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Trade Costs, Market Access and Growth in the Commonwealth

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Abstract

This paper considers how access to international markets affects development and growth, with a particular emphasis on the Commonwealth countries. It shows that countries with low trade costs to large markets have higher levels of gross domestic product (GDP) per capita on average. The relationship is strong and robust, and even extends to areas within the same country. Two implications are explored in detail. First, remote economies such as the Commonwealth's small island states face a clear disadvantage in achieving sustainable growth. Second, faster growth in economic 'hubs' will increase growth in neighbouring countries. By modelling a number of counterfactual scenarios, the paper quantifies the importance of these two results for output and growth.

JEL Classification: F14, F15, F53
Keywords: International market access, GDP, growth, Commonwealth

Contents

Abbreviations and acronyms

CU	currency union
CW	Commonwealth
DMSP	Defense Meteorological Satellite Program
EU	European Union
GDP	gross domestic product
IMA	international market access
OLS	ordinary least squares
PPML	Poisson pseudo-maximum likelihood
RTA	regional trade agreement
SIDS	small island developing state
WTO	World Trade Organization

1. Introduction

Global economic activity is distributed highly unevenly. Just a casual glance at a map, such as in Figure 1, shows that activity is largely clustered in a small number of 'hubs' - most notably western Europe and North America. Although there are a number of factors that help to explain this distribution, including both institutions and physical geography, there is increasing acknowledgement of the importance of economic geography. Countries located close to centres of economic activity benefit from cheap access to their markets, which increases investment and boosts demand for local produce. There is now strong empirical evidence that such 'market access' is an important driver of development (see e.g. Redding and Venables 2004, Mayer 2009).

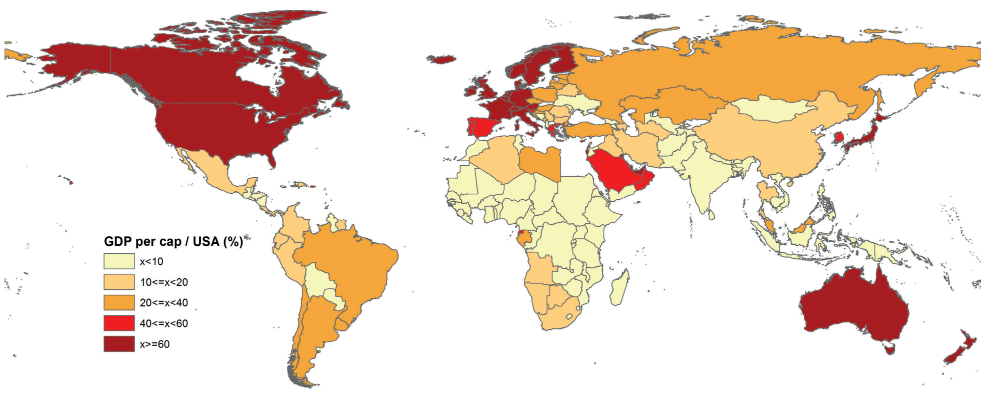
Early attempts to measure a country's market access simply calculated the distance between the home country and centres of economic activity. This provided a reasonably good fit of the data, and has a simple intuitive appeal: countries far from large markets have low market access. Later work has demonstrated, however, that distance is far from the only factor determining access to market.[1] Countries trade more when they share a common language, currency, heritage, and so on, and each of these 'trade costs' should be taken into account. Doing so, we can derive an expression that I will refer to throughout as 'international market access' (IMA).

In this paper, I calculate the IMA of each Commonwealth (CW) country, and show that IMA is indeed a significant determinant of domestic output. I do so initially at the country-level, but show in Section 5 that this result extends to different areas within a country: provinces with better IMA also have higher output. An immediate implication of this is that countries and provinces with low IMA face greater challenges in expanding their economies. I quantify the scale of this challenge by supposing that the CW's island economies (which have very low IMA) instead had the UK's level of IMA. The implied increase in GDP per capita is dramatic in many cases.

A further implication of the results is that countries benefit from higher in growth in economic 'hubs': when a hub grows more rapidly, export demand is boosted in the domestic economy, which in turn raises domestic growth. The countries that benefit the most from this are those with the cheapest access to the hub's market. In Section 4, I consider how much higher growth in each CW country would have been if major regional hubs had grown by an additional 1 percentage point each year since 2000.

The paper is structured as follows. Section 2 estimates the importance of various trade costs in determining trade flows, and subsequently calculates the IMA of each CW country. Section 3 demonstrates that countries with

Figure 1. GDP per capita as share of USA (2013)



1 The simple market access term also assumes that trade responds exactly proportionally to increases in distance. This is in fact an empirical issue, although it turns out that this initial approximation is reasonably accurate (see Head and Mayer 2015).

higher IMA have higher GDP per capita. Section 4 calculates the size of growth spillovers resulting from faster hub growth. Section 5 considers the implications of the results for different provinces within a country. Section 6 concludes.

2. Trade costs: estimating a country's IMA

IMA captures the extent to which countries have cheap access to global markets for their products. It is therefore calculated based on three factors: (i) the output in each foreign country, capturing the size of their markets, (ii) the cost of trading with each foreign country, and (iii) the responsiveness of trade to trade costs. Summing across all foreign markets, the IMA of country i in year t can be calculated as:

$$IMA_{it} = \sum_{j} \tau_{ij}^{-\theta} Y_{jt} \quad (1)$$

where τ_{ij} is the trade cost between countries i and j, θ measures the responsiveness of trade to trade costs, and Y_{jt} is the GDP in country j in year t.[2] Intuitively, countries positioned close to large economies will have a high IMA, as they benefit from cheap transportation to large markets. Transport costs are not the only factor that affect the cost of trade however. It is well established in the trade literature for example that international borders are costly to cross, and so irrespective of distance, trade will be lower when firms must cross multiple

Table 1. Gravity results (2000–2013)

	OLS		PPML	
	(1)	(2)	(3)	(4)
CW	0.898***	0.317***	0.134	0.213*
	0.062	0.066	0.116	0.116
ln(dist)	–1.802***	–1.630***	–0.8677***	–0.727***
	0.019	0.023	0.031	0.039
border	0.905***	0.683***	0.503***	0.409***
	0.097	0.097	0.068	0.067
language		0.824***		0.144**
		0.043		0.065
colonial		0.958***		0.155
		0.094		0.100
RTA		0.426***		0.576***
		0.048		0.075
CU		0.082		–0.076
		0.123		0.073
WTO		0.741***		0.615***
		0.105		0.187
Obs.	286,695	286,694	402,672	402,654
R-squared	0.73	0.74	0.86	0.87

Robust standard errors (clustered by pair) in parentheses. Columns (1) and (2) include exporter-year and importer-year fixed effects, columns (3) and (4) include exporter and importer fixed effects, plus year fixed effects.

*** p<0.01, ** p<0.05, * p<0.1

2 A theoretical justification for this expression is developed in Moore (2015).

borders. Head and Mayer (2015) undertake a meta-analysis of the most common trade costs that have been found to be important in the literature. The factors that are consistently found to be damaging to trade are: distance (capturing the cost of transport); international borders; different languages; colonial history (colonial ties tend to increase trade); regional trade agreement (RTA) membership (RTAs reduce tariffs and so increases trade), currency union (CU) membership (CUs reduce the transaction costs of changing currency), and World Trade Organization (WTO) membership (WTO countries tend to have lower tariffs and quotas).

