Economic Geography and International Inequality: Reappraisal (Part II)

(Note: Preliminary. Currently, sections of this paper overlap with Part I)

Testing the Market Access Matters Hypothesis in Historical Perspective

or the

Historical Evolution of Economic Geography and International Inequality

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Abstract

This paper replicates Redding and Venables (2004) series for Foreign Market Access and Domestic Market Access for 1994 in order to re-estimate the GDP equation with alternative socio-institutional measures. In a second part, Foreign Market Access and Domestic Market Access are calculated for other benchmark years. Using the newly created series together with the proposed social development estimates allows testing of the relationship between market access and GDP for other benchmark years.

1. Introduction

Under increasing world economic integration, why firms do not move more production to low wage countries? Redding and Venables (2004) try to answer this question by incorporating geographical location into the analysis. Other factors previously studied are endowments, technology, and institutional quality. The mechanism in which they focus is distance to markets. Both distance to inputs (capital and intermediate goods) and distance to output (final production) markets are considered. Under given technology and internationally set prices (except wages), firms located further away from markets bear extra costs to trade that force wages downwards in order to remain competitive. This mechanism would explain why there are not more firms moving to low-wage countries.

Geographic location determines wages. Redding and Venables (2004) find statistically significant effects of geographical location on per capita income, after controlling for primary resource endowments, and a number of institutional, social, and political characteristics. The magnitude of these effects according to Redding and Venables (2004) is important. Halving a country's distance to markets would result in about a 25 percent increase in per capita income.

One of the theoretical mechanisms linking geographic location and wages is the price index. The mechanism works as follows: Distant location from suppliers leads to higher transportation costs, these being transferred to the aggregate price index. A higher price index would imply lower real wages, but also that nominal wages must be lower in order to remain competitive under globalised markets. Redding and Venables (2004)

find that their supplier access measure is inversely related to the relative price of machinery at the 5% significance level. This confirms the link between geographic location and the price index of intermediate goods. More expensive intermediate goods relative to the GDP price index, implies relatively inexpensive wages.

This paper replicates Redding and Venables (2004) series for Foreign Market Access and Domestic Market Access for 1994 in order to re-estimate the GDP equation with alternative socio-institutional measures. In a second part, Foreign Market Access and Domestic Market Access are calculated for other benchmark years. The newly created series together with the proposed social development estimates allow testing whether the relationship between market access and GDP still holds for other benchmark years.

2. Model

The theoretical framework follows the general equilibrium model exposed in Fujita, Krugman, and Venables (1999), chapter 14 on international specialisation. This model allows for international specialisation with intermediate goods. The final manufactured good is also used as an input in the production function, thus, acting as well as an intermediate capital good. Production also requires an immobile (non-tradable) factor of production, which can be interpreted as labour.

In the exposition of the model, we follow Fujita, Krugman, and Venables (1999), and introduce some notation changes to match Redding and Venables (2004) application. For instance, we allow for i = 1,…, R countries instead of two in the original Fujita, Krugman, and Venables (1999).

Prices of production factors are w_i for labour and G_i for the intermediate good. When the latter is sold directly to the consumer its price is p_i. These define the indirect production function

$$p_i = w_i^{1-\alpha} G_i^{\alpha}, \qquad 0< \alpha <1 \qquad (1),$$

which is Cobb-Douglas with intermediate manufactured good share α. Equation 1 illustrates the fact that firms set price equal to marginal cost.

In each country i, there are n firms producing n differentiated manufactured products. Therefore, n_i is the number of varieties of the manufactured good produced in country i. The manufactured good enjoys a constant elasticity of substitution (CES) amongst all its varieties. The CES function is

$$G_i = [\sum_{j=1}^{R} n_j (p_j T_{ji})^{1-\sigma}]^{\frac{1}{1-\sigma}}, \qquad \sigma >1 \quad (2),$$

where T_{ji} stands for the transportation costs from country j to country i. Firms chose to buy all varieties available to produce at internal price G_i, and the more varieties the better. Equally, consumers get best utility by purchasing all varieties available, and the more the better. Their CES utility function is

$$U_j = [\sum_{i=1}^{R} n_i x_{ij}^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}} \qquad (3),$$

where x_{ij} is the amount of the manufactured good produced in country i which is demanded by county j. In other words, x_{ij} represents the level of exports from i to j, and the level of internal demand in the case of j = i. Aggregating across importing countries we have

$$\sum_{j=1}^{R} x_{ij} = x_i \qquad (4),$$

where x_i is the aggregate level of production for a given firm-variety in country i.

How much is the expenditure of country i on manufactured goods? If we define Y_i as income in country i and μ as the share of manufactures that go to final consumption, then total expenditure of country i on manufactured goods, E_i is equal to the sum of consumers' demand plus intermediate good's demand on behalf of producers.

$$E_i = \mu Y_i + \alpha n_i p_i x_i \qquad (5)$$

In equation 5, μY_i is the proportion of income that goes to direct consumption of manufactures and $\alpha n_i p_i x_i$ is the proportion of total production that is devoted to the purchase of intermediate goods. Notice that α is the Cobb-Douglass share of the tradable input and x_i represents the equilibrium level of production. Therefore, $n_i p_i x_i$ is the value of production of country i, which we can denote by X_i. So,

$$E_i = \mu Y_i + \alpha X_i \qquad (6)$$

X_{ij} is the value of exports from country i to country j. We will later focus on this variable –value of exports–.

