tourism, the restricted approach is advantageous, since it saves degrees of freedom.

4. Data

The study employs data for the Commonwealth's 52 countries. Time periods vary according to the dependent variable under consideration. Tourism data are for 2010–14, and remittance data are for 2010–15. The aid data ends in 2014 but go as far back as 1960.

The gravity variables are standard and include GDP per capita, distance and the exchange rate, both bilateral and real. Each is used to ascertain its significance to changes in Commonwealth tourism, remittances and aid, particularly where the origin country is the UK. In the spirit of Leitão (2010), a variable measuring the trade relationship among Commonwealth countries is added to investigate whether or not strong trading ties carry positive externalities.

As is traditional, common language and colonial history are included in the dataset. Given the British colonial foundations, English is the official language for a majority of Commonwealth countries, but not for all nations in the grouping.[5] Hence, a test of whether or not shared language is beneficial to tourism, remittance and aid flows is still valid in the Commonwealth context. Likewise, although the majority of countries are former British colonies, there are several that have not been colonised and others that are members of the association simply through recognition of the Commonwealth Charter, not because of any historical affinity.

The other usual variables – common currency, common legal system, whether countries are

landlocked or islands, etc. – are not considered in this paper, as they are not deemed relevant in this context. These variables reflect transaction costs that are more important to models examining the determinants of trade in goods.

The bilateral exchange rate is calculated from the perspective of destination countries (see Culiuc 2014), where an increase represents an appreciation of the destination's currency relative to that of the country of origin.

$$RER_i = \frac{P_j/P_i}{E_i/E_j} \quad (5)$$

The real exchange rate (RER), on the other hand, is calculated from the perspective of the country of origin, as dictated by the study's objective, which is in part to investigate how Commonwealth tourist arrivals, remittances and aid flows respond to variations in the UK's real exchange rate. Constructing the variable in this way provides for a more intuitive interpretation. The consequence is that an increase in the UK's real exchange rate is expected to be positively correlated with Commonwealth tourism arrivals. Table 6 lists the set of variables, their details and data sources.

5. Results

Estimates are for a 'bare bones' model, that is, a model with the main explanatory variables, and a model including all explanatory variables plus UK-specific effects. The coefficients for these are extracted using fixed effects (models 1–3) and random effects (models 4–6) regressions, respectively. Since there are no country-specific control variables in these models, the random effects regressions simply provide a useful contrast, bearing in mind that the coefficients are likely to be inconsistent. If the fixed effects and random effects coefficients are fairly similar, this is taken as a sign of model stability.

The gravity model fits the data fairly well on average. Goodness of fit measures are on average 60 per cent, while the fixed effects and random effects coefficients are not very dissimilar in size. Although signs vary from those reported in the literature, most explanatory variables are statistically significant at the 5 per cent level, under both the fixed and random effects specifications.

In all cases, origin GDP and distance have the expected sign. However, there are differences in sign and significance for destination country GDP. The exchange rate variable and the other controls are mostly significant. All estimates, with the exception of those in the fixed effects aid model, show the highest coefficients for 'bare bones' estimations. This result implies that the basic trade model, represented by GDP and distance, cannot fully explain variations in flows from tourism, remittances and aid. Detailed results are reported in Tables 2–4.

5.1 Commonwealth countries

5.1.1 Intra-Commonwealth estimates

Tourism flows in the Commonwealth are mainly determined by the distance between countries. The fixed effects and random effects models reveal average coefficients of about –0.8 and –1.1, respectively. Country distance is less important in determining remittance receipts (0.3) but considerably more important to receipt of official development assistance (ODA) (1.7). The former result is in line with the literature on remittances, while the latter result is substantiated to some extent by the aid relationships between Australia and the Pacific, between Canada and the Caribbean, and between the UK and France and Africa.

Aid is also highly income elastic. The fixed effects estimates are around 1.7 on average for origin GDP, while the random effects models give an average estimate of around 1.1. Commonwealth tourism, on the other hand, has an origin income elasticity of between 0.3 and 0.6. The random effects equivalent is slightly higher than for fixed effects at 0.5, but is fairly stable even when control variables are added. Remittances are similarly sensitive to changes in Commonwealth origin income.

