Lerner, Smith, Trade Policy and Income Growth

An Empirical Validation

Matthew J. Cadbury

University of Hertfordshire

February 2016

Contents

1.0 Abstract

Despite much evidence suggesting linkages between open trade policy and economic growth, there is no conclusive empirical evidence on the mechanism by which this might occur. The empirical literature focuses on evidence that exporting allows technology spill-overs and the results are mixed. The literature does not supply an answer to how trade policy should best be measured nor does it provide a clear mechanism by which trade might affect growth. Three research questions were identified:

1 What is the best way to measure trade policy?

2 What is the theoretical mechanism linking trade to growth?

3 What is the empirical method that can be used to test this mechanism?

This research proposes to test Lerner's Theorem (1936) empirically to answer the first question and proposes a theoretical framework based on the thinking of Smith (1999) to answer the second question.

Lerner's Theorem states that tariffs on imports and exports have identical economic effects in the presence of zero balance of payments. A simplification of the normal gravity equation was used to investigate how country trade policy affects country trade values. The analysis showed that tariffs had very similar effects on imports and exports and this finding gives strong support that the conditions of Lerner's Theorem are met in practice. If Lerner's Theorem applies then Effective Tariff, which takes account of country trade policy on both imports and exports, is the appropriate way to measure a country's trade policy for cross-country analysis and there.

Smith suggested that income growth was achieved through greater specialisation of tasks. He observed that the degree of specialisation that was possible depends on the size of available market and that trade could provide extensions to the market. Economic Geographers have developed models of market access and derived "Market Potential" measures from them, consisting of local and foreign components. Trade/GDP or "Openness" is also used as a measure of the extent to which a country accesses foreign markets. Openness might be an appropriate measure particularly for smaller countries where the size of the local market is small compared with the global economy and thus access to foreign markets could be considered as the dominant component of Market Access. Other factors affecting access to foreign markets are trade policy and distance.

A cross country panel growth equation was used to investigate possible linkages between these market access measures and income growth. The two economic geography measures were found not to correlate with income growth; however Trade/GDP ratio showed a strong positive correlation. To test the full hypothesis of trade policy affecting Market Access affecting growth and to control for endogeneity a 2 stage least squares instrumented equation was then used. Trade/GDP ratio was instrumented by Effective tariff, Real GDP and Remoteness. This equation showed a significant coefficient for Trade/GDP ratio and a Hausman test showed that the instrumented equation was preferred to a simple fixed effects equation.

In conclusion Market Access provides a theoretical mechanism for trade openness to affect growth. It improves on Classical Trade Theory in that the Market Access mechanism works equally well for

imports and exports and works equally well for developed and developing markets. Subsidiary conclusions are that Lerner's Theorem applies in international trade and that Effective tariff is the appropriate way to measure country trade policy. The results suggest that countries with trade barriers are restricting their ability to grow their incomes.

2.0 Introduction

Possible linkages between trade policy and economic growth are a controversial subject; whilst there is generally empirical evidence of a link it is not conclusive. This analysis sets out to re-examine the question of how trade policy, meaning particularly the use of barriers to impede trade, might influence economic growth and specifically income growth. The basis for carrying out this re-examination is the development of a new hypothesis of how trade barriers might influence growth through economic scale and specialisation, together with different analytical methods and the recent availability of longer term datasets on trade policy measures.

The hypothesis behind this analysis is that barriers to trade restrict the scale of market that a country's economic actors can access and that this reduces the potential opportunities for new specialisation and hence reduces economic growth.

This study was conducted entirely on the basis of secondary data. Because of the considerable number of data gaps in country historical data there is a trade-off between number of observations in a given equation and the number of variables included in the equation. For the purposes of this analysis the trade-off is biased towards number of observations since it is primarily the robustness of the trade policy, market scale and growth linkages that is of interest rather than creating the best possible growth equation. As a consequence the equations used do not pretend to be complete growth equations.

There are two areas of contribution, in both areas there is a theoretical and a methodological element. The empirical study of how trade policy influences trade levels makes both a theoretical and a methodological contribution in understanding how trade policy works and how best it can be measured. The results show that the conditions of Lerner's Theorem (1936) apply to a typical country's trade; thus imports and exports are closely tied to each other and any policy measure affecting one has the same effect on the other. The theoretical contribution is therefore that trade policy is unable to prioritise exports differentially over imports. The methodological contribution is that Effective Tariff, meaning total customs income divided by total imports, is the most appropriate way to measure a country's trade policy. A subsidiary finding is that the coverage of non-tariff barriers is a very poor measure of trade policy.

A theoretical hypothesis is put forward linking trade policy to growth through Market Access. This is backed by empirical testing using a 2 stage least squares instrumented equation linking trade policy to market access and then income growth. These results make a methodological contribution to growth modelling by demonstrating that a market scale term is needed in growth equations to capture the effect of Market Access on growth. In reality many growth equations already use a trade/GDP ratio term and this analysis validates that approach both theoretically and empirically.

3.0 Review of the Theoretical and Empirical Literature

Adam Smith made the first attempt to form a theory of how nations can become wealthy (Smith 1999). Smith concluded that the wealth of a country was not the amount of gold it held in its treasury, as had previously been thought by the Mercantilists, but the extent of economic transactions that took place. Smith concluded that a country could increase its wealth by greater efficiency and that this could be achieved through greater specialisation and division of labour. As tasks are broken down into smaller sub-tasks, these can be done repetitively at a greater level of efficiency and doing this also encourages the specialists in these sub-tasks to invent methods and machinery to improve efficiency further. Smith saw that the size of available market could potentially constrain this process of specialisation and that trade was a means of providing "extensions to the market" if the local market was insufficient. Trade would occur where different countries specialised in different economic activities and each sold its specialism to the other to the benefit of both

> "When two men trade between themselves it is undoubtedly for the advantage of both....The case is exactly the same betwixt any two nations" (Butler 2007).

Smith's scale argument is equally applicable to business activity that takes place within a country and activity that crosses borders, such that larger countries are likely to have more opportunities for specialisation than smaller ones in the same way that countries with more trade will have more opportunities

> "The benefits we get from exchange are what drive us to specialise and so increase the surplus that we exchange with others. Just how far that specialisation can go depends on the extent to which exchange is possible, says Smith – that is, on the extent of the *market*. Only a "great town" provides enough customers for porters, for example: while scattered communities may be unable to support even specialist carpenters or stonemasons, forcing people to do more of these tasks themselves." (Butler 2007).

Smith thus saw wealth as driven by productivity through specialisation in a market place sufficiently large to accommodate that level of specialisation.