Now, we want to know the number of varieties n_i. In order to simplify the model, we follow Fujita, Krugman, and Venables (1999) by setting an arbitrary breakeven point of sales ($\bar{x}$)[1]. The breakeven point of sales is the same for every country because they enjoy the same technology. Then, this breakeven point determines the salaries.

$$\bar{x} = \frac{1}{1-\alpha} \qquad (7),$$

Choosing the breakeven point equal to $\frac{1}{1-\alpha}$ simplifies the calculation. Equation 7 implies that

[1] Fujita, Krugman, and Venables (1999) use a different notation for $\bar{x}$. They use q* for the level of sales at the zero-profit equilibrium instead (see Fujita, Krugman, and Venables, 1999:242). Here we choose $\bar{x}$ notation in order to make it match with that of Redding and Venables (2004).

$$(1-\alpha)n_i p_i\left(\frac{1}{1-\alpha}\right)=w_i\lambda_i \qquad (8)$$

so

$$n_i p_i = w_i\lambda_i \qquad (9)$$

and, therefore,

$$n_i = \frac{w_i}{p_i}\lambda_i \qquad (10)$$

So, the number of varieties in every country is proportional to the real wage. The higher the real wage, the larger the number of industrial varieties. Likewise, the larger the share of the labour force in manufactures, the larger the number of industrial varieties.

In order to obtain price equations for the intermediate good, we incorporate n_j and p_j into G_i equation. First, we incorporate the resulting equation for n_j, equation 10, into G_i, equation 2;

$$G_i = [\sum_{j=1}^{R}\frac{w_j}{p_j}\lambda_j(p_j T_{ji})^{1-\sigma}]^{\frac{1}{1-\sigma}} \qquad (11)$$

and, then, we incorporate the indirect production function, equation 1, determining the price of the consumption good, p_j, as a function of the prices of inputs, w_j and G_j.

$$G_i = [\sum_{j=1}^{R}\frac{w_j}{w_j^{1-\alpha}G_j^{\alpha}}\lambda_j(w_j^{1-\alpha}G_j^{\alpha}T_{ji})^{1-\sigma}]^{\frac{1}{1-\sigma}} \qquad (12)$$

Rearranging it renders

$$G_i^{1-\sigma} = \sum_{j=1}^{R}\lambda_j w_j^{1-\sigma(1-\alpha)}G_j^{-\alpha\sigma}T_{ji}^{1-\sigma} \qquad (13)$$

which is the price equation for country i.

The structure of the price equation is the same as in Fujita, Krugman, and Venables (1999) and Redding and Venables (2004), but, unlike them, we initially allow for a higher number of countries, R. The referred previous models consisted of a world of two countries only.

On the producers' side, firms follow a profit maximising behaviour. Profits are as follows:

$$\pi_i = p_i x_i - w_i(F + cx_i) \qquad (14)$$

where F represents the fixed costs of production and c the variable costs, being the latter proportional to the quantity produced, q_i. Production is given by the demand function.

Firms take the price of the intermediate input imported from another country, G_j, as given. x_i is equal to the proportion of total sales that go to final consumption. This amount is given by equation 15.

$$x_i = \mu \sum_{i=1}^{R} Y_i (p_i T_{ij})^{-\sigma} G_i^{\sigma-1} T_{ij} \qquad (15)$$

Under a perfectly competitive environment, firms set price equal to marginal cost. This zero-profit condition gives rise to the optimal production choice for the firm, $\overline{x}$. Therefore, rearranging terms, the demand function is

$$\overline{x} = \mu \sum_{i=1}^{R} Y_i p_i^{-\sigma} T_{ij}^{1-\sigma} G_i^{\sigma-1} \qquad (16)$$

Now we can isolate the price of the consumption good, p_i.

$$p_i^{\sigma} = \frac{\mu}{\overline{x}} \sum_{i=1}^{R} Y_i T_{ij}^{1-\sigma} G_i^{\sigma-1} \qquad (17)$$

Elasticity of demand is σ.

$$p_i (1 - \frac{1}{\sigma}) = cw_i \qquad (18)$$

or

$$p_i = cw_i \left(\frac{\sigma}{\sigma - 1} \right) \qquad (19)$$

Equation 19 is the pricing rule. The demand function and the pricing rule give rise to the wage equations. The next step is finding the wage equations. Applying the pricing rule to the inverse demand function found in equation 17 renders

$$cw_i \left(\frac{\sigma}{\sigma - 1} \right) = \left(\frac{\mu}{\overline{x}} \sum_{j=1}^{R} Y_j T_{ij}^{1-\sigma} G_j^{\sigma-1} \right)^{\frac{1}{\sigma}} \qquad (20)$$

Thus, the initial wage equation is as follows:

$$w_i = \frac{\sigma - 1}{c\sigma} \left(\frac{\mu}{\overline{x}} \sum_{j=1}^{R} Y_j T_{ij}^{1-\sigma} G_j^{\sigma-1} \right)^{\frac{1}{\sigma}} \qquad (21)$$

Equation 21 gives the wage at which firms in country i break even.