Destination income is significant for remittances and aid but not for tourism. In addition, the regressions show a negative sign for destination GDP in the aid and tourism models, while the respective signs are positive in the case of remittances. A negative sign for destination income is

Table 2. Commonwealth Tourism

	Fixed Effects Models			Random Effects Models		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Log GDP per capita (origin)	0.583**	0.365**	0.343**	0.598**	0.546**	0.530**
	(0.026)	(0.026)	(0.026)	(0.057)	(0.060)	(0.061)
Log GDP per capita (destination)	0.399**	0.004	0.013	0.376**	0.202**	0.209**
	(0.034)	(0.029)	(0.028)	(0.073)	(0.072)	(0.071)
Log distance	–1.574**	–0.766**	–0.784**	–1.713**	–1.119**	–1.136**
	(0.037)	(0.024)	(0.024)	(0.082)	(0.070)	(0.070)
Log real exchange rate		0.062**	0.056**		0.084**	0.083**
		(0.015)	(0.015)		(0.030)	(0.030)
Log trade		0.641**	0.643**		0.198**	0.200**
		(0.009)	(0.009)		(0.024)	(0.024)
Language		0.188*	0.198*		–0.099	–0.088
		(0.079)	(0.078)		(0.204)	(0.201)
Colonial relationship		1.447**	0.346*		2.718**	1.575**
		(0.105)	(0.135)		(0.258)	(0.254)
UK* log GDP per capita (origin)			0.161**			0.134**
			(0.017)			(0.038)
UK* log real exchange rate			0.133**			0.004
			(0.035)			(0.083)
Constant	13.184**	3.853**	4.103**	14.236**	8.831**	9.037**
	(0.505)	(0.332)	(0.334)	(1.077)	(0.927)	(0.935)
No. of observations	4,711	3,323	3,323	4,711	3,323	3,323
R-squared	0.368	0.755	0.759	0.367	0.577	0.581

Region fixed effects for destination countries have been used in all models.
GDP measured in constant 2010 USD.
Standard errors are in parentheses ( ).
*p < 0.05; ** p < 0.01.

intuitive and expected in the case of aid. These results point to the policy of development support for poorer countries. With regard to remittances, it is likely that the positive sign proxies other variables such as the degree of financial openness and the presence of technologies.

While some gravity model studies have found a positive correlation between GDP destination and tourism, there is an explanation that justifies the negative sign in this study. The raw data suggest that Commonwealth tourism flows mainly originate from advanced countries. Therefore, a negative sign for the GDP destination coefficient is more than likely to reflect the preference of advanced Commonwealth countries for developing Commonwealth country destinations. A positive sign would suggest that the model for tourism is very similar to that postulated for goods trade, where there is more trade and travel between larger countries.

The bilateral exchange rate and the real exchange rate variables have the expected signs and are largely significant. Nevertheless, their coefficients suggest that price effects are not as relevant as income effects in determining these Commonwealth flows. On the other hand, positive externalities from intra-Commonwealth trading relations are found. Results suggest that a 1 per cent improvement in the value of total trade between two Commonwealth countries could increase tourist arrivals, remittances and aid by around 0.5 per cent on average. It should be noted, however, that for tourism these coefficients show the largest

Table 3. Commonwealth remittances

Variables	Fixed Effects Models			Random Effects Models		
	(1)	(2)	(3)	(4)	(5)	(6)
Log GDP per capita (origin)	0.695**	0.301**	0.302**	0.272**	0.189*	0.192*
	(0.037)	(0.035)	(0.034)	(0.081)	(0.084)	(0.083)
Log GDP per capita (destination)	0.402**	–0.121**	–0.122**	0.279**	0.239*	0.236*
	(0.052)	(0.046)	(0.046)	(0.098)	(0.096)	(0.095)
Log distance	–0.892**	–0.280**	–0.277**	–0.771**	–0.551**	–0.544**
	(0.046)	(0.034)	(0.034)	(0.095)	(0.078)	(0.077)
Log bilateral exchange rate		–0.128**	–0.130**		–0.152**	–0.158**
		(0.020)	(0.019)		(0.044)	(0.043)
Log trade		0.664**	0.665**		0.250**	0.251**
		(0.015)	(0.015)		(0.030)	(0.030)
Language		0.604**	0.604**		0.383	0.389
		(0.124)	(0.124)		(0.305)	(0.305)
Colonial relationship		1.192**	1.317**		2.239**	2.666**
		(0.192)	(0.114)		(0.287)	(0.281)
UK* log GDP per capita (origin)			0.011			0.025
			(0.025)			(0.046)
UK* log bilateral exchange rate			–0.015			–0.103
			(0.047)			(0.108)
Constant	0.466	–5.625**	–5.645**	3.521**	–0.449	–0.532
	(0.601)	(0.449)	(0.443)	(1.192)	(1.081)	(1.060)
No. of observations	3,595	2,969	2,969	3,595	2,969	2,969
R-squared	0.222	0.638	0.638	0.193	0.532	0.533