Ricardo (1817) showed that trade between two countries would still be beneficial to both even if one had an absolute productivity advantage in all products and illustrated this with an example of England exporting cloth to Portugal and Portugal exporting wine to England. Ricardo had actually gone further than describing trade, he had proposed a universal theory of exchange, explaining the economic basis of all transactions between all economic actors. Heckscher and Ohlin added the concept of factor endowments (Ohlin 1933) showing that different economies would value factors of production according to their relative scarcity. Comparative Advantage and Factor Endowments became the basis of Classical Trade Theory,

Subsequently the idea of "Dynamic Gains" from trade was added. These gains include learning from foreign markets as well as improvements in institutions (Olsen 1982). Nordas et al (2006) provide a framework for the mechanisms that might be at work in dynamic gains from trade. They identify five possible channels by which trade might affect an economy and conclude that the only channel that provides a true growth effect is the technology spill-over channel as shown in Figure 1. An

implication from Nordas's analysis is that income growth increases from trade can only occur for a less technologically developed trading partner which is receiving technology spill-overs from a more developed trading partner.

Channel of productivity gain	Level/Growth effect
Better resource allocation	Level
Deepening specialisation	Level
Higher returns to investment (investment/capita and/or R&D)	Level – long adjustment period
Technology spill-overs	Growth

Figure 1: Productivity Effects of Trade by Channel (Nordas et al 2006)

However Smith observed that specialisation brought with it an effect on technology "Men are much more likely to discover easier and readier methods of attaining any object when the whole attention of their minds is directed towards the single object than when it is dissipated among a great variety of things" (Smith 1999). This suggests that the size of total market that firms and households can access might also have a growth effect on income. Additionally specialisation might also mirror technology in that higher technologies tend to require larger markets to be viable, so perhaps Nordas et al's framework is too focussed on technology and misses the longer term implications of specialisation.

The main counter theory to classical economic theory on trade has been that there are strategic advantages accruing to a country which restricts its imports. The origins of this idea were originally put forward by Alexander Hamilton in the USA in the 18th century and developed and enlarged by Singer (1950)and Prebisch (1950), who showed that over a long time period commodity prices had been falling in real terms, whilst the prices of manufactured goods had not

> "It is a matter of historical fact that ever since the seventies (1870s) the trend of process has been heavily against sellers of food and raw materials and in favour of the sellers of manufactured articles" (Singer 1950).

A more recent analysis by Jacks (2013) looked at commodity prices for 30 commodities over a total of 160 years. Jacks showed that prices for excavated minerals had increased whilst prices of grown agricultural commodities had fallen. The comparison made by Prebisch and Singer was based on per unit prices and is misleading fro grown agricultural commodities. The income from agricultural commodities depends on price and yield and yields have grown faster than the fall in agricultural prices, hence income from both types of commodities has in reality increased, negating the basis of the Prebisch Singer argument.

Ocampo and Taylor (1998) point out that it makes sense to impede international competition whilst a new industry builds up scale to the point where it can be exposed to external competition. New Growth Theory in the 1980s from Paul Krugman was followed by New Trade Theory allowing for imperfect competition. Krugman's thinking showed how it might be optimum for a government to provide import protection to a particular industry to further its development. However, applying the same imperfect competition thinking from a national market perspective can also explain why infant industry policies tend not to work. Once a tariff barrier is put in place the local environment is isolated from international competition. Given that national markets are smaller and with more rigid boundaries than the global market; this makes the likelihood of imperfect competition higher in the

national market according to Olsen (1982). Krugman had showed that it was mathematically possible for an infant industry policy to work; he had not shown that it was likely in reality.

During the latter part of the 20th century it became clear that many developing countries were not getting richer and this led to investigation of the differences in policy between those countries that were succeeding and those that weren't. The "Asian Tigers", Japan, South Korea, Taiwan, Hong Kong and Singapore had all seen fast increases in per capita income and were seen to have achieved this on the back of growing exports and by being outward looking. Countries in Latin America, South Asia and Africa had experienced disappointing growth and this was seen to be a consequence of following inward looking policies of substituting local manufacture for imports. There was an extensive debate on "import substitution" versus "export promotion". Both sides of this debate were essentially seeking an autonomous increase in net exports, with one side focussing on reducing imports relative to exports whilst the other focussed on increasing exports relative to imports.

A survey by Singh (2010) considers 61 macroeconomic trade and growth studies. Analysis of the studies referenced by Singh shows that 48 studies found evidence to support a link between openness and growth, 12 showed no significant relationship and one showed a negative relationship between openness and growth for the period 1875 to 1914 as shown in Figure 2. The majority of these were cross-country studies. Since Singh's publication a long term analysis by Schularick and Solomou (2011) has cast doubt on the one study showing a negative relationship between openness and growth for the period 1875 to 1914 through a more complete equation specification.

Number of Macroeconomic Studies Linking	To GDP Growth (extensive)	To Income Growth (intensive)
Trade Policy		4
Exports	24	3
Imports	1	
Total Trade	2	8
Other factors	1	5

Figure 2: Summary of Macroeconomic Trade and Growth Studies in Singh 2010

Two things stand out from Figure 2: first that the majority of studies analyse connections between exports and GDP growth, with just one study analysing imports and second that very few studies attempt specifically to relate trade policy to growth.

These same observations apply to Singh's survey of Microeconomic trade studies. Singh examined 44 firm and industry level studies to survey the microeconomic evidence for trade benefits and these are shown in Figure 3. Of these studies 36 analysed exporting and generally find a relationship between exporting and higher productivity, suggesting that exporting may lead to higher productivity and hence growth. However, 19 of the export studies suggest that higher productivity firms choose to export whilst only 10 studies find clear causality running from exporting to improved productivity. All the microeconomic studies connected with import liberalisation show that this leads to gains in productivity, which might suggest that dynamic gains from trade are more significant on the supply than the demand side; however the sample size of 4 importing studies is small, reflecting the habitual bias in favour of exports.

		Learning from Exporting	Self-selection of Exporters	Productivity gains from Import Liberalisation
	Number of studies	10	19	4
Developed	29	6 + some evidence in 4	13	1
Developing	15	4 + some evidence in 2	6	3

Figure 3: Microeconomic studies (Singh 2010)

The overall picture from Nordas et al and Singh is that researchers have primarily been looking for growth gains from trade through technology spill-overs from exporting. The results are mixed and there has been little work specifically examining the effect of trade policy. One explanation for this is the difficulty that has been found in measuring trade policy and/or openness. Pritchett (1996)analysed data for 72 developing countries and showed that six different measures of openness used in various studies were poorly correlated to each other, casting doubt on these analyses of trade openness against growth

> "The results suggest disappointingly low correlations between the various measures…….. If these different empirical proxies for policy stance were strongly correlated, this would create confidence that some significant, well understood aspect of countries' trade policy is being captured" (Pritchett 1996).

By contrast, Edwards (1998) analysed a number of trade related variables and showed that 6 out of 9 different measures showed a statistically significant correlation to total factor productivity growth from 1960 to 1990 and all had the expected sign. This suggests that each measure might be picking up a different aspect of openness.