In order to simplify the calculations, we can do the following normalisations, without loss of generality:

$$F \equiv \frac{\mu}{\sigma} \qquad (22)$$

and

$$c = \frac{\sigma - 1}{\sigma} \equiv \rho \qquad (23)$$

By setting the fixed and variable costs of manufacturing production equal to certain parameters of our interest, we will be able to simplify the pricing rule and the wage equations. Thanks to the normalisation in equation 22, the pricing rule in equation 19 becomes

$$p_i = w_i \qquad (24)$$

and the wage equations in 21 become

$$w_i = \left(\sum_{j=1}^{R} Y_j T_{ij}^{1-\sigma} G_j^{\sigma-1} \right)^{\frac{1}{\sigma}} \qquad (25)$$

In equilibrium, the supply capacity of country i, s_i is

$$s_i = n_i p_i^{1-\sigma} \qquad (26)$$

If we weight the internal price by the iceberg transportation costs from country i to country j, the resulting expression will be expressed in terms of the price of domestically produced goods placed at the foreign market j. Adding up over all countries we get the resulting supplier access of country j.

$$SA_j = \sum_{i=1}^{R} n_i (p_i T_{ij})^{\sigma-1} \qquad (27)$$

Moving to the exports' market, the market capacity of country j, m_j, is defined as

$$m_j = E_j G_j^{\sigma-1} \qquad (28)$$

and the corresponding market access of country i, MA_i, is defined as the sum of all market accesses across countries, expressed in terms of the price once the good is placed in country j. i.e. weighted by the iceberg transportation cost from country i to country j.

$$MA_i = \sum_{j=1}^{R} E_j (G_j T_{ij})^{\sigma-1} \qquad (29)$$

X_{ij} is defined as the value of exports from county i to country j.

$$X_{ij} = n_i p_i x_{ij} \qquad (30)$$

Then, the value of exports gives rise to the following trade equation:

$$n_i p_i x_{ij} = n_i p_i^{1-\sigma} T_{ij}^{1-\sigma} E_j G_j^{\sigma-1} \qquad (31)$$

which, in terms of the above definitions, can be written as

$$X_{ij} = s_i T_{ij}^{1-\sigma} m_j \qquad (32)$$

3. Econometric specifications

From theoretical model to econometric specifications. This section deals with the issue of how to approach econometric specification for empirical estimation of the Market Access and Supplier Access indicators.

First, we take logarithms at both sides of the trade equation.

$$\ln X_{ij} = \ln s_i + (1-\sigma) \ln T_{ij} + \ln m_j \qquad (33)$$

Following Redding and Venables (2004), the supply capacity of the exporting country is estimated with exporting country characteristics (cty_i). The importing partner market capacity is estimated with importing country characteristics (ptn_j). The transportations costs between the two countries are estimated with the distance between capitals ($dist_{ij}$) and a common border dummy ($bord_{ij}$).

$$\ln X_{ij} = \theta + \mu_i cty_i + \lambda_j ptn_j + \delta_1 \ln dist_{ij} + \delta_2 bord_{ij} + u_{ij} \qquad (34)$$

In equation 34, all explanatory variables are dummy variables but distance between capitals; u_{ij} is the error term. Considering that, by nature, trade data are censored at 0, we prefer a Tobit estimation over ordinary least squares.

The Market Access and Supplier Access indicators are defined as follows:

$$MA_i \equiv \sum_{j=1}^{R} m_j T_{ij}^{1-\sigma} \qquad (35)$$

$$SA_j \equiv \sum_{i=1}^{R} T_{ij}^{1-\sigma} s_i \qquad (36)$$

and, according to the econometric specification in equation 34, they are calculated as

$$\ln \hat{MA}_i = \sum_{j=1}^{R} (\hat{\lambda}_j ptn_j + \hat{\delta}_1 \ln dist_{ij} + \hat{\delta}_2 bord_{ij}) \qquad (37)$$

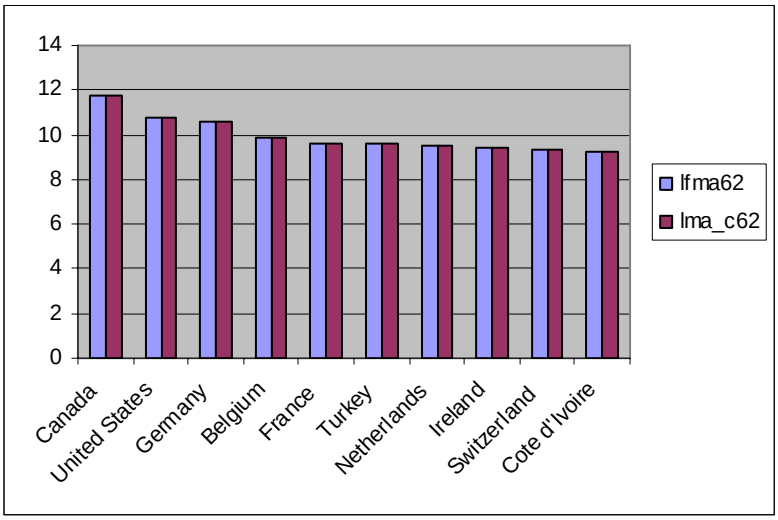
$$\ln \hat{S}A_j = \sum_{i=1}^{R} (\hat{\mu}_i cty_i + \hat{\delta}_1 dist_{ij} + \hat{\delta}_2 bord_{ij}) \qquad (38)$$