Region fixed effects for destination countries have been used in all models.
Standard errors are in parentheses ( ).
GDP measured in constant 2010 USD.
*p < 0.05; **p < 0.01.

Table 4. Commonwealth ODA

Variables	Fixed Effects Models			Random Effects Models		
	(1)	(2)	(3)	(4)	(5)	(6)
	b/se	b/se	b/se	b/se	b/se	b/se
Log GDP per capita (origin)	1.152**	1.710**	1.692**	1.103**	1.094**	1.145**
	(0.034)	(0.088)	(0.086)	(0.116)	(0.188)	(0.181)
Log GDP per capita (destination)	–0.860**	–1.139**	–1.082**	–0.683**	–0.463**	–0.517**
	(0.026)	(0.041)	(0.040)	(0.122)	(0.146)	(0.138)
Log distance	–2.111**	–1.392**	–1.628**	–1.324**	–1.355**	–1.419**
	(0.063)	(0.088)	(0.088)	(0.303)	(0.265)	(0.265)
Log bilateral exchange rate		0.012	–0.049**		0.147*	0.036
		(0.018)	(0.019)		(0.069)	(0.066)

(*Continued*)

Table 4. Commonwealth ODA (*Continued*)

Variables	Fixed Effects Models			Random Effects Models		
	(1)	(2)	(3)	(4)	(5)	(6)
	b/se	b/se	b/se	b/se	b/se	b/se
Log trade		0.482**	0.408**		0.225**	0.229**
		(0.018)	(0.017)		(0.048)	(0.047)
Language		0.242	–0.265*		0.785	0.158
		(0.126)	(0.111)		(0.552)	(0.539)
Colonial relationship		1.238**	0.522**		2.948**	1.994*
		(0.163)	(0.127)		(0.717)	(0.781)
UK* log GDP per capita (origin)			0.318**			0.080
			(0.031)			(0.130)
UK* log bilateral exchange rate			0.243**			0.407**
			(0.030)			(0.112)
Constant	16.510**	–2.606*	–2.418*	6.764*	–0.641	–0.570
	(0.598)	(1.132)	(1.026)	(2.923)	(2.536)	(2.338)
No. of observations	6,378	2,681	2,681	6,378	2,681	2,681
R-squared	0.466	0.665	0.701	0.402	0.584	0.653

Region fixed effects for destination countries have been used in all models.
GDP measured in constant 2010 USD.
Standard errors are in parentheses ( ).
*p < 0.05; **p < 0.01.

differences between the fixed effects and random effects estimates. The fixed effects estimates suggest an elasticity of around 0.5, while the random effect estimates are near to 0.1 on average. There is evidence of a positive influence from shared official language and colonial history.

5.1.2 UK-specific estimates

With reference to the UK, the evidence signals that changes in UK per capita income have a relatively smaller impact on Commonwealth tourist arrivals than changes in average Commonwealth per capita income. In addition, annual changes in the UK's real exchange rate do not appear to have a significant effect on Commonwealth tourism. This could be related to the general stability of the pound sterling during the period under review. Commonwealth aid receipts do, however, show some sensitivity to changes in the UK bilateral exchange rate.[6] The difference between the UK per capita income impact on aid and the average response of aid to changes in Commonwealth income is larger for tourism. There is no indication that fluctuation in UK GDP or the pound sterling will affect Commonwealth remittances, as the UK-specific coefficients are all insignificant in this case.