One study which takes a different approach was carried out by Wacziarg (2001), who used a two-step approach to relate measures of trade policy to a variety of key economic measures which were then in turn related to growth. A change in trade policy does not, of itself, have any influence on growth, so Wacziarg's approach seems sensible. The results showed that trade liberalisation measures were correlated to increased investment, increased FDI and improved macroeconomic management, which in turn correlated to higher growth. The finding of a link between trade and growth through investment suggested a link with size of economy:

> "If specialisation is limited by the extent of the market, under increasing returns to scale trade openness should allow entrepreneurs to undertake previously unprofitable investments" (Wacziarg 2001).

Smith had clearly articulated the idea that scale of market limited the extent to which division of labour could occur, thus affecting wealth. The concept of scale has also been widely used in microeconomics, particularly in the understanding of competition between firms. Recent empirical studies by Economic Geographers Redding and Venables (2004) and Head and Mayer (2011) analysed the effect of geography on scale of market and then related this to country income. Both these sets of authors carried out a 2 step approach to produce a measure of "Market Potential" consisting of the sum of access to the local national market and access to foreign markets:

Market Potential = Local Market Access + Foreign market Access

They started with gravity equations, using the value of transactions between and within countries as the dependent variable and then a variety of geographical and political independent variables, such as distance, common borders etc. These equations were done on a fixed effects basis and in this way they avoided the need to specify or quantify trade policy, since it becomes a part of the fixed effects term. The gravity equations were combined with a wage equation and used as drivers of a global equilibrium model. From this they were able to compute how much market access is available to local firms in each local market and how much market access those firms have to foreign markets on an equivalent basis. They find that distance is the main driver of Market Potential and they find that countries with large economies and countries near to rich countries therefore have greater Market Potential than small remote countries. They further find a correlation between Market Potential and income levels. A possible challenge to this work is that it might be a circular argument; the key variable in the first stage of the analysis is distance and this then subsequently emerges as the key driver of the outcome from the equilibrium model. Another challenge is that nearby countries may have developed for the same underlying historical reasons rather than because they were near other large markets.

Away from Economics, scale is a focus in Biology, specifically in terms of measuring habitat loss and the consequential effect on extinction. This idea has been developed into the species-area curve, defined by Preston (1962)as the number of species (S) is equal to a constant (c) times the area (A) to the power of another constant (z). This gives a straight line relationship between the log of species number and the log of area. Biodiversity and habitat scale are a natural analogy to division of labour, specialisation and economic scale, taking Preston's equation, we might expect a connection between the log of the size of market and the log of the growth rate.

4.0 Discussion of the Literature

The literature review shows that trade theory explains why trade occurs but does not explain the consequences of trade, beyond the identification of modest static income level increases. The concept of Dynamic Gains has been proposed and the most widely studied dynamic gain is learning from exporting with consequent spill-over of technology. Empirical analysis of this has produced results that are unclear and this gain would tend to apply more to a technologically less advanced country exporting to a technologically advanced country. There are three key questions on which the literature does not supply a conclusion:

1 What is the best way to measure trade policy?

2 What is the theoretical mechanism linking trade to growth?

3 What is the empirical method that can be used to test this mechanism?

The empirical literature has not tested Lerner's theory and Smith's concept of trade providing "extensions to the market". The hypothesis of this study is that these two concepts may be useful in answering the above questions.

5.0 Empirical Test of Lerner's Theorem

Lerner's theory is that trade policy has no differential impact between exports and imports if there is a zero balance of payments. Lerner effectively suggests that there is a circular flow of trade, the value of the flow can increase or decrease but it is essentially the same for exports and imports. The effect of trade policy under Lerner's conditions is to restrict or promote all trade, with no ability to preferentially promote or restrict imports or exports. If the conditions exist for Lerner's Theorem to apply then exports and imports are not autonomous from each other.

The normal method of analysing trade flows using a gravity model requires an analysis of the trade flow between each pair of countries based on their respective sizes, distance between them and other factors.

$$Trade\ flow\ between\ two\ markets = \frac{Market\ size\ 1\ x\ Market\ size\ 2}{Distance}$$

This equation was simplified by pairing each country with the total world market thus enable country trade policy measures to be included, giving a single pairing for each country and year.

$$Total\ Country\ Trade = \frac{Market\ Size\ Country\ 1\ x\ Market\ Size\ World}{Remoteness\ x\ Trade\ Barriers}$$

In a normal gravity specification the independent variables include the distance between the two countries. In this case with each country paired with the rest of the world, a weighted average distance is used where the distance to each other country is weighted by the percentage of world GDP that that country represents – this measure is also referred to as "Remoteness".

Measuring trade policy is a key problem identified from the literature. Countries rarely use a simple tariff across all imports preferring to use a variety of trade policies, ranging from per quantity tariffs, to percentage of value tariffs, to quotas and bans. Trade policy is also not just restricted to imports, with tariffs, subsidies and quantity controls being applied in some cases to exports as well. Some economists have attempted to capture all this information in a single measure or index, for example Winters (2001)recommends:

> "tariffs need to be aggregated, quantitative restrictions assessed and then aggregated, and the degrees of credibility, vulnerability to lobbying, and enforcement measured"

On the other hand Rodriguez and Rodrik (1999) disagree:

> "It is common to assert in this literature that simple….indicators of trade restrictions - are misleading as indicators of the stance of trade policy. Yet we know of no papers that document the existence of serious biases in these direct indicators, much less establish that an alternative indicator performs better"

Datasets that are available cover various measures of tariff rates and also the number of tariff categories that are covered by a quantitative import restriction of some kind. Tariffs are measured in ratios of tariff charged divided by value of goods, several of these measures suffer from distortions either to the numerator or the denominator of their ratios. The data sets used in this study and their

sources are shown in Figure 4, together with number of observations available, analysis of distortions/biases present in the measure and overall comments.

Measure	Observ-ations	Definition	Numer a -tor Bias	Denomi-nator Bias	Comments
Coverage of non-tariff barriers (UNCTAD TRAINS 2012)	2438	Number of product categories with a non-tariff barrier	Yes	Yes	A poor measure because product categories are arbitrary and there is also no measurement of the severity of each barrier
Weighted Average Applied Tariff (World Bank 2012)	2090	Weighted average of actual applied tariffs on manufactured goods	No	Yes	A good measure, but ignores imports which are not cleared by customs
Weighted Average Applied Tariff with EU Adjustment	2002	As above, adjusted for intra-EU trade	No	Yes	As above, corrected for the most significant bias
World Average Applied Tariff (World Bank 2012)	6290	This is a world average of Weighted Average tariff	No	Yes	As above
Weighted Average Most Favoured Nation Tariff (UNCTAD TRAINS 2012)	2736	Weighted average of MFN duty rates on all goods	Yes	Yes	A poor measure, it takes no account of the effect of any preferential trade agreements
Weighted Average Most Favoured Nation Tariff with EU adjustment	2577	As above, adjusted for intra-EU trade	Yes	Yes	As above, corrected for the most significant denominator bias
Standard Deviation of Most Favoured Nation Tariff (UNCTAD TRAINS 2012)	2736	Standard Deviation of MFN rates	Yes	Yes	A poor measure of tariff variability
Effective Tariff (UNCTAD Rozanski 2012)	2904	This is total customs collection divided by total import value	No	No	Unbiased measure of tariffs, also takes account of policy on exports
Trade Restrictiveness Index (UNCTAD TRAINS 2012)	2135	This is a calculation of the tariff rate combined with the import market elasticity of demand	No	No	This is an index created to model how much effect a tariff might actually have on the flow of trade, taking into account both the size of the tariff and conditions in the importing marketplace

Figure 4: Available Trade Policy Datasets

The data points are spread unevenly over 185 countries and some 50 years, giving a total of 9250 potential observations. The gaps in this data are startling; the largest data set, Effective Tariff, has just 2,904 observations.