4. Empirical data estimation

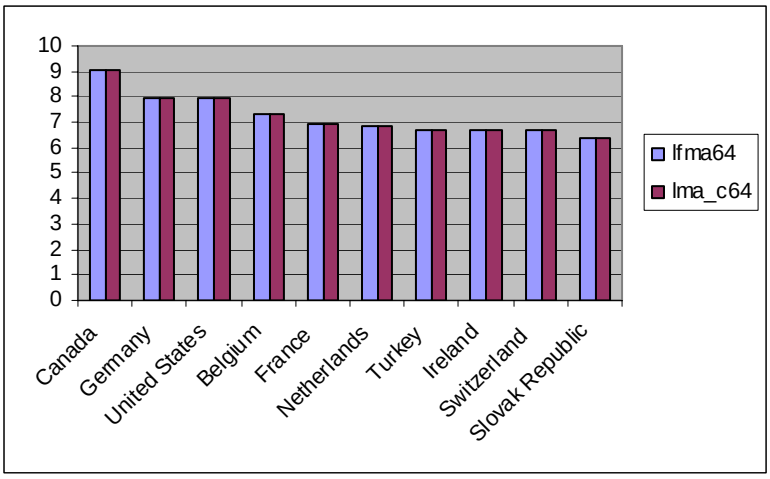
The NBER-UN International Trade Data on-line archive provides bilateral trade data for a given year since 1962 and until 2000. We extracted all bilateral trade data available for 1994. This on-line archive is an updated version of the Canadian Statistics trade data archive. There is a change of approach in the new version. The latter compile information primarily from the importer side instead of from the exporter side, since this is supposed to be more reliable (Feenstra et al. 2005).

We replicated Redding and Venables (2004) market access indicators for 1994 using their method. Then we created new series of market access indicators for other benchmark years using the same method. Market access series can be calculated for every year between 1962 and 2000, since bilateral trade data are available from the NBER-UN International Trade Data for every year within this range.

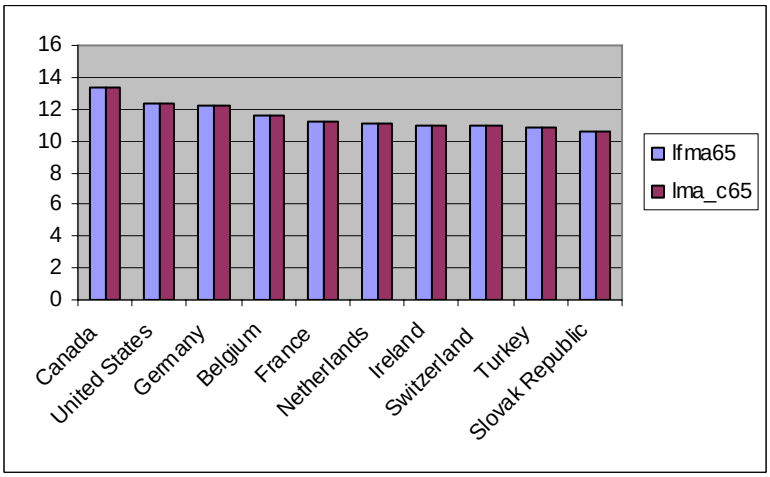
The following graphs illustrate the oscillations in levels and rankings of market access over the years.
(based on own calculations, replicating Redding and Venables 2004 method)
lfma = log of foreign market access
lma_c = log of market access MA(3), using Tobit estimation, as in Redding and Venables (2004)



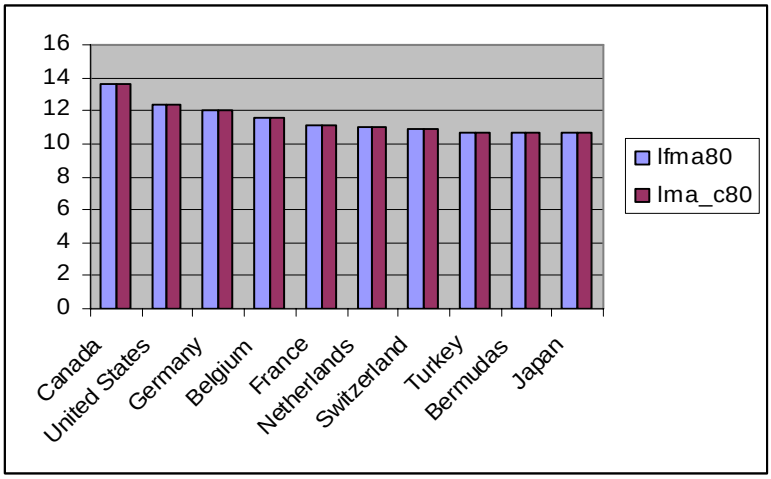
Ten Highest Market Access Scores for 1962



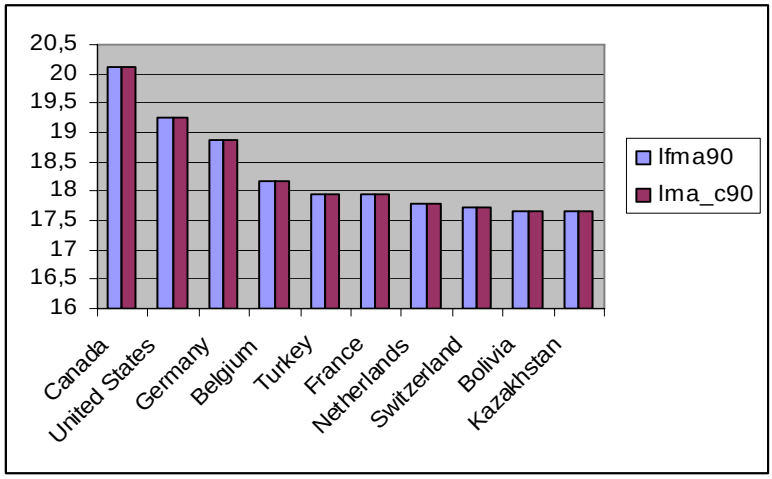
Ten Highest Market Access Scores for 1964