5.2 Small states

5.2.1 Intra-Commonwealth estimates

Table 1 suggests that it is useful to look at the effect of the UK's income and exchange rate on tourism, remittances and aid in Commonwealth small states. Commonwealth small states on average appear more dependent on UK flows than larger countries in the association. The data for small states are extracted and the same models are estimated for this category of countries.

As can be seen in Tables 5–7, results for tourism in small states differ only marginally from those reported in the full sample regressions. Income and exchange rate elasticity measures are almost identical, as are the coefficients for distance. Trade still shows positive externalities and the UK-specific effects are also on a par with the real exchange rate, reflecting an insignificant coefficient. The UK's income elasticity with regard to

Table 5. Small states tourism

Variables	Fixed Effects Models			Random Effects Models		
	(1)	(2)	(3)	(4)	(5)	(6)
	b/se	b/se	b/se	b/se	b/se	b/se
Log GDP per capita (origin)	0.773**	0.476**	0.469**	0.813**	0.726**	0.725**
	(0.036)	(0.041)	(0.041)	(0.079)	(0.100)	(0.100)
Log GDP per capita (destination)	−0.012	−0.057	−0.064	0.012	0.054	0.051
	(0.061)	(0.061)	(0.061)	(0.128)	(0.141)	(0.142)
Log distance	−1.311**	−0.671**	−0.682**	−1.450**	−0.999**	−1.004**
	(0.036)	(0.031)	(0.031)	(0.080)	(0.079)	(0.080)
Log real exchange rate		0.098**	0.098**		0.118*	0.124*
		(0.022)	(0.022)		(0.052)	(0.052)
Log trade		0.546**	0.550**		0.108**	0.109**
		(0.017)	(0.017)		(0.029)	(0.029)
Language		0.465**	0.459*		0.034	0.029
		(0.180)	(0.179)		(0.416)	(0.415)
Colonial relationship		1.816**	0.965**		2.846**	2.205**
		(0.146)	(0.175)		(0.365)	(0.504)
UK* log GDP per capita (origin)			0.116**			0.043
			(0.020)			(0.057)
UK* log real exchange rate			0.106			−0.133
			(0.064)			(0.158)
Constant	15.112**	4.619**	4.779**	15.674**	10.610**	10.693**
	(0.845)	(0.809)	(0.810)	(1.762)	(1.827)	(1.839)
No. of observations	2,202	1,466	1,466	2,202	1,466	1,466
R-squared	0.509	0.729	0.732	0.506	0.567	0.567

Region fixed effects for destination countries have been used in all models.
GDP measured in constant 2010 USD.
Standard errors are in parentheses ( ).
*p < 0.05; **p < 0.01.

small states' tourism arrivals continues to be low, and the coefficient is only slightly smaller than for the total sample. The only differences to report are changes in sign on the random effects estimates for destination GDP, which, in both the general and small states cases, remain insignificant.

The picture is similar for remittances in small states. The significance and sign of coefficients are the same as for the general model. However, the majority of estimates are higher in the case of small states. In particular, language plays twice as large a role in determining small states' remittances. This could be reflective of small states' choices of emigration destination. In addition, the income elasticity estimate for the fixed effects small states model has a positive difference of 0.414 and, for distance and shared colonial history, the estimates are larger but only marginally. The insignificance of UK slope effects for remittances remains unchanged.

5.2.2 UK-specific estimates

The small states regression on aid indicates a negative rather than a positive sign for UK origin GDP, but the coefficient is insignificant in the fixed effects model. The random effects model shows the same sign but with a significant coefficient. Bilateral exchange rate influences are larger