Finally no data exist specifically measuring trade policy on exports. It is not therefore possible to include any measure of the trade policy on exports of partner countries, nor to include a world average export trade policy measure. This is simply astonishing.

The results of cross-correlation between trade policy measures are shown in Figure 5. There are considerable differences between the measurement of Weighted Average tariff and Effective Tariff, as suggested a large part of this difference might be the result of export processing, but a significant part of the difference is also likely to be trade policy measures applied to exports.

R squared	Effective Tariff % Imports	Weighted Average Tariff % Imports with EU correction	Weighted Average MFN Tariff % Imports with EU correction	Trade Restrictiveness Index	Non-Tariff Barrier Coverage
Effective Tariff					
Weighted Average Tariff with EU correction	0.14				
Weighted Average MFN Tariff with EU correction	0.03	0.45			
Trade Restrictiveness Index	0.02	0.08	0.14		
Non-Tariff Barrier Coverage	-0.03	-0.11	-0.01	-0.02	

Figure 5: Comparison of Trade Policy Measures

The regressions generally show low correlations between these various datasets, this is a striking finding and suggests that the biases in the various measures might be high, also supporting Pritchett's finding of little correlation between different openness measures. The most extreme difference is between the coverage of non-tariff barriers and the various tariff measures, where all the correlations are negative suggesting that non-tariff barriers and tariffs might to some extent be substitutes rather than complements. In this stage of the analysis Effective Tariff and Weighted Average Tariff will be the main variables analysed.

A series of panel regression were carried out on gravity equations of the form developed above. For this analysis the objective is to make a level comparison of trade policy to trade flow and this has been done in two ways: first level against level and second change of level against change of level

The first set of equations will follow the normal gravity model format of looking at trade values. There will be three different dependent variables: import value in real US$, export value in real US$ and total trade value in real US$. Independent variables will be remoteness, country trade policy, export destination trade policy, country GDP, world GDP, country population, world population and country capital and savings to GDP ratios. The independent variables are lagged by one year to

mitigate reverse causality problems. A time variable is included since many of the variables are stationary only with trend; in particular this is true of the trade policy measures as shown in Figure 6. Most of the variables do not have unit-roots and the two main trade variables, Log Effective Tariff and Log of Trade/GDP ratio, have no unit-roots when a trend is included. Remoteness had no unit-roots without a trend, but fails the test when a trend is included. This problem was avoided by subtracting each county's value from the value for the United States of America for the same year, thus giving a measure of the gap between individual countries and the USA. This gap measure is stationary with trend.

P statistic	Levin-Lin-Chu Unit-Root Test	Unit-Root Test with trend
Log Oil	0.00	0.00
Log Effective Tariff	0.97	0.00
Log Trade/GDP	0.78	0.00
Savings/GDP	0.00	0.00
Log Capital/GDP	0.00	0.00
Log GDP/Capita	0.00	0.00
Log Remoteness	0.00	0.17

Figure 6: Tests for Unit Roots

Country trade policy in these equations is measured by either Weighted Average Tariff or Effective Tariff. Export destination trade policy is measured by World Average Tariff. The measure used for country population is the size of the population between the ages of 15 and 64, i.e. the working age population, for world population the total population measure is used. Capital and savings ratios are included as they are expected to influence the level of trade of a country and thus their inclusion should improve the performance of the equation. As far as possible log values are used, however Remoteness Gap and Savings/GDP have both positive and negative observations so they are included at their actual values. In the case of the tariff variables, 1 is added to each observation such that the log of zero tariff is zero. The form in which the equation needs to be run was first established by testing for the inclusion of country specific effects and then testing between random and fixed effects. A Breusch and Pagan Lagrangian multiplier test for random effects rejected the null hypothesis of no country effects and a Hausman test rejected the null hypothesis of random effects, so these equations were run in fixed effects and results are shown in Figure 7.

Dependent Variable	Log of Real Imports	Log of real Exports	Log of Real Total Trade	Log of Real Imports	Log of real Exports	Log of Real Total Trade
Observations	1421	1421	1421	2685	2685	2685
Countries	151	151	151	133	133	133
R squared	0.94	0.89	0.94	0.93	0.89	0.93
	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
Remoteness Gap	0.712 -13.09	0.092 -73.08	0.405 -29.04	0.000 +119.64 ***	0.004 +96.979 **	0.000 +108.878 ***
Log of Weighted Average Tariff	0.002 -0.0534 **	0.007 -0.0567 **	0.000 -0.0652 ***			
Log of Effective Tariff				0.000 -0.1289 ***	0.000 -0.1558 ***	0.000 -0.1366 ***
Log of World Tariff	0.000 -0.9807 ***	0.000 -0.9172 ***	0.000 -0.9796 ***	0.000 +0.2035 ***	0.003 +0.2106 **	0.000 +0.2115 ***
Log of Real GDP	0.000 +0.4996 ***	0.000 +0.5098 ***	0.000 +0.5106 ***	0.000 +0.5723 ***	0.000 +0.5359 ***	0.000 +0.5569 ***
Log of World GDP	0.000 +0.5410 ***	0.015 +0.2842 *	0.000 +0.4308 ***	0.000 +0.7363 ***	0.000 +0.5961 ***	0.000 +0.6896 ***
Log of Population 15-64	0.032 +0.6360 *	0.108 +0.5797	0.006 +0.8029 **	0.000 +0.8874 ***	0.000 +1.684 ***	0.000 +1.164 ***
Log of World Population	0.000 -9.279 ***	0.000 -11.878 ***	0.000 -10.738 ***	0.000 -8.701 ***	0.000 -7.819 ***	0.000 -8.505 ***
Log of Capital/GDP	0.000 +0.2751 ***	0.094 -0.0652	0.000 +0.1111 ***	0.000 +0.3534 ***	0.000 +0.1025 ***	0.000 +0.2269 ***
Savings/GDP	0.205 +1.383	0.000 +12.905 ***	0.000 +6.919 ***	0.000 +1.935 ***	0.000 +5.393 ***	0.000 +4.232 ***

Figure 7: Results of Trade Value equations

The first three columns of Figure 7 have Weighted Average Tariff as the measure of country trade policy and the last three columns have Effective Tariff. In both cases the import, export and total trade equations are very similar and the coefficients on most of the independent variables are similar. This is exactly what would be expected under the conditions of Lerner's Theorem. In both cases the coefficients for country tariff are highly significant and negative, showing that tariffs reduce import value, export value and the value of total trade, which is again what would be expected.