In Table 1, I undertake a gravity regression to estimate the impact of these factors on trade. (This is necessary to estimate the $\tau_{ij}^{-\theta}$ term in the IMA equation.) Formally, I run the following regression over the period 2000-2013:

$$\text{In}(X_{ijt})=\text{In}(dist_{ij})+Z'_{ij}\gamma+\delta_{it}+\delta_{jt}+\varepsilon_{ijt} \qquad (2)$$

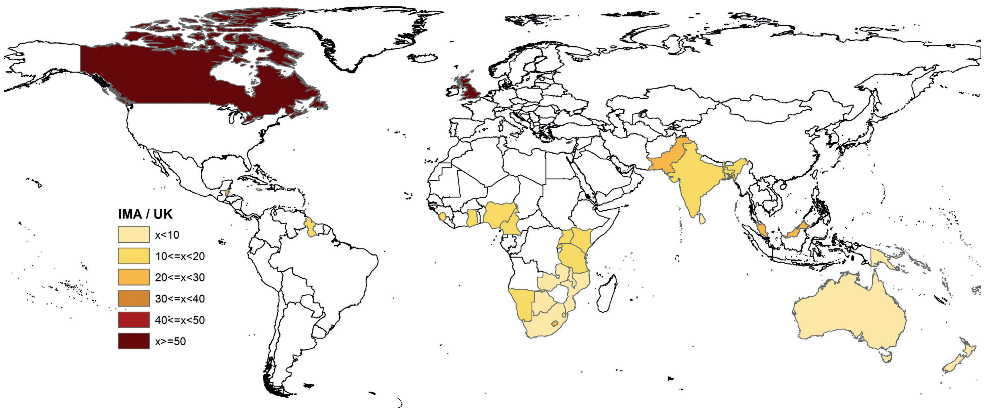
where X_{ijt} are the exports of country i to country j in year t, $dist_{ij}$ is the distance (km) from country i to country j, Z_{ij} are the other trade cost factors mentioned above, δ_{it} and δ_{jt} are exporter- and importer-year fixed effects, and ε_{ijt} is the error term. I estimate the equation both by ordinary least squares (OLS) in columns (1) and (2), and by a Poisson pseudo-maximum likelihood estimator (PPML) in columns (3) and (4). In addition to the factors identified by Head and Mayer (2015), I also include an indicator for whether the two countries are CW members. This enables me to consider the effect of being in the CW on trade.

Columns (1) and (3) include only the trade cost factors considered by Redding and Venables (2004), in addition to the CW indicator, and columns (2) and (4) include all the factors considered by Head and Mayer (2015). In all columns, we see that trade falls as the distance between the two countries increases. In contrast, sharing a common border increases trade, as does sharing a common language, colonial ties, RTA, CU and WTO membership. CW membership also is found to be a significant determinant of trade. Taking columns (2) and (4) as the best estimates, we find that CW membership increases trade between two countries by around 24 per cent to 37 per cent.[3]

The results in Table 1 show how the various trade costs (such as distance) affect trade. We

Figure 2. Levels of IMA across the CW (2013)

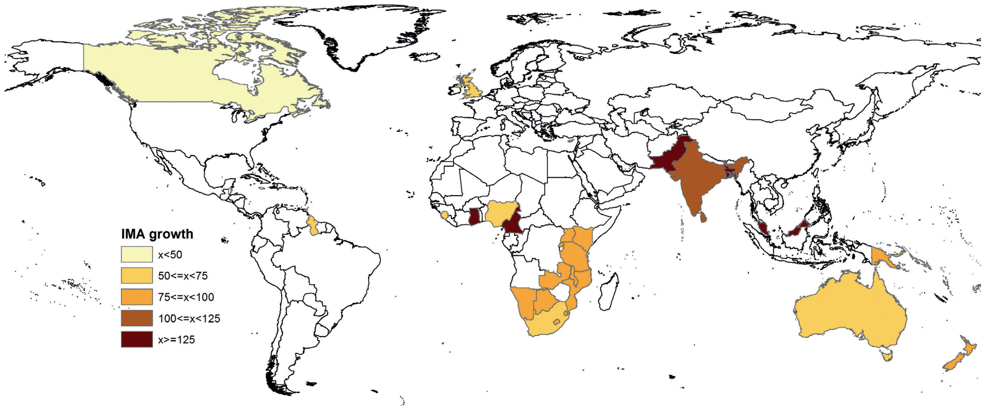
Relative to UK (%)			
Highest IMA		Lowest IMA	
Canada	70	Tuvalu	2
Cyprus	58	Tonga	2
Malta	51	Samoa	2
Singapore	32	Kiribati	3
Malaysia	30	Vanuatu	3



3 The CW estimate in column (1) is most likely too high, as it is attributing the effects of common language, colonial history (etc.) to a 'CW effect'. Even in columns (2) and (4), the CW term is likely picking up some aspects of shared culture (other than language and colonial history). Hence the CW estimate should be treated with some caution. The 37 per cent figure is calculated as exp(0:317) - 1 and analogously for the 24 per cent figure.

Figure 3. Growth of IMA across the CW (2000–2013)

Absolute growth (%)			
Highest		Lowest	
Cameroon	156	Canada	23
Malaysia	142	The Bahamas	30
Pakistan	139	Jamaica	36
Singapore	135	Belize	39
Ghana	133	St. Lucia	39



can now use these numbers to estimate the IMA of each CW country. Table A1 in the Appendix provides a complete list of the IMA of each CW country, and this is mapped in Figure 2, along with the five countries with the highest and lowest levels of IMA. For comparability, I have expressed each country's IMA relative to that of the UK's. Being located in western Europe, and as a member of a large RTA (the European Union), the UK has the highest IMA of all the CW countries. Two of the other CW countries with high IMA – Cyprus and Malta – also benefit from easy access to the large European markets. Canada benefits from its proximity to the USA, whilst Singapore and Malaysia are well-located in the rapidly emerging South East Asia region. At the other end of the spectrum, the small island economies have very low IMA. This is largely explained by the large distances and (subsequently) high transport costs incurred in accessing important global markets.

Figure 3 shows which countries have experienced the highest growth in IMA over the period 2000–2013. Again, only the five highest and lowest countries are included in the table, with a complete list provided in the Appendix. Those countries that have experienced the largest growth are neighbours of rapidly growing large economies: Nigeria in the cases of Cameroon and Ghana, and India in the case of Pakistan. Again, Malaysia and Singapore benefit from being located in the dynamic South East Asia region.

3. IMA and development

This section considers the importance of IMA for development levels, captured by GDP per capita, across the CW. To do so, I run the following regression:

$$\ln(y_{it}) = \beta \ln(IMA_{it}) + \delta_i + \delta_t + \varepsilon_{it} \qquad (3)$$

where y_{it} is GDP per capita in country i in year t, IMA_{it} is country i's level of IMA (as calculated in Section 2), δ_i and δ_t are country and year fixed-effects (respectively), and ε_{it} is an error term.[4] I first run this as a cross-country regression for the years 2000 and 2013, following

4 I use the coefficients from column (2) of Table 1 to estimate the IMA term. Column (2) are my preferred estimates, as they are estimated using a full set of importer and export year fixed effects.

Table 2. IMA and GDP per capita

	(1)	(2)	(3)	(4)
ln(IMA)	0.706***	0.751***	0.765***	0.989***
	0.076	0.069	0.064	0.141
Time period	2000	2013	2000-2013	2000-2013
Country FE	No	No	No	Yes
Obs.	179	172	2,483	2,483
R-squared	0.25	0.31	0.32	0.71

Robust standard errors (clustered by country) in parentheses. Columns (1) and (2) are cross-section OLS regressions, column (3) is pooled OLS and column (4) includes country fixed effects. The panel regressions also include year fixed effects.

*** p<0.01, ** p<0.05, * p<0.1

Redding and Venables (2004). I then run it on the full 2000–2013 panel, using pooled OLS and country-year fixed effects (the latter exploiting within-country variation).

Table 2 shows the impact of IMA on GDP per capita, as estimated from equation (3). As can be seen in every column, IMA is a positive and significant determinant of GDP per capita levels. In terms of magnitudes, column (1) implies that, on average, a 1 per cent increase in IMA is associated with a 0.7 per cent increase in GDP per capita. Although the calculation of IMA is slightly different, similar estimates are found in Redding and Venables (2004) and Mayer (2009). Redding and Venables estimate a coefficient of 0.48 on 'foreign market access', and Mayer (2009) estimates coefficients in a range of 0.57 to 0.88 on 'foreign market potential'. Such magnitudes imply an important role for IMA in explaining levels of development and wealth across the globe.