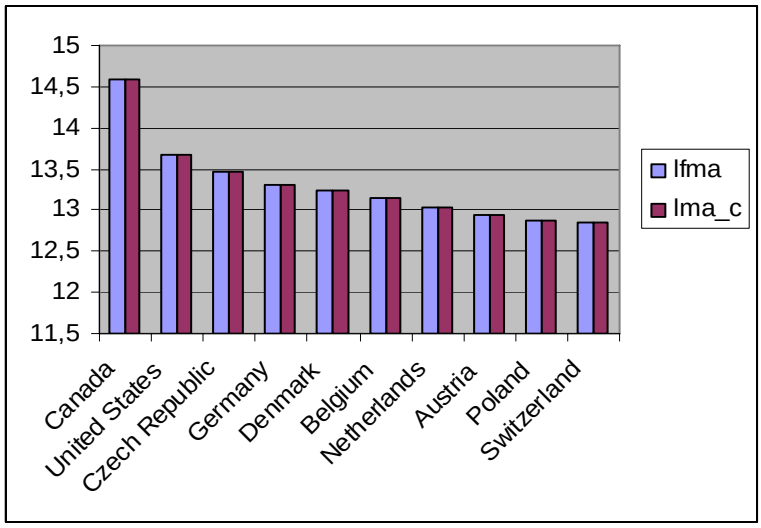
Ten highest Market Access Scores for 1965



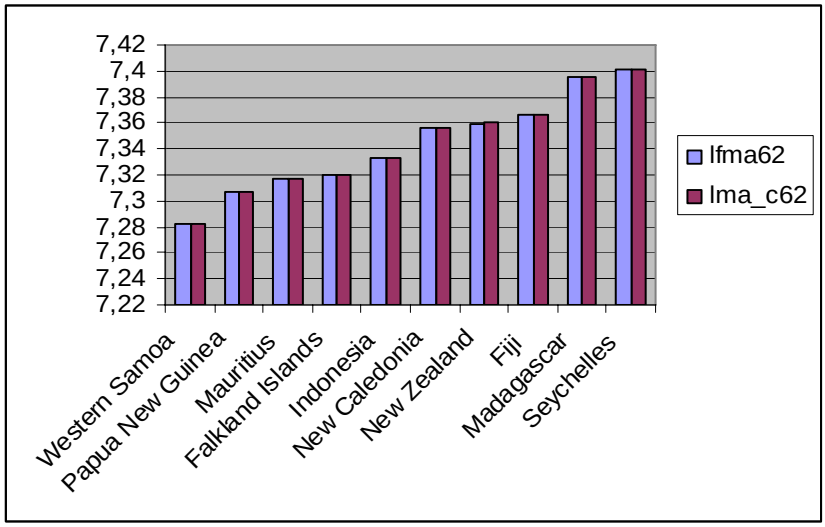
Ten Highest Market Access Scores for 1980



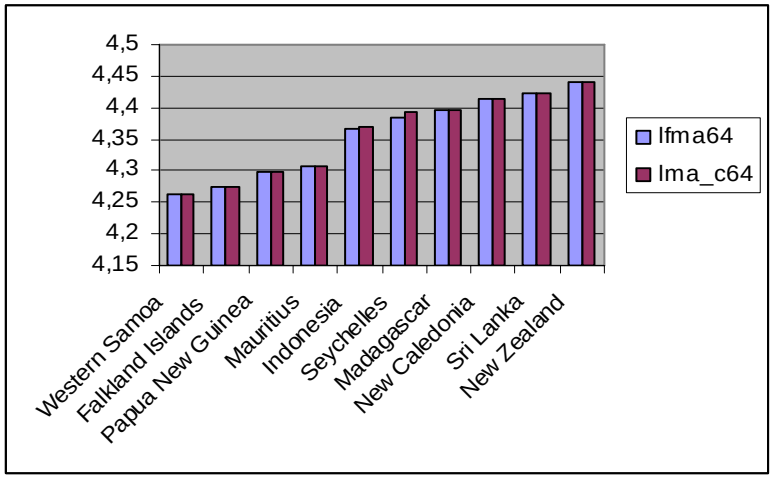
Ten Highest Market Access Scores for 1990



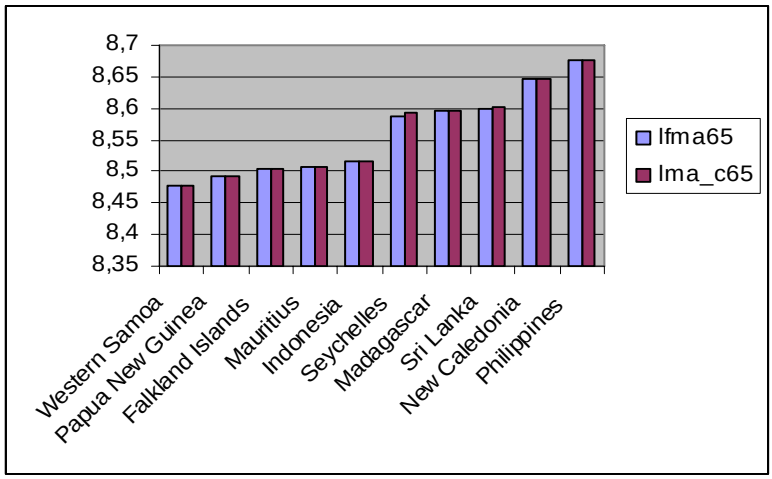
Ten Highest Market Access Scores for 1994