Two differences between the two sets of equations are: that Remoteness Gap is not significant and carries an unexpected sign in the Weighted Average Tariff equations and is highly significant with the

expected sign in the Effective Tariff equations and that World Tariff carries a negative sign with Average Tariff and a positive sign with Effective Tariff, being strongly significant in both cases. Capital and Savings are positive and significant in most equations with Capital seeming to correlate more strongly with imports and savings with exports. The data for Average Tariff cover a total of 151 countries, which is more than the 133 countries covered by the Effective Tariff data, but there are only 1,421 observations compared with a total of 2,685 observations for Effective Tariff.

The final equation from Figure 7 was used to test the remaining possible measures of trade policy as shown in Figure 8.

Measure	Coefficient in equation with log real trade as dependent variable	z value	p value	R2	Observations
Effective Tariff	-0.1366	-12.30	0.000	0.93	2685
Weighted Average Tariff EU adjusted	-0.0652	-3.86	0.000	0.94	1421
MFN Tariff EU adjusted	-0.2004	-6.50	0.000	0.93	1877
Coverage of Non-Tariff Barriers	+0.0390	+1.76	0.079	0.92	1962
Trade Restrictiveness Index	-0.0537	-4.69	0.000	0.91	1810
Standard Deviation	-0.0217	-2.50	0.013	0.91	2002

Figure 8: Comparison of Performance of Trade Policy Measures

MFN Tariff and Trade Restrictiveness Index were both negative and significant, but with fewer observations than Effective Tariff and lower levels of significance as measured by the z statistic. Coverage of Non-tariff Barriers was found to be insignificant, when combined with the tariff measures it remained insignificant but negative alongside Effective Tariff and significantly positive alongside Weighted Average Tariff. These results suggest that Coverage of Non-tariff Barriers has little or no effect on trade flows, which is a further striking finding. One possible explanation for this might be that non-tariff barriers exist for many reasons, such as food safety, that have nothing whatsoever to do with economic trade policy and it may be that these uses out way the use of non-tariff barriers to hinder imports or even in some way facilitate imports. Another possibility is that quotas might be set at levels close to the levels of imports that would occur in the absence of the quotas, meaning that their actual effect is small. What is clear is that the Coverage of Non-tariff Barriers is not an effective way of measuring trade policy. Furthermore Non-tariff Barrier Coverage appears to interact inconsistently when placed in an equation together with tariff measures and therefore it would seem that this measure is at best useless in trade policy analysis.

Trade Restrictiveness Index seems to perform in a similar way to Average Tariff; this measure is based on tariff levels combined with elasticities and the similar result with plain tariff suggests that the addition of elasticities to the measure achieves little. The result for Standard Deviation of MFN

Tariffs suggests that consistent tariffs across all products are less restrictive of trade value than tariffs that vary across products. This is interesting with respect to the argument for using varying tariff protection to support infant industries and suggests that an infant industry protection policy is likely to be more damaging for trade than a simple flat tariff.

A second set of results is shown in Figure 9. In this case ratios to GDP are used as the dependent variable rather than absolute values. Results are generally similar, although the R squared tends to be much lower.

Dependent Variable, fixed effects	Log of Import/GDP	Log of Export/GDP	Log of Total Trade/GDP	Log of Import/GDP	Log of Export/GDP	Log of Total Trade/GDP
Observations	1420	1420	1420	2683	2683	2683
Countries	151	151	151	133	133	133
R squared	0.38	0.01	0.22	0.41	0.09	0.29
Remoteness Gap	0.160 +40.249	0.612 -20.006	0.400 +24.110	0.000 +133.73 ***	0.001 +110.44 **	0.000 +122.519 ***
Log of Weighted Average Tariff	0.006 -0.0384 **	0.028 -0.0420 *	0.000 -0.0501 ***			
Log of Effective Tariff				0.000 -0.1068 ***	0.000 -0.1325 ***	0.000 -0.1140 ***
Log of World Tariff	0.000 -0.5535 ***	0.000 -0.4886 ***	0.000 -0.5525 ***	0.000 -0.1841 ***	0.010 -0.1752 **	0.000 -0.1748 ***
Log of Real GDP	0.000 -0.3114 ***	0.000 -0.3015 ***	0.000 -0.3005 ***	0.000 -0.2618 ***	0.000 -0.2975 ***	0.000 +0.2768 ***
Log of World GDP	0.000 +0.5728 ***	0.003 +0.3153 **	0.000 +0.4632 ***	0.000 +0.4739 ***	0.000 +0.3320 ***	0.000 +0.4263 ***
Log of Population 15-64	0.080 +0.4168	0.271 +0.3612	0.015 +0.5831 *	0.001 +0.4676 **	0.000 +1.254 ***	0.000 +0.7400 ***
Log of World Population	0.728 -0.5181	0.129 -3.1076	0.186 -1.9685	0.000 -3.7607 ***	0.000 -2.8855 ***	0.000 -3.5725 ***
Log of Capital/GDP	0.000 +0.2652 ***	0.034 -0.0750 *	0.000 +0.1014 ***	0.000 +0.3117 ***	0.009 +0.0619 **	0.000 +0.1858 ***
Savings/GDP	0.042 -1.791 *	0.000 +9.726 ***	0.000 +3.741 ***	0.009 +1.275 **	0.000 +4.716 ***	0.000 +3.567 ***

Figure 9: Results of trade ratio equations

Figure 9 again shows very similar coefficients for the three different trade equations, even to the extent that the coefficients on country tariff are actually slightly higher in the export than the import

equations. The tariff coefficients are similar to the trade value equations, in this case Effective Tariff has a higher level of significance and the Effective Tariff equations also have a higher level of correlation than the Average Tariff equations.

A final set of results compares changes with changes. Once again the equation is tested for country effects and the Breusch and Pagan Lagrangian test does not reject the null hypothesis of no country effects. These equations are therefore run without any country effects and with no time lags, so it is the immediate effect of changes that is compared. The lack of country effects is useful because it enables dummy variables to be included in this equation, we can therefore test for the effect of trade blocks on change in trade and also for physical characteristics of countries. Results are in Figure 10.