Figure 4 demonstrates the relationship between IMA and GDP per capita in both 2000 and 2013. In both years there is a clearly positive relationship, with higher IMA associated with higher GDP per capita. This trend also holds for the group of CW countries, represented by red diamonds in the Figure. Across the globe, therefore, countries with cheaper access to large foreign markets benefit from higher demand for their products. As a result, they tend to have higher levels of GDP per capita.

3.1 IMA and development over time

In this sub-section I briefly consider whether the effect of IMA on GDP per capita has changed significantly since 2000, as the results in Table 2 suggest a slight increase in the magnitude of IMA's effect. To see how the effect of IMA has changed each year, and to test whether these changes are statistically significant, I re-estimate equation (3) for the whole period, allowing the IMA variable to change every year. Specifically, I estimate:

$$\ln(y_{it}) = \beta \ln(IMA_{it}) + \ln(IMA_{it}) * T_t\theta + \delta_i + \delta_t + \varepsilon_{it} \quad (4)$$

where all the variables are defined as in equation (3), except that I now also interact the IMA term with the vector of time dummies T_t. The coefficients in θ show the *additional* effect of IMA on GDP per capita each year.[5]

The effect of IMA on GDP per capita each year, from equation (4), is plotted in Figure 5.[6] In addition to the estimated coefficients, I plot 95 per cent confidence intervals to see whether any of the changes are statistically significant. It can be seen that the coefficient increases slightly between 2000 and 2001, and then remains fairly stable for the rest of the period. At no point is the change in IMA significant; that is, there is no year in the sample for which IMA has a significantly larger or smaller effect than in 2000.

The effect of IMA on GDP per capita is, therefore, very stable over the period. This is unsurprising, as IMA is a slow-moving

5 From equation (5), the effect of ln(IMA) on ln(y) in year t is given by $\beta+\theta_t$. We can, therefore, test the coefficient θ_t to see if IMA has a significantly different effect in year t than average.

6 Specifically, this plots $\beta+\theta_t$ for each year.

Figure 4. IMA and GDP per capita (2000 and 2013)

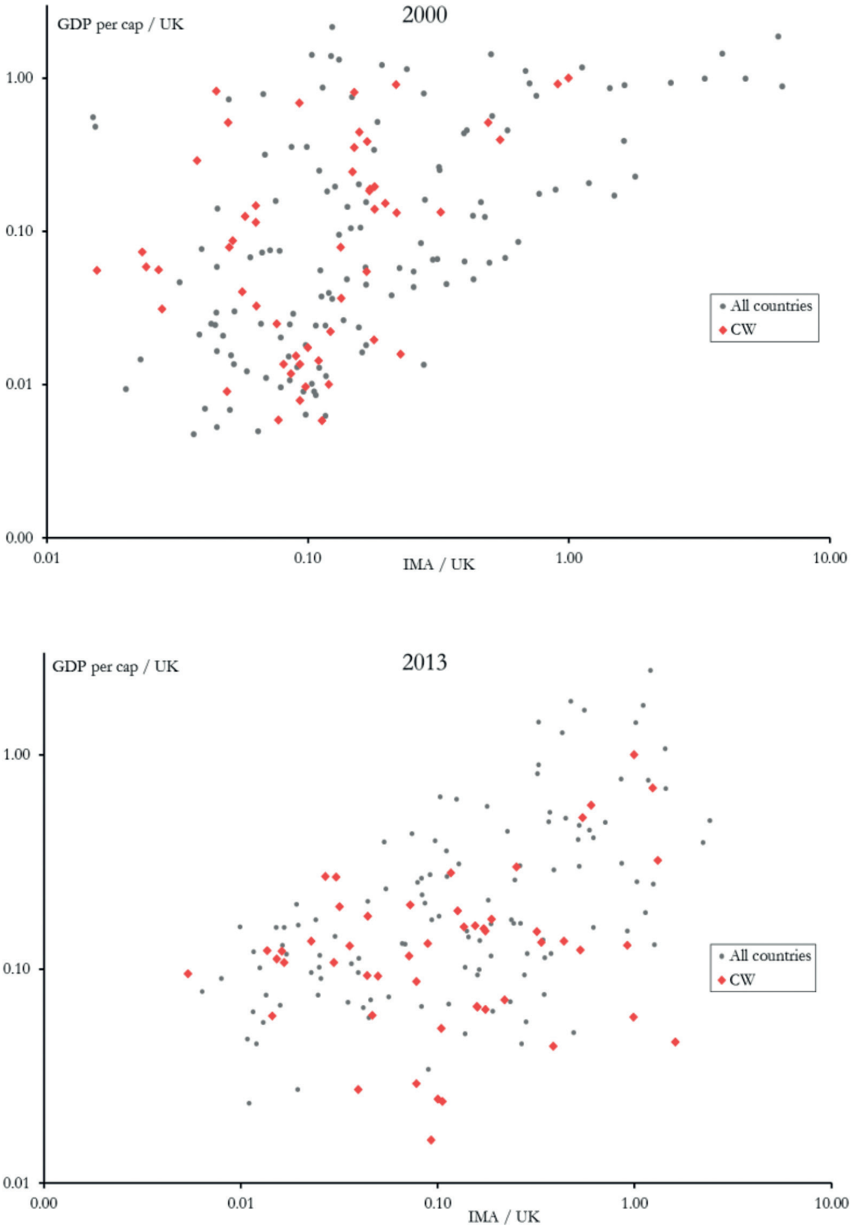


Figure 5. IMA coefficient over time (with 95 per cent confidence intervals)

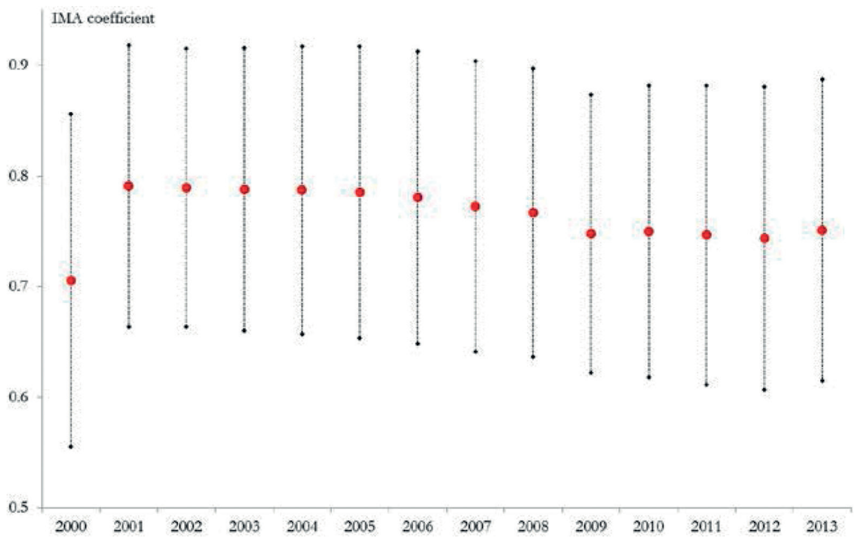


Table 3. IMA and GDP per capita 2013 Commonwealth effects

	(1)	(2)	(3)	(4)
ln(IMA)	0.751***	0.772***	0.822***	0.808***
	(0.069)	(0.069)	(0.072)	(0.072)
Interactions				
CW		0.012		
		(0.012)		
SIDS			0.051***	
			(0.012)	
Africa				-0.036**
				(0.018)
Asia				0.010
				(0.028)
Caribbean				0.036***
				(0.012)
Europe				0.033***
				(0.005)
Pacific				0.076***
				(0.027)
Obs.	172	172	172	172
R-squared	0.31	0.31	0.35	0.39

Robust standard errors (clustered by country) in parentheses. The interaction terms are defined as ln(IMA)*X, where X is the CW dummy (column 2) or a CW region (column 3).