Table 6. Small states remittances

Variables	Fixed Effects Models			Random Effects Models		
	(1)	(2)	(3)	(4)	(5)	(6)
	b/se	b/se	b/se	b/se	b/se	b/se
Log GDP per capita (origin)	1.061**	0.715**	0.715**	0.592**	0.483**	0.480**
	(0.131)	(0.084)	(0.082)	(0.314)	(0.339)	(0.343)
Log GDP per capita (destination)	0.131	0.084	0.082	0.314	0.339	0.343
	(0.095)	(0.092)	(0.093)	(0.187)	(0.178)	(0.179)
Log distance	–0.754**	–0.397**	–0.400**	–0.705**	–0.581**	–0.577**
	(0.052)	(0.045)	(0.045)	(0.104)	(0.086)	(0.088)
Log bilateral exchange rate		–0.119**	–0.120**		–0.176**	–0.176**
		(0.031)	(0.031)		(0.064)	(0.065)
Log trade		0.493**	0.493**		0.176**	0.174
		(0.029)	(0.029)		(0.035)	(0.035)
Language		–2.178**	–2.175**		–1.859	–1.857
		(0.736)	(0.736)		(1.073)	(1.076)
Colonial relationship		1.604**	1.452**		2.619**	2.802**
		(0.190)	(0.415)		(0.410)	(0.519)
UK* log GDP per capita (origin)			0.023			–0.027
			(0.040)			(0.056)
UK* log bilateral exchange rate			0.024			–0.030
			(0.071)			(0.162)
Constant	–6.154**	–7.678**	–8.415**	–3.865	0	0
	(0.985)	(0.950)	(0.994)	(2.366)	(.)	(.)
No. of observations	1,502	1,214	1,214	1,502	1,214	1,214
R-squared	0.195	0.521	0.521	0.16	0.448	0.447

Region fixed effects for destination countries have been used in all models.
GDP measured in constant 2010 USD.
Standard errors are in parentheses ( ).
*p < 0.05; **p < 0.01.

in the small states case (0.437). In terms of the aggregate small states origin and destination relationships, as with tourism and remittances, these results show similar signs and coefficient.

5.3 Scenario analysis

In the July 2017 World Economic Outlook (WEO), the International Monetary Fund (IMF) revised its forecast for UK growth from 2 per cent to 1.7 per cent in 2017. This change in outlook came shortly after raising the forecast from 1.5 per cent to 2 per cent in January, based on slower than expected UK performance in the first quarter. However, the expected growth estimate for 2018 remained unchanged at 1.5 per cent (IMF 2017).

The uncertainty surrounding the outcome of Brexit has made it particularly difficult to project the future of the UK economy and, by extension, its impact on its trading partners. The IMF expects that a 'hard Brexit' will have adverse effects, but continues to remain cautious in its outlook. A 'soft' Brexit has become more likely, however, following a close UK election result between the UK's Conservative and Labour parties.

In this section, the results from the preceding regressions are used to produce three scenar-

Table 7. Small states ODA

Variables	Fixed Effects Models			Random Effects Models		
	(1)	(2)	(3)	(4)	(5)	(6)
	b/se	b/se	b/se	b/se	b/se	b/se
Log GDP per capita (origin)	0.884**	1.602**	1.613**	1.076**	1.327**	1.368**
	(0.051)	(0.110)	(0.106)	(0.174)	(0.214)	(0.203)
Log GDP per capita (destination)	–0.756**	–1.090**	–1.095**	–0.847**	–0.896**	–0.872**
	(0.036)	(0.058)	(0.057)	(0.149)	(0.182)	(0.172)
Log distance	–2.298**	–1.576**	–1.398**	–2.151**	–1.494**	–1.260**
	(0.061)	(0.092)	(0.093)	(0.240)	(0.247)	(0.268)
Log bilateral exchange rate		–0.046	–0.176**		–0.004	–0.109
		(0.032)	(0.033)		(0.099)	(0.100)
Log trade		0.408**	0.414**		0.280**	0.291**
		(0.022)	(0.022)		(0.061)	(0.060)
Language		0.654	0.459		0.817	3.618
		(0.398)	(0.741)		(0.703)	(2.362)
Colonial relationship		0.475**	0.416**		0.856	1.489*
		(0.132)	(0.134)		(0.528)	(0.733)
UK* log GDP per capita (origin)			–0.112			–0.551*
			(0.081)			(0.258)
UK* log bilateral exchange rate			0.437**			0.475**
			(0.044)			(0.135)
Constant	20.089**	0.820	–0.632	17.224**	2.144	0.479
	(0.635)	(2.140)	(2.093)	(2.300)	(3.056)	(3.169)
No. of observations	3,496	1,413	1,413	3,496	1,413	1,413
R-squared	0.487	0.664	0.685	0.455	0.656	0.661