Dependent Variable, No country effects	Difference in Log of Imports	Difference in Log of Exports	Difference in Log of Total trade	Difference in Log of Imports	Difference in Log of Exports	Difference in Log of Total trade
Observations	1007	1007	1007	2513	2513	2513
Countries	137	137	137	132	132	132
R squared	0.56	0.40	0.53	0.45	0.30	0.44
Difference in Log of Remoteness	0.033 +0.4332 *	0.041 +0.4518 *	0.035 +0.3948 *	0.184 -0.2371	0.496 -0.1460	0.109 -0.2490
Difference in Log of Average tariff	0.003 -0.03682 **	0.062 -0.02539	0.010 -0.02965 **			
Difference in Log of Effective Tariff				0.000 -0.0718 ***	0.000 -0.0740 ***	0.000 -0.0763 ***
Difference in Log of World Tariff	0.069 -0.1305	0.131 -0.1183	0.039 -0.1367 *	0.011 -0.1230 *	0.012 -0.1460 *	0.000 -0.1474 ***
Difference in Log of Real GDP	0.000 +0.6201 ***	0.000 +0.5054 ***	0.000 +0.5567 ***	0.000 +0.5590 ***	0.000 +0.4132 ***	0.000 +0.4932 ***
Difference in Log of World GDP	0.000 +0.4280 ***	0.000 +0.5030 ***	0.000 +0.4485 ***	0.000 +0.5256 ***	0.000 +0.6282 ***	0.000 +0.5666 ***
Difference in Log of Population 15-64	0.739 +0.3208	0.072 +1.785	0.198 +1.036	0.078 +0.9754	0.034 +1.411 *	0.004 +1.401 **
Difference in Log of World Population	0.014 +16.332 *	0.130 +10.951	0.011 +15.627 *	0.592 +1.621	0.241 -4.2735	0.961 -0.1273
Difference in Log of Capital/GDP	0.000 +0.3674 ***	0.014 -0.0673 *	0.000 +0.1692 ***	0.000 +0.3245 ***	0.000 -0.0713 ***	0.000 +0.1359 ***

Difference in Log of Savings/GDP	0.000 -0.00400 ***	0.000 +0.00737 ***	0.014 +0.00206 *	0.000 -0.00158 ***	0.000 +0.00785 ***	0.000 +0.00256 ***
Landlocked Dummy Variable	0.703 -0.00494	0.403 +0.0106	0.906 +0.00117	0.126 +0.0104	0.799 -0.00209	0.356 +0.00547
Island Dummy Variable	0.002 -0.04189 **	0.033 -0.0287 *	0.002 -0.0335 **	0.132 -0.0100	0.011 -0.02034 *	0.021 -0.0134 *
EU Dummy Variable	0.091 -0.01950	0.236 -0.0143	0.051 -0.0192	0.502 -0.00617	0.479 -0.00783	0.443 -0.00613
NAFTA Dummy Variable	0.413 -0.0222	0.250 -0.0308	0.161 -0.0295	0.683 -0.00893	0.282 -0.02827	0.359 -0.0174
Developing Country Dummy Variable	0.147 -0.0174	0.021 -0.0275 *	0.021 -0.0218 *	0.106 -0.0101	0.077 -0.01327	0.022 -0.0124 *

Figure 10: Trade equations with changes

Once again coefficients are generally similar across the three equations for imports, exports and total trade. With Average Tariff, change in tariff is not significant in the export equation whilst it is significant in the import equation. This might indicate that tariff changes have a more immediate effect on imports than exports; however there is no difference in the equations with Effective Tariff. The remoteness term in these equations is change in remoteness, so a negative sign would be expected with trade falling when a country becomes more remote as the world's economic activity becomes more distant from that country. The significant positive coefficient on the equations with Average Tariff is therefore unexpected. The dummy variables are mostly not significant, there is some indication that there is a less than average response in trade values in the case of islands and developing countries.

Taken together these equations show strong evidence that imports and exports are equally affected by a country's trade policy in line with Lerner's Theorem. Following on from that it is also therefore clear that Effective Tariff is the best available measure of trade policy, since it is the only measure that takes into account a country's policy on both imports and exports. Effective Tariff is also a much simpler measure to calculate, is not biased by imports that are not cleared through customs or membership of trading blocks and has more data points. The only downsides of the Effective Tariff measure are that it covers a smaller sample of countries than Weighted Average Tariff and some of the correlations have a lower R squared.

Several other possible measures of trade policy are shown to be inferior, especially so in the case of Coverage of Non-tariff Barriers which seems to be a very poor measure. This analysis can answer the points raised by Pritchet, Winters and Rodriguez. Pritchet's finding that many measures of openness do not correlate well with each other is simply because they measure different things which in reality do not correlate with each other. Winters advocates a complex measurement of trade policy, whilst Rodriguez favours use of simple tariff measures; this analysis suggests that the only reasonably accurate measure is Effective Tariff and therefore any process of combining Effective

Tariff with other measures is likely to worsen the accuracy. In particular Coverage of Non-Tariff Barriers is found to be unsuitable for use in analysis.

The analyses all showed that the most significant driver of trade is country GDP. The analyses also showed that Capital/GDP ratio and Savings/GDP ratio have a significant role in determining trade values. After these variables a country's own trade policy is the most significant determinant of that country's trade value, more significant that the world average trade policy or geographical factors. Simply put a restrictive trade policy restricts a country's own trade and the policies of other countries and geography have less effect.

All of these results suggest that the necessary conditions for Lerner's theorem apply to country level data: imports and exports are not autonomous from each other and trade policies, both levels and changes, have similar effects on imports, exports and total trade. Overall these analyses show very strong evidence that trade policy, regardless of where in the trade cycle it is applied, has a similar effect on imports and exports. The results do not support the concept that net exports can be increased through changes in country or trading partner trade policy. This is a significant finding because it suggests that the second stage of this analysis requires just one measure of market access for each country applying equally to imports and exports. This finding is also relevant to the real world since it shows that mercantilism does not work and further suggests that the "special and differential treatment" policies used to assist Least Developed Countries and which form the basis of the current WTO negotiating round will be much less effective than hoped for.

In summary a country's trade is chiefly affected by that country's GDP, its own trade policy as measured by Effective Tariff, the level of world GDP and by the level of World Average Tariff. The local variables: country GDP and country Effective Tariff have a greater significance in explaining variation than the equivalent world variables. Almost all countries use trade policy as an attempt to boost exports through incentives of various kinds and to restrict imports through tariffs and other measures, these results show that trade policy incentives and restrictions apply equally to imports and exports.

6.0 Smith's Hypothesis

The literature review showed that Trade theory explains static gains arising from imports and it hypothesises dynamic gains such as learning from exporting and from greater competition in the case of imports, albeit Nordas et al suggested that the only true dynamic gains from trade were the result of technology transfer. Learning from exporting and technology transfer would be likely to happen when developing countries export to developed countries, but not the other way round. Thus trade theory suggests gains from some trade transactions and not from others. In short there isn't any overarching theoretical explanation for why trade transactions should be beneficial for growth.