*** p<0.01, ** p<0.05, * p<0.1

variable – calculated based on the real GDP of neighbouring countries and trade costs. As neither of these two variables fluctuates rapidly over time, IMA itself changes only slowly.

3.2 IMA and development in the CW regions

In this sub-section I test whether IMA has differential effects on GDP per capita amongst CW countries. Specifically, I ask: 'does IMA have a larger/smaller effect on GDP per capita for (specific groups of) CW countries?'. To answer this, I again re-estimate equation (3), this time allowing the effect of IMA to change across groups of countries. For example, to test whether IMA has a larger/smaller effect for CW countries than it does on average, I estimate:

$$\text{In}(y_{it}) = \beta\, \text{In}(IMA_{it}) + \text{In}(IMA_{it}) * CW_i \varphi + \delta_i + \delta_t + \varepsilon_{it} \quad (5)$$

where, as before, CW_i is a dummy variable equal to 1 if country i is a CW country and equal to zero otherwise. From equation (5), the effect of IMA on GDP per capita is given by β for non-CW countries, and $\beta+\varphi$ for CW countries. If φ is significantly positive (negative), then IMA has a larger (smaller) effect on GDP per capita for CW countries than it does on average across the global sample.

The results of equation 5, estimated for the year 2013, are shown in Table 3. For reference, column (1) replicates the result from Table 2 without any interaction terms. In column (2) we see that IMA does not affect GDP per capita any differently in CW countries than it does globally (the φ coefficient, 0.012, is very small and insignificant). In column (3) I test whether IMA has a differential effect on the small island developing state (SIDS), and in this case IMA has a larger effect on these countries than on average (φ=0.051). This is perhaps surprising, although the size of this additional effect is small.[7]

7 The estimates in column (3) suggest that a 1 per cent increase in IMA increases GDP per capita by 0.82 per cent on average, and by 0.87 per cent for SIDS.

Table 4. Islands moved to the UK Impact on GDP per capita (2012)

		GDP per capita 2012 ($)	
	Factor increase	Actual	Counterfactual
Vanuatu	6.94	3,161	21,952
Mauritius	6.22	8,862	55,131
Tuvalu	5.99	4,044	24,222
Samoa	5.94	4,245	25,206
Seychelles	5.26	11,689	61,497
Tonga	5.01	4,494	22,520
Fiji	4.84	4,401	21,282
Kiribati	4.54	1,736	7,881
Nauru	4.53	.	.
Solomon Islands	4.34	1,801	7,812
Papua New Guinea	3.91	2,184	8,532
Maldives	3.71	6,244	23,192
Dominica	2.79	7,182	20,027
Guyana	2.56	3,585	9,170
St. Kitts and Nevis	2.52	13,659	34,400
Trinidad and Tobago	2.50	17,523	43,765
Barbados	2.38	14,917	35,510
Antigua and Barbuda	2.32	13,526	31,317
St. Lucia	2.26	7,202	16,272
St. Vincent and the Grenadines	2.17	6,339	13,768
Grenada	2.10	7,583	15,938
Jamaica	2.01	5,464	10,977
The Bahamas	1.61	22,096	35,522
Belize	1.55	4,857	7,523
Singapore	1.43	54,007	77,193
United Kingdom	1.00	41,054	41,054

Column (4) allows the effect of IMA to vary across the CW regions. A number of the regional effects enter significantly, with IMA having a larger effect than average in the Caribbean, Europe and Pacific regions, but a smaller effect in Africa. In all cases, however, the additional effects are very small relative to the overall effect of IMA on GDP per capita.

3.3 Counterfactual: islands moved to the UK

Given the apparent importance of IMA for development, remote islands clearly face a substantial challenge in accessing global markets and expanding their economies. To quantify the scale of this challenge, I recalculate the IMA of each CW small island developing state (SIDS) in 2012 under the counterfactual that it had the UK's geography.[8] Based on this, I can then estimate the implied change in GDP per capita using the results from Table 2 (which show how GDP per capita responds to changes in IMA).[9] Of course, the results of this exercise are extremely speculative; the idea is to quantify the scale of the challenge that economic geography poses to development in the SIDS.

The results are presented in Table 4. The implied increases in GDP per capita are dramatic for a number of the islands; in Vanuatu for example GDP per capita increases by a factor of almost seven. Such an estimate demonstrates the dramatic variation in access to markets amongst the two countries, and the challenges faced by the SIDS in penetrating global markets.

8 That is I replace each country's distance and border figures with that of the UK. I use 2012 as the reference year as 2013 GDP figures are missing for a number of the island economies.

9 Throughout this section and section 4, I use the estimate from column (1) of Table 2. That is, I assume an elasticity of 0.706 of GDP per capita with respect to IMA.

4. Growth spillovers

This section considers how growth in large economic 'hubs' affects growth in the CW countries. Hubs are large economies that can substantially affect a country's IMA: when a hub grows more rapidly, the IMA of the domestic economy increases, and this subsequently increases domestic growth. (Growth in smaller foreign countries will also increase the domestic economy's IMA, but to a much smaller extent.) The countries that are most affected by growth in economic hubs are those with the lowest trade costs with the relevant hub, as their IMA will increase the most. Lowering trade costs is, therefore, a mechanism through which countries can increase the spillover from international economic growth into domestic growth.

To identify the relevant economic hubs, I first examine the export profiles of the CW countries. In the Appendix I show the top five importers of each CW country over the period 2000–2013. Based on this, I identify the major international markets in each CW region. For each region, I then consider how higher growth in three different hubs would affect each CW country. In each case I include at least one CW country as a hub (typically the largest CW economy in the region).

The counterfactual is calculated as follows. I first re-calculate each CW country's IMA under the scenario that the relevant hub had grown by an additional 1 per cent point per year over 2000–2013. I then use the estimates from equation (3) to determine how much this would increase growth in each CW country.

Table 5a. Hub spillovers in Africa

	Trade partners		
	EU	South Africa	Nigeria
% point increase in annual growth			
Botswana	0.23	.	0.03
Cameroon	0.21	0.01	0.26
Ghana	0.22	0.01	0.25
Kenya	0.21	0.02	0.02
Lesotho	0.03	0.56	0.01
Malawi	0.19	0.09	0.02
Mauritius	0.24	0.04	0.01
Mozambique	0.14	0.21	0.01
Namibia	0.09	0.45	0.02
Nigeria	0.33	0.01	0.00
Rwanda	0.22	0.02	0.03
Seychelles	0.26	0.02	0.01
Sierra Leone	0.30	0.01	0.08
South Africa	0.31	.	0.02
Swaziland	0.07	0.50	0.01
Tanzania	0.19	0.04	0.02
Uganda	0.21	0.02	0.02
Zambia	0.19	0.10	0.03

Table shows the % point increase in annual real GDP per capita growth, resulting from an extra 1% point annual growth in each of the three trading partners, over the period 2000-2013.

4.1 Africa

The three hubs I consider for the Africa region are the European Union (EU), South Africa and Nigeria.[10] The EU collectively is the dominant trade partner for most African countries, whilst South Africa and Nigeria are by far the largest economies in Sub-Saharan Africa (together accounting for over half of total GDP).

As seen in Table 5a, higher growth in the EU has a notable impact on domestic growth for most of the African CW countries. This is largely because African markets are small compared to those in Europe, and so European economies constitute an important part of the

Table 5b. Hub spillovers in Asia (South)

	Trade partners		
	EU	USA	India
% point increase in annual growth			
Bangladesh	0.09	0.03	0.25
India	0.16	0.06	.
Maldives	0.16	0.04	0.14
Pakistan	0.11	0.03	0.38
Sri Lanka	0.13	0.03	0.24

Table shows the % point increase in annual real GDP per capita growth, resulting from an extra 1% point annual growth in each of the three trading partners, over the period 2000-2013.