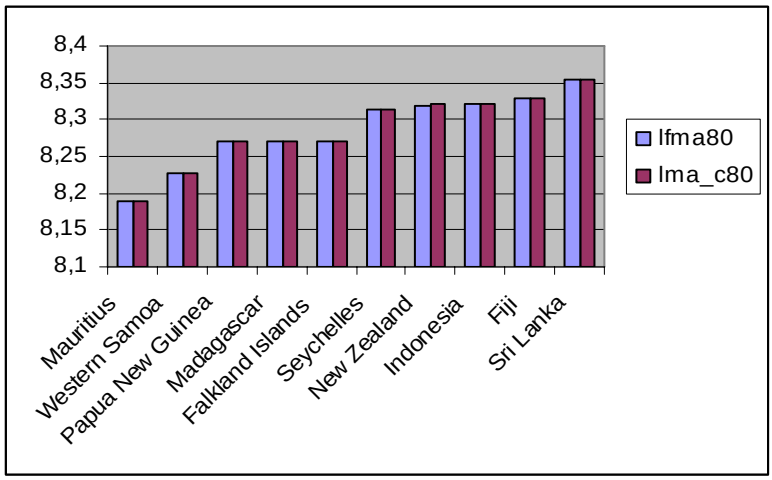
Ten Lowest Market Access Scores for 1962



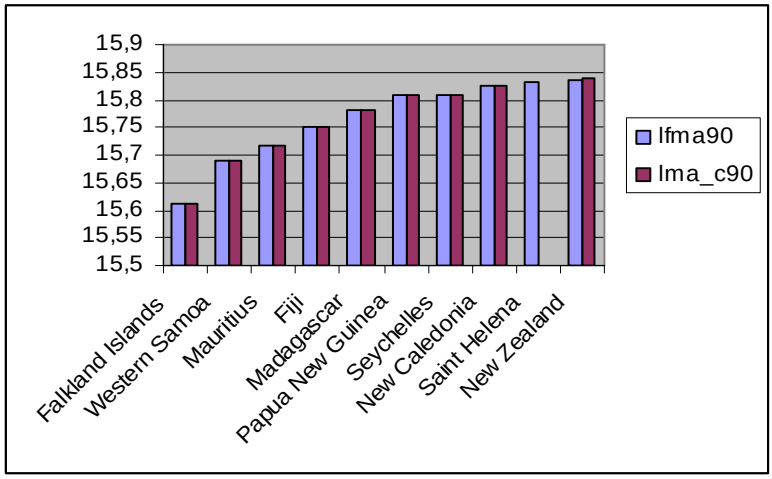
Ten Lowest Market Access Scores for 1964



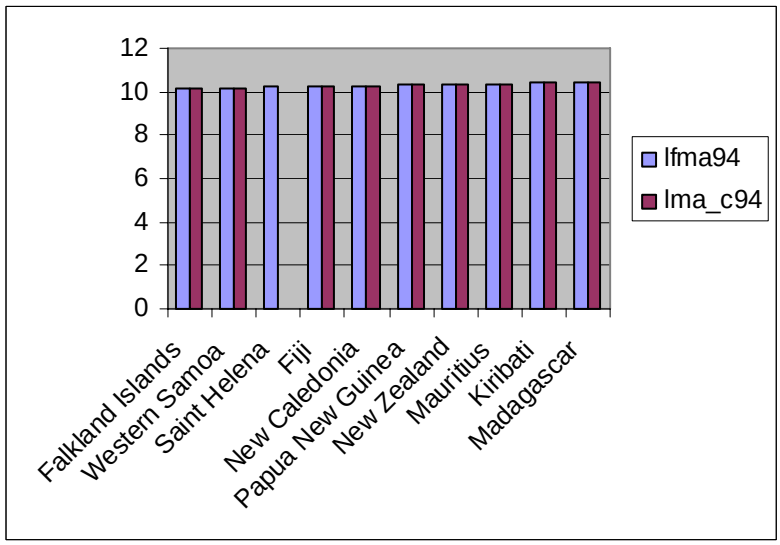
Ten Lowest Market Access Scores for 1965



Ten Lowest Market Access Scores for 1980



Ten Lowest Market Access Scores for 1990
(Sri Lanka still comes right after in position 11 after New Zealand)



Ten Lowest Market Access Scores for 1994

5. Application -Testing the theory for two benchmark years

After obtaining the Market Access indicators for several years, we can now test the theory of whether access to markets matters for GDP.

Regressions (1) and (2) in Table 1 are similar to those of Redding and Venables (2004:69) in their Table 3 (equations (1) and (3) respectively), with some differences. We took the logarithm of 1994 real GDP per capita instead of 1996's one in order to match it with the trade indicators, dating 1994 in both our and their paper. Regrettably, the size of our sample is approximately one third of theirs. In this way, we move from their 91 country sample size to our 60 countries. The number of observations is not large enough to get statistical significance for all coefficients. Still, the amount of variance explained is large (between 75 and 90% of total variation) and even larger than in Redding and Venables in some cases.

Regressions (3) to (5) in Table 1 substitute the rare institutional variables used in Redding and Venables (2004) for alternative social capital indicators, such as trust and civic engagement from the World Value Surveys. The use of the new variables has been suggested by Knack and Keefer (1997) and used widely ever since. Redding and Venables (2004:68) claim to take their control variables from Knack and Keefer (1997) among others, but do not make use of their social capital indicators in their regressions. Including these alternative indicators gives excellent results. Significance of the socio-institutional controls increases sharply and R-squares rise by 16% or more in some cases.