Region fixed effects for destination countries have been used in all models.
GDP measured in constant 2010 USD.
Standard errors are in parentheses ( ).
*p < 0.05; **p < 0.01.

ios on the impact of Brexit on Commonwealth tourism, remittances and aid. Scenarios 1–3 are termed 'soft', 'medium' and 'hard' Brexit scenarios, respectively. The medium scenario is for UK growth in line with current IMF projections.[7] It is termed medium on the assumption that the IMF's projections are somewhere in the middle of a bright and difficult outcome for the UK, following Brexit negotiations. This outcome would be one in which the UK retains some access to the EU market and some control of its borders. On the other hand, a soft Brexit is where the current UK–EU arrangement remains mostly unchanged, and conversely, a hard Brexit is assumed to be an outcome in which the UK loses its market access and regains all control of its borders.

The IMF's forecasts together with some assumptions about movements in the pound sterling are used to construct the scenarios. In particular, one standard deviation above and below the IMF UK growth projection for 2018 and the average monthly UK:US exchange rate for October 2016 to August 2017 are applied.[8,9] One standard deviation above is associated with a soft Brexit, while one below the medium scenario signifies a hard Brexit outcome. These standard deviations are very small in logged terms, reflecting historical stability in UK growth.

Table 8. Brexit scenario analysis

Sector	Brexit scenarios					
	Hard Brexit		Medium Brexit		Soft Brexit	
	GDP	£	GDP	£	GDP	£
Tourism	0.025	0.012	0.028	0.013	0.031	0.015
Remittances	0.004	–0.001	0.005	–0.001	0.006	–0.002
Aid	0.130	0.023	0.152	0.024	0.130	0.024

GDP is short-hand for the income effect and £ for the U.K/U.S exchange rate effect.

The scenario results presented in Table 8 indicate that, given the small UK-specific income and price elasticities, regardless of UK–EU negotiations, Brexit is unlikely to have significant effects on Commonwealth countries, particularly with regard to the performance of their tourism, remittances and aid sectors. Even the potential combined effects of Brexit-related income and exchange rate movements appear negligible in percentage terms. The scenarios also show that it would take a very large change in UK GDP growth or a large depreciation of the pound for the Commonwealth to experience noticeable effects.

A caveat of the scenario analysis is the use of historical standard deviations, given that it is difficult to predict the effect of crises. Nonetheless, changing this method would hardly change the conclusions, since the standard deviations in recorded UK growth and the average exchange rate are each around 0.01, on average.

6. Conclusion

Spill-overs from Brexit to Commonwealth tourism, remittance and aid sectors would be negligible, even when combining marginal effects from both changes in UK GDP and related fluctuations in the UK's exchange rate. The remittance sector would be the only one of the three to remain completely stable in the face of Brexit, as UK income and price changes have traditionally had an insignificant impact on remittance flows.

In particular, under the different scenarios for Brexit, the relative output movements for each Commonwealth sector are not far from zero, and there is little difference in the estimates according to scenarios for hard, medium and soft Brexit outcomes. This confirms the basic analysis used by the Commonwealth (2016), which shows that, because of the moderate shares of UK contributions to Commonwealth countries' total inflows for tourism, remittances and aid, the aggregate impact on Commonwealth countries from Brexit is likely to be contained. In undertaking this analysis, some interesting evidence has been unearthed. Commonwealth tourism is mainly determined by the distance between Commonwealth countries, and distance is also a predictor of bilateral development flows. This means that Commonwealth donors are more likely to provide aid to countries that are closer to them. However, distance plays no role in determining the volume of Commonwealth remittances. For example, the amount of remittances sent by the Commonwealth Caribbean diaspora does not depend on whether they are based in the Pacific or African regions of the Commonwealth.

Interestingly, the study also finds that origin country income, while playing a significant role in determining tourism flows, is not highly important, and it would appear that Commonwealth travellers are more inclined to go on holiday in developing Commonwealth economies. Not surprisingly, the evidence suggests that bilateral aid flows to the poorest Commonwealth nations but also that attributes such as a high degree of financial openness and a high prevalence of financial technologies could help to boost intra-Commonwealth remittances.