10 For the EU, I increase the growth of every EU country by 1% point per year.

Table 5c. Hub spillovers in Asia (South East)

	Trade partners		
	China	Japan	Singapore
% point increase in annual growth			
Malaysia	0.14	0.02	0.40
Singapore	0.16	0.02	.
Brunei	0.10	0.05	0.04

Table shows the % point increase in annual real GDP per capita growth, resulting from an extra 1% point annual growth in each of the three trading partners, over the period 2000-2013.

Table 5d. Hub spillovers in the Caribbean

	Trade partners		
	USA	EU	Canada
% point increase in annual growth			
Canada	0.63	0.05	.
Trinidad and Tobago	0.32	0.14	0.04
Jamaica	0.44	0.11	0.05
The Bahamas	0.50	0.07	0.05
Guyana	0.27	0.14	0.04
Belize	0.34	0.05	0.03
St. Lucia	0.31	0.14	0.04
Antigua and Barbuda	0.35	0.15	0.05
Grenada	0.27	0.14	0.04
St. Kitts and Nevis	0.36	0.16	0.05
St. Vincent and the Grenadines	0.29	0.15	0.04
Dominica	0.32	0.17	0.04

Table shows the % point increase in annual real GDP per capita growth, resulting from an extra 1% point annual growth in each of the three trading partners, over the period 2000–2013.

African countries' IMA even though trade costs are relatively high.[11] This is less true for those countries such as Namibia and Swaziland that border a large African economy. For these countries, South Africa dominates their IMA, and so increases in EU growth are relatively less important.

Consistent with this argument, the Table shows that higher growth in South Africa and Nigeria have sizeable impacts on the neighbouring CW countries.[12] This is particularly true for South Africa, because its trade costs with its neighbours are generally lower. South Africa shares a common border, language, currency and RTA with Lesotho, Namibia and Swaziland. Each of these variables was identified in Table 1 as having a significant effect on trade flows. As a result, the estimated spillover from South African growth into neighbouring growth is substantial (see also Arora and Vamvakidis (2005) and Moore (2015) for evidence on South Africa's regional importance).

4.2 Asia (South)

As shown in the Appendix, the USA and EU remain the largest importers of goods from South Asia, whilst India is by far the largest of the CW economies in the region. Based on its size, and the relatively low trade costs with its neighbours, higher growth in India translates into notably higher growth in each of its CW neighbours.

Higher growth in the EU is estimated to have a larger impact on the South Asian CW countries than that of the USA, owing to its lower trade costs. This includes substantially lower distances and hence transport costs – the distance from India to the USA for example is almost twice that from India to the UK. These lower trade costs imply that as EU growth expands, increasing its overall demand for imports, more of this will be sourced from South Asia than is the case under higher US growth. (Collectively, the EU is also a larger economy than the USA, meaning that it is more important element of each country's IMA.)

4.3 Asia (South East)

China and Japan are by far the largest economies of South East Asia, and as shown in the Appendix, constitute important export markets for the region's CW countries. Of the CW

11 This also explains why the EU is such an important trade partner for most African countries.

12 Unfortunately, South Africa does not report trading with Botswana in the IMF database. It is therefore not possible to calculate the spillover effect for Botswana in column (2). This also means that South Africa is not included in the IMA of Botswana, and so the estimate for the EU's impact on Botswana in column (1) should be treated with caution.

Table 5e. Hub spillovers in Europe

	Trade partners		
	EU	USA	UK
% point increase in annual growth			
Cyprus	0.22	0.01	0.05
Malta	0.56	0.03	0.23
United Kingdom	0.57	0.06	.

Table shows the % point increase in annual real GDP per capita growth, resulting from an extra 1% point annual growth in each of the three trading partners, over the period 2000–2013.

countries themselves, Malaysia and Singapore are roughly equal in terms of overall output, although Singapore is considerably wealthier on a per capita basis and is a more important export market for Malaysia than vice-versa.

The spillover from Chinese growth onto the CW countries is estimated to be considerably higher than that of Japan. As argued above, this stems from China having both lower trade costs with the CW countries, and a larger market. In 2013 Chinese GDP was almost twice as high as Japan's (on World Bank estimates), whilst it is around 1,000 km closer to the region's CW countries (from the trade database).

4.4 Caribbean and Americas

As detailed in the Appendix, the USA is (unsurprisingly) the most important trade partner for a number of the CW countries in the region, with the EU also providing an important export market. Given its size and relative proximity, the estimated spillover effects from the USA are large for most countries. This is most apparent for Canada, whose IMA is completely dominated by the USA. Indeed over the period, almost 80 per cent of its exports went to its southern neighbour.

Given the remoteness of some of the Caribbean islands, the spillover coefficients from higher US growth, presented in the table, at first appear somewhat high. The islands' remoteness however, means both that their IMA is relatively small, and that the USA is a very important component of that IMA. This means that higher US growth translates into proportionally large increases in the IMA of the CW countries in the region, which in turn implies relatively large growth spillovers.

Table 5f. Hub spillovers in the Pacific

	Trade partners		
	China	Japan	Australia
% point increase in annual growth			
Australia	0.08	0.05	.
Fiji	0.06	0.05	0.13
Kiribati	0.08	0.08	0.08
New Zealand	0.04	0.03	0.30
Papua New Guinea	0.07	0.06	0.27
Samoa	0.06	0.05	0.09
Solomon Islands	0.08	0.07	0.15
Tonga	0.06	0.05	0.12
Tuvalu	0.11	0.10	0.08
Vanuatu	0.06	0.05	0.17

Table shows the % point increase in annual real GDP per capita growth, resulting from an extra 1% point annual growth in each of the three trading partners, over the period 2000–2013.

4.5 Europe

Although the USA is the largest single importer of UK goods, collectively the EU dominates the trade flows of the European CW nations. With low trade costs to such a large market, spillover effects are estimated to be substantial for all the countries. The influence of the USA is substantially smaller, owing to the much larger distances and subsequently higher transport costs to this market.

4.6 Pacific

Finally to the Pacific region, where Australia, China and Japan act as major export markets for most of the CW countries. Of the three hub countries, estimated spillover effects from Australia are clearly the largest. Although total output in both China and Japan is far greater than that in Australia, trade costs with the CW countries are generally much higher. Not only does CW membership itself reduce trade costs among members (Table 1), but Australia shares a common language with each country except Tuvalu, and is generally much closer. To put the relative distances into context, China is on average 4,400 km further away than Australia for the CW countries in the region, and Japan is 3,000 km further away.[13] The CW countries' lower trade costs with Australia mean that they benefit more from its growth than they do from growth in China and Japan.

13 Based on the trade database used in the gravity regression (Table 1).

5. Sub-national effects of IMA

So far, the analysis has considered the impact of IMA on output and growth at the national level. It was shown that there is a robust correlation between a country's market access and its level of development. Countries benefit from cheap access to international markets, as exports are higher and prices are lower. The same logic applies when considering sub-national provinces or districts. Provinces with easier access to international markets have an economic advantage over those that are more remote.

To test whether the importance of IMA extends to sub-national provinces, I use night lights data to estimate GDP at the provincial level. The lights data is collected by the US Defense Meteorological Satellite Program (DMSP), who then process the data to remove natural sources of light such as moonlight, sunlight and forest fires. The remaining lights are, therefore, mostly artificial, and can be used to measure levels of economic activity in areas where official figures are unreliable or not available.[14]

Using the lights data, I measure the output of every sub-national province in the world in 2012. Based on the distance to every foreign province, as well as the other trade costs identified in Table 1, I can then calculate the IMA of every single province.[15] This allows us to test the importance of IMA at a sub-national level. It also has the econometric advantage that we can control for other important determinants of GDP such as the rule of law and quality of institutions.