Table 1
1994 Current price Real GDP per capita (lcgdp), Market Access indicators (lfma, lfma_c), and alternatives for social capital (trustkk, civickk)

lcgdp	(1)	(2)	(3)	(4)	(5)
Observations	60	60	33	33	33
Year	1994	1994	1994	1994	1994
lfma	-.0020145	-	.0020064	-	-
	(.0019331)		(.0018002)		
lfma_c	-	-.003083*	-	.0034255	.0035018**
		(.0016122)		(.0021002)	(.0013984)
lhcpc	.017341	.0195395	.0055885	.006305	.0056426
	(.0169572)	(.0163313)	(.0220886)	(.0144913)	(.0202621)
land	-.0501947	-.040012	-.0667069	-.0106173	.013819
	(.0621259)	(.0614747)	(.0646304)	(.0626815)	(.0554132)
nminerals	.0112887	.0132877	.0133041	-.0007011	-.0037857
	(.0100674)	(.0096242)	(.0161349)	(.0106503)	(.0137223)
tropicar	-.3657585***	-.3470385***	-.8440686	-1.145891***	-.9879231***
	(.1336787)	(.1222941)	(.5024605)	(.2677629)	(.3515549)
malfal94	-1.457045***	-1.487077***	-2.0712***	-1.853136***	-2.013241***
	(.1978777)	(.1863303)	(.624926)	(.3199162)	(.4848326)
re	.2088713***	.2326826***	-	-	-
	(.0476707)	(.0378889)			
socialst	-.0930034	.0409994	-	-	-
	(.2996753)	(.2243446)			
wardum	-.0177182	-.0063676	-	-	-
	(.2106432)	(.1675399)			
trustkk	-	-	.039688***	.0333133***	.0300097***
			(.0091566)	(.0088468)	(.0087374)
civickk	-	-	-.0172536*	-.0124614	-
			(.010062)	(.0115552)	
Estimation	OLS	OLS	OLS	OLS	OLS
R^2	0.7533	0.7658	0.8706	0.8920	0.8826
F(.)	22.88	24.35	20.18	105.49	26.84
Prob>F	0.0000	0.0000	0.0000	0.0000	0.0000

Constant not shown. Heteroskedasticity corrected White-robust standard errors in (1), (2), and (4). No evidence to reject homoscedasticity in (3) and (5).
*Statistically significant at the 10% level. **Statistically significant at the 5% level. ***Statistically significant at the 1% level.

We now test validity of the theory for other benchmark years.

The institutional variables used in Redding and Venables (2004) are only available for the time period they study; so their tests are impossible to perform for other benchmark years. However, the success of the social capital indicators as control variables invites us to modify the applied tests by substituting their socio-institutional variables by our social capital indicators, as shown in Table 1. The use of alternative socio-institutional

measures, together with our new market access series, allows us to test the economic geography theory for other benchmark years.

We performed a similar test of market access influence on GDP making use of the social development index available for the 1960s (Adelman and Morris, 1965) as means of controlling for social capital, as suggested by Temple and Johnson (1998). 1965 has been taken as the benchmark year. We used the newly created 1965 market access series, together with the Adelman and Morris (1965) social development index and the falciparam malaria index, which is available for 1966 from the Center for International Development (CID) at Harvard University. Purely geographical control variables do not differ from those used for 1994. Table 2 displays the results.

Again, the regression coefficients accuse the relatively small sample size; only 2/3 of that of Redding and Venables (2004) for 1994. Still, approximately 63.5% of the disparities in 1965 real GDP per capita are captured in our economic geography regressions. Also Redding and Venables (2004)'s R-squares diminish with sample size. For instance, our R-squares for 1965 are 17 to 25% smaller of what Redding and Venables could explain with a sample size of 91 for 1994 trade data; but only 6% smaller of what they could explain with a sample size of 69.

Table 2
1965 Real GDP per capita (lgdp), Market Access indicators (lfma, lfma_c), economic geography, and social capital (socdev)

lgdp65	(1)	(2)
Observations	65	65
Year	1965	1965
lfma65	.0008643	-
	(.0012726)	
lma_c65	-	.0008813
		(.0012833)
lhcpc	.0256457*	.0256431*
	(.0147253)	(.0147182)
land	.1041805*	.1041715*
	(.0524394)	(.0524458)
nminerals	-.0032233	-.0031934
	(.0099323)	(.0099337)
tropicar	-.0007069	-.000821
	(.1264444)	(.1263726)
malfal66	-.0655221	-.0650011
	(.1552821)	(.1552904)
socdev	.516002***	.5160044***
	(.0644283)	(.064435)
Estimation	OLS	OLS
R^2	0.6347	0.6348
F(.)	15.27	15.27
Prob>F	0.0000	0.0000

Constant not shown. Heteroskedasticity corrected White-robust standard errors. *Statistically significant at the 10% level.
***Statistically significant at the 1% level.

Overall, we can conclude that geography matters both now and then. However, given the data availability, the relevance of the market access indicators cannot be proven for 1965 as strongly as for 1994. This leads us to the next question: Which aspects of market access matter the most? In the next section, we explore the impact of plain distance to markets.

6. Further exploration – Testing the theory using plain bilateral distance instead of market access

Using distance to the main World markets instead of the market access indicators tends to give low statistical significance in its 1994 regression coefficients when we use Redding and Venables (2004) socio-institutional control variables (see equations (1) and (2) in Table 3). In fact, they use distance as instrumental variables for market access but never directly into the GDP regressions. However, substituting all their institutional control variables simply by trust brings distance to markets into full statistical significance with only about half their sample size (see equations (3) and (4) in Table 3).