Ideally any theory of gains from trade should be equally applicable to all trade transactions and also with economic transactions within a country. Ricardo's idea of Comparative Advantage does exactly that, but current thinking on learning from exporting does not.

This study proposes using Adam Smith's thinking on division of labour and extent of market as a way to avoid the inconsistencies of current trade theory. Smith argued that the extent to which labour could be divided would depend on the size of market. Smith went on to point out that trade provided an extension to the national market, thus allowing further division of labour. The key benefit of using Smith's idea is that size of market depends both on the size of the national market and on the level of trade. Smith's idea is therefore universal and the benefits of trade are exactly the same as the benefits of local business, trade benefits will occur both for exports and imports and for both developed and developing partner countries; current theories of static and dynamic gains can then be seen as part of an overall mechanism.

Smith explains that specialisation only makes sense if there is a sufficient market to absorb the additional specialised output that will be produced and to provide the other outputs that are foregone through specialisation, thus specialisation is limited by the size of market. Access to markets is therefore a driver of growth in specialisation. Specialisation can also be linked to economic activity. In a market where every actor had the same consumption preferences, possessed the same resources and produced the same outputs, there would be no purpose in carrying out economic activity. It is only when individual economic actors specialise that exchange between them, and thus economic activity, makes sense. Specialisation is thus closely linked to economic activity, indeed all economic activity is a consequence of specialisation.

Modern economic growth theories place technology as the ultimate driver, together with labour force, natural resources, capital and human resources and technology either arrives from outside the economic model or is created by investment within the model (exogenous or endogenous). Growth models assume that the technology that arrives can be fully utilised subject to labour, capital, resources and human capital. Adam Smith's thinking that the possibility of specialisation will be limited by available market could be integrated into growth models by assuming that technology can only be fully utilised if a large enough market is available. This was illustrated in Section 3.0 with the example of Tasmania where a society became cut off from outside contact and was too small to support the existing level of technology, consequently losing the specialisation of making fishing tools. Thus extent of Market Access becomes a limiting factor on the utilisation of new technology and larger Market Access allows better utilisation of new technology hence allowing faster economic growth. Trade policy is then a restriction on Trade, limiting Market Access, limiting utilisation of new technology and hence also limiting economic growth. Thus trade policy can be linked to economic growth through the mechanism of Market Access and specialisation.

The third question identified from the literature review was how links between trade policy and growth might be tested empirically. Having identified Smith's theoretical mechanism of trade policy linked to Market Access and hence to income growth, the next stage of this analysis is to find a way to test it. This analysis is in two parts. The first stage is to investigate ways of measuring Market Access. The second stage is to build a simple growth model to check the hypothesised mechanism that trade barriers restrict trade which restricts Market Access and hence reduces income growth.

7.0 Empirical Test of Smith's Hypothesis

Economic Geographers measured "Market Potential" based on a gravity model and a global equilibrium equation. They measured two components of Market Potential, home and foreign:

Market Potential = Home Market Access + Foreign Market Access

The economic geographers' approach is that Market Access can be measured by the economic transactions that actually take place. Their equations used both economic transactions within countries and those between countries and compared these with measures of distance and other explanatory variables in a fixed effects equation. They found that home markets were much better accessed than foreign markets. For the purposes of this study the Market Access calculations of the economic geographers are not a solution to the specific research question since the economic geographers did not explicitly use trade policy measures in their analysis.

There may also be a bias in the transactions that actually take place compared with the total potential transactions that could have taken place. A firm may be able to access suppliers in the local area and from further afield, however it might be assumed that, other things being equal, the firm will choose to buy locally. As a consequence the economic geographers' analyses based on actual transactions are likely to understate the underlying level of Foreign Market Access compared to Home Market Access. Figure 11 suggests that the bias in the economic geographers' calculations is considerable, especially in the case of Redding and Venables where Foreign markets contribute just 0.5% to their measure of Market Potential and trade appears to be almost irrelevant.

	Home Market Access Average	Foreign market Access Average	Foreign as % of Total
Redding and Venables Market Potential	$166.9 billion	$0.8 billion	0.5%
Head and Mayer Market Potential	$11.4 billion	$0.8 billion	6.5%

Figure 11: Measures of Market Access

The most frequently used trade measure, often simply referred to as "Openness" is a ratio of trade levels to GDP. This gives a measure of how integrated a country currently is with the rest of the world. This ratio is not completely comparable across countries because countries differ in size and countries with larger economies tend to need trade less than smaller countries. The majority of countries have small economies compared with the world market and there are only a few very large countries. This suggests that one possible way to approach the measurement of Market Access might be to focus only on the foreign component. Trade/GDP ratio might therefore be useful as a proxy for Market Access, especially in the case of smaller countries.

A first step in testing the hypothesis is a simple regression of the Market Access measures and income growth. Using panel regression each of the possible measures of Market Access will be compared with income growth in a simple regression:

Income growth = a + b x Market Access

The analysis uses annual changes in income as the dependent variable and lagged independent variables to help ensure the correct direction of causality.

For the Trade/GDP ratio and the direct measures of Market Access, the coefficients would be expected to have a positive sign indicating that higher Market Access leads to higher growth. This is also the case for the Remoteness Gap measure, since a positive value of Remoteness Gap indicates that a country is less remote than the USA and therefore the coefficient should be positive. The only exception is Effective Tariff which would be expected to reduce trade and growth and thus to have a negative coefficient in an income growth equation.

Dependent Variable: Change in Log GDP/Capita	R squared	Observations	Z statistic	p statistic	Comment
Redding and Venables Market Access	0.000	6035	-2.04	0.042 *	Wrong sign, low significance and very low R squared
Head and Mayer Market Access	0.001	5569	+1.11	0.265	Correct sign, but not significant and very low R squared
Trade/GDP ratio	0.019	7075	+11.40	0.000 ***	Correct sign, very significant and reasonable R squared
Effective Tariff	0.049	2841	-5.16	0.000 ***	Correct sign, reasonable R squared
Remoteness Gap	0.003	7116	+2.62	0.009 **	Correct sign, very low R squared

Figure 12: Simple regression of market access measures against Income Growth

Figure 12 shows simple panel regressions of each of these Market Access measures against change in Log of GDP/Capita in the presence of a time trend and 1 year lag. This analysis shows that the economic geography measures are either not significant or wrongly signed and have very low R squared figures, suggesting that they are not proving to be effective at explaining income growth. Trade/GDP ratio and Effective Tariff have the expected sign, are significant, and with reasonable levels of correlation, suggesting that these variables might be linked to income growth. Remoteness Gap is significant and has the expected sign, but the level of R square is quite low. Time lags beyond one year were also investigated and for most of the Market Access measures a 1 year time lag gives the best results. A single year time lag has the effect of comparing the growth over the period with the level of the independent variable at the start of the growth period, which would seem to be the most logical comparison to make. Figure 13 shows the cross correlations between these various Market Access measures.