The results of estimating equation (3) at the provincial level are provided in Table 6. In column (1) I run a simple OLS regression across provinces, and in column (2) I control for country fixed effects. The strong results in column (2) are notable: even within the same country, provinces with higher IMA have significantly higher levels of output. (The magnitude of the effect is slightly smaller but comparable to the estimates in Table 2.) This provides strong evidence for the importance of

Table 6. IMA and GDP, sub-national estimates

	(1)	(2)	(3)	(4)
ln(IMA)	0.640***	0.430***	0.520***	0.581***
	(0.075)	(0.126)	(0.089)	(0.103)
Port			0.458***	0.576***
			(0.094)	(0.108)
Airport			0.513***	0.555***
			(0.104)	(0.111)
Capital			1.850***	2.017***
			(0.131)	(0.143)
Time period	2012	2012	2012	2000
Country FE	No	Yes	Yes	Yes
Obs.	2,282	2,282	2,282	2,266
R-squared	0.20	0.01	0.23	0.24

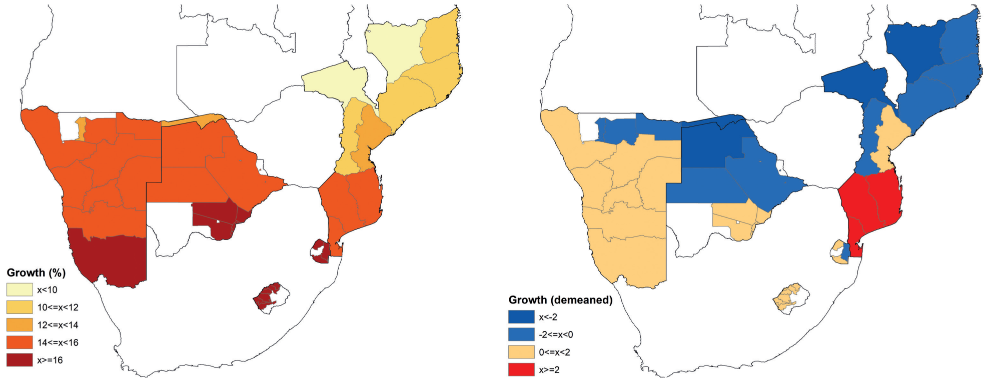
Robust standard errors (clustered by country) in parentheses. The dependent variable is the lights output of the province divided by the province's area.

*** p<0.01, ** p<0.05, * p<0.1

14 It has been shown that lights are highly correlated with measured GDP; see Henderson et al. (2012), Storeygard (2014) and Moore (2015).

15 Technical details on this procedure can be found in Moore (2015). When calculating a province's IMA, I include all foreign provinces within the same UN continental region (Africa, Americas, Asia, Europe and Oceania). The province boundaries are taken from the Natural Earth `regions' boundaries: http://www.naturalearthdata.com/

Figure 6. Provincial impact of higher South African growth



IMA for development, as the relationship is strongly significant even when we control for country-level factors such as institutions (and even the country's own market access).

In column (3) I control for other factors that are likely to affect a province's output: whether it contains a port or airport, and whether it is a capital city. As expected, each variable is significantly correlated with provincial output, although the IMA variable itself remains strongly significant. Column (4) repeats the exercise for 2000 to demonstrate that the results are robust across different years.[16]

5.1 Growth spillovers

As the importance of IMA extends to provinces within a country, this suggests that growth spillovers will also be larger in some areas than others. When a neighbouring country grows, provinces with low trade costs, typically border areas, should gain the most benefit. This is explored in detail in Moore (2015), and I consider the example of South Africa here. As was shown in Table 5a, South Africa is a major continental hub, whose growth generates substantial spillovers into neighbouring countries.

Figure 6 shows how these spillovers are distributed across provinces. Analogously to Section 4, I increase the average growth of each South African province by 1 percentage point per year over 1992–2012. In the left-hand map, it can be seen that every neighbouring province benefits from this faster growth, as they all experience some increase in demand. In the right-hand map however, it is clear that some provinces benefit more than others; provinces coloured blue benefit less than their national average. In contrast, the provinces along the border benefit the most, which is most apparent in Mozambique. Growth spillovers due to IMA are, therefore, not entirely inclusive in the sense that some provinces are better placed to take advantage of the spillovers than others.

5.2 Commonwealth SIDS

It was argued earlier that the Commonwealth SIDS struggle to compete in global markets because of their remoteness. The lights data enable us to consider these cases in more detail, and ask to what extent particular regions within these countries have better market access, and whether output is also higher in these regions.

In Figure 7 I provide maps of output, population and IMA at the provincial level for three SIDS: Grenada, Samoa and Fiji. In each case it is clear that both output and population is concentrated in the capital province. It is notable, however, that there is very little variation in IMA across provinces. The reason for this is that the distances to large export markets are so large that they completely dwarf within-country differences. (This is not the case in all countries; as seen in Figure 6 the southern districts of Namibia and Mozambique have better access to South Africa than the northern regions. Similarly, London and the South East of the UK

16 For the results in Table 6, I use lights/area as the dependent variable. This is to account for the fact that capital cities and other urban areas are much smaller in size than average. The results are almost identical if I do not correct for province size. The results also extend to looking at the distribution of population.

Figure 7. a) Provincial activity, Grenada; b) Samoa; c) Fiji

Figure 7a. Provincial activity, Grenada

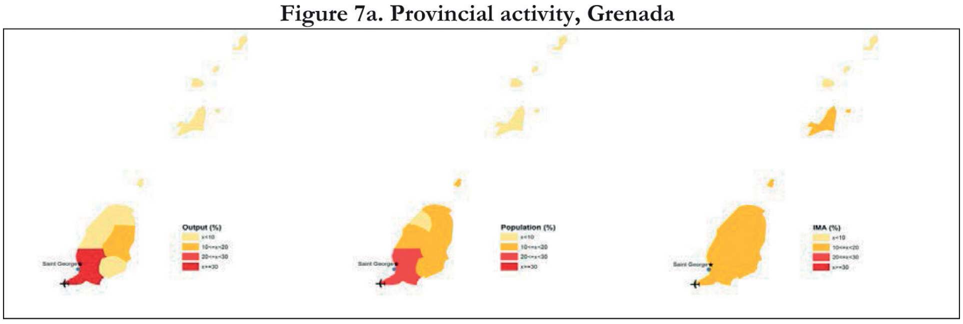


Figure 7b. Samoa

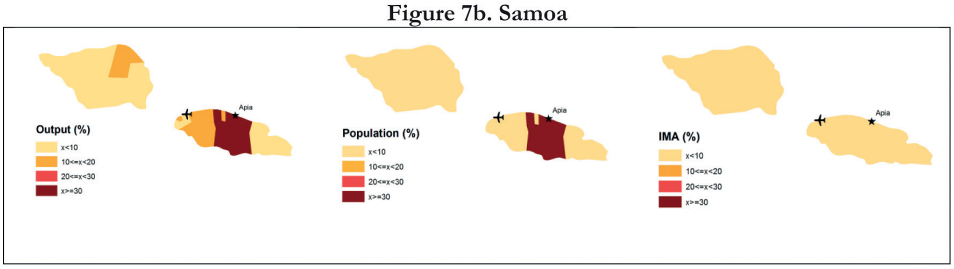
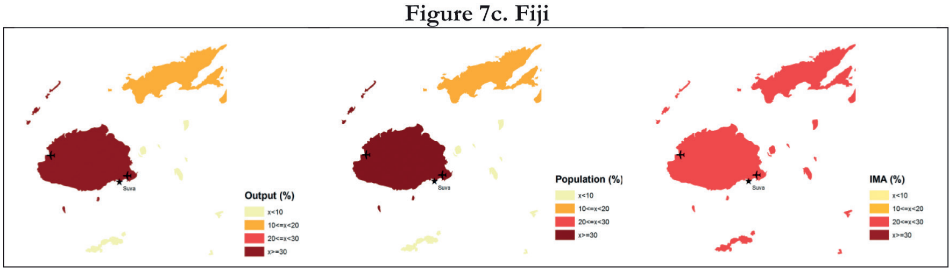


Figure 7c. Fiji



have higher IMA than northern Scotland as they are closer to the European markets.)