New Table 3
1994 Real GDP per capita, distance to main world markets, and alternative socio-institutional controls

lcgdp	(1)	(2)	(3)	(4)
Observations	61	61	33	33
Year	1994	1994	1994	1994
ldistcapBEL	.0351821	-	.2445488***	-
	(.185142)		(.0764972)	
ldistcapJPN	.0291634	-	-.3261921**	-
	(.2215422)		(.1209158)	
ldistcapUSA	-.040608	-	-.2202866**	-
	(.1912263)		(.0947225)	
lmindistcap	-	-.0655999	-	.3226696***
		(.1691209)		(.0693244)
lhcpc	.0162129	.0158793	.0022319	-.0001821
	(.0174161)	(.0168245)	(.0198561)	(.0166695)
land	-.0821346	-.0613253	.1858462**	.16112**
	(.0798287)	(.0542211)	(.0770065)	(.0584438)
nminerals	.0133351	.0118586	.0030361	.0066756
	(.0135943)	(.0121571)	(.0136523)	(.0110755)
tropicar	-.419312	-.3313137*	-.2477512	-.3359614
	(.3029904)	(.1918178)	(.3880428)	(.3232305)
malfal94	-1.35033***	-1.398534***	2.166932****	2.050771***
	(.2976878)	(.2065599)	(.4541972)	(.3959919)
re	.232621***	.2326341***	-	-
	(.0446833)	(.0428952)		
socialst	.0233783	-.0031844	-	-
	(.2990669)	(.2892105)		
wardum	.0738104	.0657117	-	-
	(.214453)	(.2078047)		
trustkk	-	-	.0289483***	.0307995***
			(.0082608)	(.0068507)
Estimation	OLS	OLS	OLS	OLS
R^2	0.7588	0.7591	0.9076	0.9213
F(.)	14.02	17.85	25.10	41.82
Prob>F	0.0000	0.0000	0.0000	0.0000

Constant not shown. No evidence of heteroskedasticity at the 5% significance level.
**Statistically significant at the 5% level. ***Statistically significant at the 1% level.

New Table 3: Direct distance indicators do not prove statistically significant when we use the socio-institutional controls suggested by Redding and Venables (2004). However, distance, –and even more log distance–, is indeed statistically significant when we replace it for the complex market access indices, together with our proposed social capital indicators. Thus, distance to markets can tell us something about the GDP

gap by itself. And so, this finding reduces the urge to search for complex market access indicators.

Other distances: dist, distw, and distwces give similar results. Head and Mayer (2002) describe the four distance measurement alternatives in detail. Though differences in results are small, distwces, the measure suggested by Head and Mayer, brings sometimes slightly higher R-squares and statistical significance of the coefficients in our regressions. Regressions shown in New Table 3 do no include civic engagement because it did not show statistical significance in a consistent way.

Moving to the other benchmark year, 1965, brings interesting results. Distance to some important World markets turns out to be strongly significant when replacing the market access indicators in the regressions (see Table 4); and this is true for all four alternative ways to measure distance between two countries. Furthermore, they all give very similar results.

New Table 4
1965 Real GDP per capita (lgdp), distance to main World markets, and social capital (socdev)

lgdp65	(1)	(2)	(3)
Observations	65	65	65
Year	1965	1965	1965
ldistcapBEL	.1337774	-	-
	(.1443213)		
ldistcapJPN	-.0724993	-	-
	(.1234726)		
ldistcapUSA	-.5188161***	-.4259002***	-
	(.172848)	(.1548918)	
lmindistcap	-	-	-.1733149
			(.1138626)
lhcpc	.0268375**	.0230233*	.0246632*
	(.0134193)	(.0130092)	(.0135557)
land	.096233	.0771795	.1478507***
	(.0667467)	(.046329)	(.0548435)
nminerals	.0035628	.0043482	-.0063391
	(.0099511)	(.0096579)	(.0093154)
tropicar	-.4280922*	-.3048425*	.0432986
	(.2470194)	(.1785606)	(.1500375)
malfal66	.2934417	.2255119	-.0796224
	(.254974)	(.2363274)	(.2152924)
socdev	.4448018***	.478015***	.5157289***
	(.0898398)	(.0832651)	(.0854312)
Estimation	OLS	OLS	OLS
R^2	0.6837	0.6749	0.6462
F(.)	13.21	16.90	14.87
Prob>F	0.0000	0.0000	0.0000

Constant not shown. No evidence of heteroskedasticity at the 5% significance level.
***Statistically significant at the 1% level.

New Table 4. We should take into account the historical context. 1965 is not 1994 in terms of economic development. The world economy is much more globalised towards the end of the century and main world markets have changed. For 1965 regressions, including distance to the United States alone explains nearly as much variance as including all three distances and is the only one that remains statistically significant throughout. In fact, distance to the United States is more significant than the minimum

distance between the three (Belgium, Japan, and the United States), showing that, at that time, proximity to the American economy could be more important than proximity to other more local markets within the continental scale.

Appendix

List of variables and sources:

Endogenous variable:
GDP per capita (ln used in the regressions), "lcgdp"

Exogenous variables:
Market Access (ln used in the regressions). Two variations: "lfma" and "lma_c".

Instrumental variables:
Distance to the US, distance to Belgium, and distance to Japan (ln used in some regressions). "ldistcapUSA", "ldistcapBEL", "ldistcapJPN" respectively.

Control variables:
Arable land area per capita (ln is used in the regressions), "land"
Hydrocarbons per capita (ln is used in the regressions), "lhcpc"
Number of minerals, "nminerals"
Fraction of land in the geographical tropics, "tropicar"
Prevalence of malaria, "malfal"
Risk of expropriation or protection of property rights, "re"
Socialist rule during 1950-1995, "socialst"
External war 1960-1985, "wardum"
Social Development Index 1960s, "socdev"
Trust (several years), "trustkk"
Civic Engagement (several years), "civickk"

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