On the question of the relevance of improved UK–Commonwealth trade relations, the study reveals that increased trade between the UK and its Commonwealth partners can bare positive externalities. Specifically, a 1 per cent improvement in the value of total trade between two Commonwealth countries could increase tourist arrivals, remittances and aid by around 0.5 per cent on average. The shared language and historical ties within the Commonwealth group are also found to be beneficial factors as regards the relative performance of these sectors.

Endnotes

1 'Brexit: Its Implications and Potential for the Commonwealth' (Commonwealth Secretariat, 2016).
2 'The Implications of Brexit for the Commonwealth' (Commonwealth Secretariat, 2016).
3 The gravity model postulates positive unitary elasticity for the effect of GDPs and negative unitary elasticity for distance, with respect to countries' goods trade.
4 Here, a dot over a variable denotes its logarithmic transformation.
5 English is not the official first language for Bangladesh, Brunei Darussalam, Republic of Cyprus, Malaysia, Mozambique, Sri Lanka and Tuvalu.
6 Suspected to be linked to valuation effects.
7 The IMF's real output forecasts are converted to nominal growth using a projected inflation rate of 2.5 per cent. The log of this growth rate is applied in the scenarios for remittances and aid.
8 The UK exchange rate bottomed out during this period following its sharp depreciation in June 2016. The average rate in this period is taken as a good proxy for the UK pound up to the end of Brexit negotiations.
9 For tourism, the real exchange rate is approximated by assuming parity in future UK and US inflation rates at 2.5 per cent; the real exchange rate forecast is equal to the nominal exchange rate. Th e log of the nominal exchange rate is used in the scenarios for remittances and aid, as with the regressions.

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Appendix

Table A1. Data description and sources

Variable	Details	Years	Source
Gross disbursements of ODA	Memo: ODA, total gross disbursements; aid (ODA) disbursements to countries and regions (Part 1 – Developing Countries)	1960–2015	OECD (2017) 'OECD Statistics – Development'
Bilateral remittance flows	Bilateral remittance estimates using migrant stocks, host country incomes and origin country incomes (millions of USD). Estimates are based on methodology developed by Ratha and Shaw (2007) 'South–South Migration and Remittances' and the World Bank (www.worldbank.org/prospects/migrationandremittances). These analytical estimates are based on logical assumptions, are derived from a global estimation of bilateral remittance flows worldwide and are not actual officially reported data. The caveats are (a) data on migrants in various destination countries are incomplete; (b) the incomes of migrants abroad and the costs of living are both roughly proxied by per capita incomes in purchasing power parity (PPP) terms; and (c) remittances flowing through informal, unrecorded channels cannot be captured (World Bank, 2017)	2010–2015	World Bank (2017) 'Migrations and Remittances Data'
Tourist arrivals	Border statistics: arrivals of non-resident tourists at national borders, arrivals of non-resident visitors at national borders	2010–2014	World Tourism Organization (2016) *Yearbook of Tourism Statistics, Data 2010–2014, 2016 Edition*
Distance	Weighted by population, km; bilateral distances between the biggest cities of two countries, with intercity distances being weighted by the population of the city as a fraction of the overall population	1948–2006	CEPII (2016) 'Gravity Dataset'
Common language	Countries that share a common official language		
Colony	Countries that have ever had a colonial link. The definition of colonisation is fairly general, i.e. one country has governed another for a fairly long time and has contributed to the current state of its institutions		

GDP per capita	Current USD, current 2010 USD	1948–2015	World Development Indicators, World Bank (accessed 4 November 2016)
Bilateral exchange rates	Bilateral exchange rates calculated from official exchange rate local currency units (LCU) per USD, period average.	1960–2015	World Development Indicators, World Bank
Price ratio	Consumer price index (100 in 2010)	1960–2015	World Development Indicators, World Bank
Trading relationship	Total exports and imports between country pairs; using data from the Merchandise Trade Matrix; product groups, exports and imports in thousands of 'US dollars', annual	995–2015	UNCTAD (2017); UNCTADstat.