To show this distribution of economic activity explicitly, I replicate column (3) of Table 6 for the CW SIDS only. The results (Table 7) show that both output (light density) and population density are far higher in capital provinces and those containing an airport. Population density for example is 227 per cent higher in capital provinces and 78 per cent higher in airport provinces. The

Table 7. IMA and GDP, sub-national estimates for SIDS

	Regression coefficients		Marginal effects (%)	
	(1)	(2)	(3)	(4)
	Lights/area	Pop/area	Lights/area	Pop/area
Capital	1.630***	1.186***	410.39	227.40
	(0.469)	(0.324)		
Airport	0.898***	0.577**	145.47	78.07
	(0.229)	(0.239)		
Port	–0.086	0.217	–8.24	24.23
	(0.226)	(0.200)		
ln(IMA)	3.608	5.079*	.	.
	(2.176)	(2.725)		
Obs.	155	162	.	.
R-squared	0.30	0.29	.	.

The table replicates column (3) of Table 6 but estimated for CW SIDS countries only. The marginal effects are calculated as exp(coefficient)-1.

effect of IMA is positive, although it is estimated very imprecisely due to the lack of variation.

Although it is difficult to detect the impact of IMA on the CW SIDS, the fact that both output and population are clustered around airports supports the importance of market access for an area's development. Here, I check whether such areas are growing more rapidly than others, by calculating annual average growth rates over 2000–2012. I separate the capital provinces into their own category and then classify the remainder depending on whether they contain an airport, port or neither.

As shown in Table 8, growth has been fairly constant across the different categories of province, although port areas have grown slightly less rapidly than average. Growth does not appear to be particularly high in capital or airport provinces. The fact that 'other' (often remote) provinces are growing the most rapidly, however, may to some extent reflect a catch-up process, as output is lowest in these provinces (Table 7).

Table 8. Growth rates across SIDS provinces

Province	Lights growth 2000-2012(%)
Capital	2.27
Other: airport	2.53
Other: port	1.55
Other	2.67

For each province, I calculate the annual average growth rate over 2000-2012. These figures are then averages across provinces in the 4 groups.

6. Conclusion

This paper analyses how access to international markets affects development and growth, focusing on the CW countries. It was shown that areas with cheap access to large markets tend to have higher levels of GDP per capita, and this result extends to provinces within countries. Such findings highlight that the CW SIDS in particular face great challenges in penetrating global markets and achieving sustainable growth.

As market access is a combination of foreign output (the 'market') and trade costs (the 'access'), faster growth in large economic hubs has substantial implications for the CW countries. A number of CW countries themselves act as hubs in their respective regions, particularly Australia, India, South Africa and the UK. The results here highlight the importance of these larger economies to the development of the smaller CW countries. Policies to reduce trade costs will also be important in expanding access to markets and boosting growth. Given the remoteness of many of the CW countries, however, the results here suggest that an emphasis on trade costs alone may be insufficient to generate competitiveness in global markets.

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Appendix

Appendix 1. IMA level and growth

Table A1 shows the IMA of each country in 2013, relative to that of the UK, and the overall growth of IMA over the period 2000–2013.

Table A1. IMA level and growth

	Level (% of UK)	Growth (%)		Level (% of UK)	Growth (%)
Antigua and Barbuda	14.9	41.5	Nauru	3.6	75.0
Australia	4.6	63.5	New Zealand	6.0	92.5
Bangladesh	13.5	131.5	Nigeria	11.5	67.1
Barbados	14.6	48.9	Pakistan	26.8	139.3
Belize	28.0	38.9	Papua New Guinea	9.2	94.8
Botswana	6.4	79.8	Rwanda	11.1	90.8
Brunei	12.9	121.8	Samoa	2.5	64.3
Cameroon	19.5	156.0	Seychelles	4.3	84.3
Canada	70.0	23.3	Sierra Leone	12.1	70.5
Cyprus	58.0	89.4	Singapore	32.0	135.3
Dominica	15.4	42.5	Solomon Islands	6.1	72.8
Fiji	5.3	68.5	South Africa	6.7	68.9
Ghana	17.5	133.1	Sri Lanka	8.7	119.8
Grenada	17.1	51.8	St. Kitts and Nevis	13.2	40.7
Guyana	13.2	56.6	St. Lucia	15.0	39.0
India	12.8	105.2	St. Vincent and the Grenadines	15.8	40.9
Jamaica	18.6	36.0	Swaziland	19.8	89.1
Kenya	10.7	90.7	Tanzania	10.7	99.7
Kiribati	2.7	58.0	The Bahamas	12.2	30.3
Lesotho	26.9	90.4	Tonga	2.4	65.9
Malawi	9.4	95.5	Trinidad and Tobago	13.5	45.9
Malaysia	29.8	141.6	Tuvalu	1.6	62.9
Maldives	6.6	106.2	Uganda	12.1	98.2
Malta	50.6	48.9	United Kingdom	100.0	60.5
Mauritius	7.1	81.3	Vanuatu	2.9	73.4
Mozambique	6.0	97.0	Zambia	9.3	83.8
Namibia	15.7	88.5			

Appendix 2. Major trading partners of each CW country

The tables below present the five largest trading partners of each CW country, based on average exports over 2000–2013.[17] As bilateral trade figures are very volatile, taking an average over multiple years provides a better indication of the key trading partners rather than focusing on a specific year. The African figures should be treated with some caution, however, as South Africa does not provide import figures from Lesotho, Namibia or Swaziland until 2012 (and provides no reports for Botswana). It is a more important trade partner for these countries than the figures here suggest. In 2013, South Africa accounted for 6 per cent (Lesotho), 18 per cent (Namibia) and 5 per cent (Swaziland) of the exports of its neighbours.

Table A2.1 Africa

CW country	Partner 1	Partner 2	Partner 3	Partner 4	Partner 5	EU share
Botswana	United Kingdom (67.8)	Norway (10.5)	United States (5.2)	Belgium (4.4)	Zimbabwe (3.6)	73.7
Cameroon	Spain (15.8)	Italy (13.4)	Netherlands (9)	France (8.9)	China (7.3)	61.9
Ghana	Netherlands (12.2)	France (10.6)	United Kingdom (7.6)	United States (6.6)	Italy (6.4)	51.9
Kenya	Uganda (12.7)	United Kingdom (10.4)	Netherlands (8.7)	Tanzania (7.7)	United States (7.5)	29.9
Lesotho	United States (70.5)	Belgium (23.5)	Canada (1.8)	Madagascar (0.8)	South Africa (0.5)	24.2
Malawi	United States (10)	Germany (9.7)	South Africa (9.7)	Zimbabwe (6.3)	Russia (5.5)	32.8
Mauritius	United Kingdom (25.7)	France (20)	United States (12.8)	Italy (5.7)	Belgium (3.7)	65.5
Mozambique	Belgium (19.2)	South Africa (18.1)	Italy (12.7)	Spain (9.5)	China (6.2)	56.3
Namibia	United Kingdom (22.1)	Spain (13.1)	United States (11)	China (8.8)	Canada (7.1)	61.8
Nigeria	United States (35.2)	India (8.7)	Brazil (8)	Spain (7.6)	France (4.5)	27.2
Rwanda	Indonesia (15.2)	China (14.6)	Dem. Rep. Congo (12.9)	Malaysia (8.7)	Germany (8)	21.6
Seychelles	United Kingdom (23.4)	France (19.6)	Italy (9.6)	Japan (8.7)	Spain (6.5)	69.3
Sierra Leone	China (34.9)	Belgium (27.5)	United States (6.6)	Netherlands (3.4)	Germany (3.1)	44.9
South Africa	China (16.2)	United Kingdom (10.4)	United States (9.8)	Japan (7.8)	Germany (6.3)	31.7
Swaziland	United States (16.4)	United Kingdom (6.1)	Korea (5.6)	Kenya (5.4)	Tanzania (4.9)	23.3
Tanzania	India (12.3)	China (10.5)	Japan (6.9)	Germany (5.6)	Netherlands (5.4)	26.2
Uganda	United Arab Emirates (10.2)	Rwanda (8.9)	Netherlands (8.4)	Dem. Rep. Congo (8.1)	Belgium (7.3)	39.9
Zambia	China (28.9)	South Africa (8.1)	Dem. Rep. Congo (7.9)	Korea (7.7)	Zimbabwe (7.4)	11.5

17 I use the import reports of the partner country, as import reports are believed to be more reliable than export reports (World Trade Organization 2012). For comparability across time, I deflate the trade figures into $1985 using the US CPI deflator.

Table A2.2 Asia (South)

CW country	Partner 1	Partner 2	Partner 3	Partner 4	Partner 5	EU share
Bangladesh	United States (25.6)	Germany (13.7)	United Kingdom (9.9)	France (5.6)	Netherlands (5.3)	51.5
India	United States (14.9)	United Arab Emirates (11)	China (7.3)	Hong Kong (3.8)	United Kingdom (3.6)	19.3
Maldives	Mexico (20.7)	United States (17)	Thailand (13.2)	Sri Lanka (8.5)	France (8)	23.4
Pakistan	United States (18.9)	United Arab Emirates (8.3)	China (7.1)	Afghanistan (7)	United Kingdom (5.3)	24.6
Sri Lanka	United States (29.5)	United Kingdom (12.2)	India (5.4)	Germany (5.1)	Belgium (5.1)	33.3

Table A2.3 Asia (South East)

CW country	Partner 1	Partner 2	Partner 3	Partner 4	Partner 5	EU share
Brunei	Japan (41.3)	Korea (14.6)	Indonesia (10.3)	Australia (9.9)	United States (4)	0.8
Malaysia	Singapore (15.6)	United States (14.8)	China (14.7)	Japan (9.7)	Hong Kong (4.1)	11.0
Singapore	Hong Kong (12.1)	United States (10.3)	China (9.9)	Malaysia (9.3)	Indonesia (7.5)	12.8

Table A2.4 Caribbean

CW country	Partner 1	Partner 2	Partner 3	Partner 4	Partner 5	EU share
Antigua and Barbuda	Germany (39.5)	France (20.8)	Poland (7)	Spain (4.8)	United Kingdom (4.8)	81.5
Barbados	Guatemala (15.2)	Trinidad and Tobago (15.1)	United States (9.9)	United Kingdom (7.8)	St. Lucia (6.3)	15.7
Belize	United States (32.9)	United Kingdom (21)	Japan (4)	Costa Rica (3.8)	Nigeria (3.2)	32.2
Canada	United States (76.9)	China (3.0)	United Kingdom (2.8)	Japan (2.7)	Mexico (2.1)	7.3
Dominica	Japan (27.1)	United Kingdom (12.9)	Jamaica (10.1)	Guyana (6.9)	Trinidad and Tobago (5.2)	18.2
Grenada	Nigeria (32)	United States (13.7)	St. Lucia (9.4)	Dominica (6.6)	St. Kitts and Nevis (5.2)	17.3
Guyana	Canada (25.7)	United States (23.7)	United Kingdom (9.5)	Portugal (4.7)	Trinidad and Tobago (4)	24.8
Jamaica	United States (29.7)	Canada (14)	United Kingdom (9.1)	Netherlands (6.8)	Norway (5.7)	29.6
St. Kitts and Nevis	United States (64.3)	Canada (8.4)	United Kingdom (5)	Bangladesh (3)	Germany (2.8)	13.6
St. Lucia	United Kingdom (21.3)	France (19.3)	United States (17.9)	Barbados (5)	Dominica (4.7)	44.2
St. Vincent and the Grenadines	France (29.6)	Greece (15.7)	Italy (8)	United Kingdom (6.1)	Spain (4.8)	70.5
The Bahamas	United States (28.5)	Singapore (11.5)	Spain (8)	Germany (7.3)	Poland (7.3)	29.4
Trinidad and Tobago	United States (50)	Jamaica (5.1)	Spain (4.4)	Barbados (3.2)	Argentina (3.1)	12.0

Table A2.5 Europe

CW country	Partner 1	Partner 2	Partner 3	Partner 4	Partner 5	EU share
Cyprus	Greece (16.1)	United Kingdom (13.8)	Germany (9)	Korea (6.2)	Israel (5)	66.1
Malta	Singapore (11)	Germany (9.7)	China (8.9)	France (7.8)	United States (7.6)	41.3
United Kingdom	United States (13.5)	Germany (12.6)	France (8.3)	Netherlands (6.9)	Ireland (6.4)	57.0

Table A2.6 Pacific

CW country	Partner 1	Partner 2	Partner 3	Partner 4	Partner 5	EU share
Australia	China (22.5)	Japan (21.8)	Korea (9.1)	United States (5.9)	India (4.6)	9.6
Fiji	United States (24.7)	Australia (21.1)	United Kingdom (13.2)	Samoa (7.5)	Japan (7)	15.0
Kiribati	Thailand (33.9)	Japan (29.2)	Nigeria (5.6)	Ecuador (5.5)	Korea (4.8)	5.1
Nauru	Nigeria (39.4)	Korea (26)	India (11.3)	Australia (7.1)	New Zealand (6.9)	1.5
New Zealand	Australia (21.2)	United States (12.1)	Japan (10)	China (9.7)	United Kingdom (4.4)	14.2
Papua New Guinea	Australia (45.9)	Japan (13.7)	China (9.1)	Germany (5.5)	Korea (3.1)	14.0
Samoa	Australia (69)	United States (7.5)	Indonesia (3.6)	Nigeria (3)	New Zealand (2.7)	2.5
Solomon Islands	China (52.1)	Australia (7.5)	Korea (6.8)	Thailand (5.7)	Japan (5.1)	9.1
Tonga	Japan (31.7)	United States (31.1)	New Zealand (7.6)	Hong Kong (4.6)	Fiji (4.5)	5.1
Tuvalu	Japan (28.8)	Albania (17.4)	Indonesia (8.2)	Australia (6.4)	Fiji (5.1)	14.1
Vanuatu	Thailand (56.2)	Japan (12.6)	Canada (4.2)	India (3.9)	Côte d'Ivoire (3.5)	5.4

B Data Sources

Variable	Description	Source
X	Exports from country i to country j in year t. (Calculated using the import reports of country j for quality purposes).	IMF Direction of Trade Statistics.
dist	Distance between countries (km)	Head, Mayer and Reiss (2010), CEPII gravity dataset
border	= 1 if countries share a border, 0 otherwise	Head, Mayer and Reiss (2010)
language	= 1 if countries share an official language, 0 otherwise	Head, Mayer and Reiss (2010)
colonial	= 1 if one country colonised the other, 0 otherwise	Head, Mayer and Reiss (2010)
RTA	= 1 if countries are members of the same regional trade agreement, 0 otherwise	Head, Mayer and Reiss (2010)
CU	= 1 if countries are members of the same currency union, 0 otherwise	Head, Mayer and Reiss (2010)
WTO	= 1 if countries are members of the WTO/GATT, 0 otherwise	Head, Mayer and Reiss (2010)
Y	GDP, constant $	World Bank, Federal Reserve Bank of St Louis (deflator)
y	GDP per capita, constant $	World Bank, Federal Reserve Bank of St Louis (deflator)