R squared	Redding and Venables	Head and Mayer	Trade/GDP ratio	Effective Tariff %	Remoteness
Redding and Venables					
Head and Mayer	+0.86				
Trade/GDP ratio	+0.03	+0.07			
Effective tariff %	-0.33	-0.39	-0.12		
Remoteness Gap	-0.02	-0.10	+0.00	-0.15	

Figure 13: Cross correlations of possible Market Access measures

The results of simple panel regressions show that the measure with the highest correlation to income growth is Effective Tariff followed by Trade/GDP ratio. The measures with the lowest correlations are the two Economic Geography measures followed by the Remoteness measure. In terms of cross correlations the Redding and Venables and Head and Mayer measures correlate with each other and correlate negatively with Effective Tariff. Trade/GDP ratio and Remoteness Gap have low correlations with the other measures. In terms of overall ability to explain growth Effective Tariff has a high z statistic, a reasonable level of correlation and a negative coefficient indicating that countries with higher rates of Effective Tariff grow incomes slower. The Trade/GDP ratio has a very high z statistic and a reasonable level of correlation to growth with a positive sign, indicating that countries which trade more grow incomes faster. The economic geography measures do not appear to be measuring the right thing for this analysis. This is perhaps a consequence of the way they are built up from actual transaction data which ignores the possible bias against foreign transactions identified earlier. The economic geography measures not only do not explicitly include trade policy, they also seem to generate poor and even contradictory results suggesting they may be of limited use as measures of Market Access for this analysis.

Three of the measures correlate significantly with income growth, even though there is limited correlation between these measures, which is again consistent with Pritchet's finding that different trade related variables might affect growth without being well correlated to each other. This would seem to suggest either that there is more than one mechanism linking trade and growth or that there is just one mechanism linking trade and growth: Market Access, and that the different variables are simply measuring different aspects of Market Access. Thus Trade/GDP ratio, Remoteness and Tariff could all be aspects of Market Access, which in turn drives income growth and thus consistent with the hypothesis being suggested here.

A simple regression alone is some evidence of a relationship, but this evidence can be strengthened if it can also be shown that the variables behave similarly in a multiple regression equation with other growth variables. The next section of this analysis therefore expands the simple regression to test for consistency of coefficients in the presence of other typical growth drivers. If the Market Access growth drivers are working properly then it would be expected that they would have a similar coefficient and sign when combined in an equation with other independent growth variables.

A typical growth equation would relate income growth to Initial Income Level, Natural Resources, Capital, Human Capital and Technology to which will now be added Market Access:

Income growth = function of: initial income level, natural resources, capital, technology, human capital, market access.

Figure 14 shows a summary for the measures identified for these additional variables and their sources.

Variable Name	Measure	Source	Variable Quality	Quantity of Data	Overall Assessment
Natural Resources	Oil Output (000 barrels/day)	EIA	Reasonable (since oil is the most economically significant natural resource)	5494	Good
Capital	Capital/GDP ratio	World Bank	Reasonable (measures additions to capital, not capital itself)	6941	Good
	Savings/GDP ratio	World Bank	Reasonable (measures additions to savings and is not directly related to capital)	4860	Average
	FDI/GDP	World Bank	Reasonable (measures additions to FDI, which may be a key driver of growth)	5725	Average
	Aid/GDP	World Bank	Reasonable (measures Aid inflows)	6005	Average
Technology	R&D/GDP	World Bank	Poor (R&D spend is not directly linked to additional technology)	1273	Very Poor
	Patents Filed	World Bank	Very Poor (patents filed not directly linked to additional technology)	3640	Very Poor
Human Capital	Gross Secondary Enrolment	World Bank	Very poor measure due to double counting problems of re-enrolment	5062	Very Poor
	Net Secondary Enrolment	World Bank	Reasonable (a measure of coverage of schooling)	1958	Very Poor
	School Years	CEPEII	Reasonable (a measure of total schooling), but mostly interpolated data	4300	Very Poor

Figure 14: Additional Drivers of Growth

There is no direct way of measuring Natural resources however the most significant natural resource in economic terms is oil, so oil output is a reasonable proxy for natural resource endowment and there is a reasonable amount of cross-country data.

There is no direct way of measuring the stock of capital that is gainfully used in an economy, what can be measured is either the additions to capital stock in the form of Capital/GDP or the stock of availability of finance in the form of Savings/GDP. Two other measures might also be relevant:

Foreign Direct Investment may be a significant source of additional capital and Foreign Aid may make a significant contribution to the availability of finance. There is a good quantity of data on Capital/GDP and average for the other measures

There is no direct way to measure the amount of technology that an economy uses. Growth economists have focussed on measuring new technology discovery either on the basis of expenditure on development R&D/GDP or on the basis of patent protection of new technology. Neither of these measures is good: R&D expenditure is at best weakly connected to outcomes and only 0.1% of patents result in economic activity. Furthermore Parente (2001) points out that it is only the most advanced economies that depend on new technology discovery to increase the level of technology used in their economies. Most developing countries operate far behind the frontier of technological discovery and use only a small proportion of the technology that is readily available. Parente explains that this is why developing countries can achieve growth miracles by adopting technology that is freely available, whereas developed countries cannot achieve similar miracles. The opportunity for a country to grow through adopting freely available technology is therefore inversely proportional to its current level of income. On balance then, the inclusion of income in the equation is likely to explain technology better than R&D or patents.

Human Capital is another variable which cannot be directly measured. What can be measured is education, however in reality Human Capital is a much wider concept that just schooling, so the available proxies are likely to be rather weak. Education can be measured either in terms of enrolment rates or years of schooling, both of which have data problems. Enrolment rates are widely measured at the gross level, which is the total number of children enrolled at a particular school level divided by the number of children at an appropriate age for that level. In developing countries it is frequently the case that children repeat the same school level and thus gross enrolment can be over 100% which makes no sense. Net enrolment is the rate of enrolment corrected for this problem. Unfortunately data coverage on gross enrolment is quite extensive and there is poor data coverage on net enrolment. Average number of years of schooling is perhaps a better measure, but requires a great deal of analysis to derive it and again data coverage is a problem; Barro and Lee have estimated school years for over 100 countries, but their estimate are at 5 year intervals. In summary there is no good variable for Human Capital and it has not been included in the subsequent stages of this analysis.

For this analysis the key measure will be the measure of trade policy which is Effective Tariff. As a consequence what is important in terms of data coverage is how well each of the other independent variable data sets match the available data points for Effective Tariff. The number of overlapping observations for each variable is summarised in Figure 15. In terms of number of observations the best variables are income, oil, capital, savings and FDI; aid and gross secondary enrolment are marginal and the other variables lose too many observations especially when several variables are combined in one equation. There is a dilemma between number of observations and number of variables and in this case the decision will be biased towards number of observations. Given the problems with the Gross Secondary Enrolment data, only Income, Oil, Capital, Savings, FDI and Aid will be used.

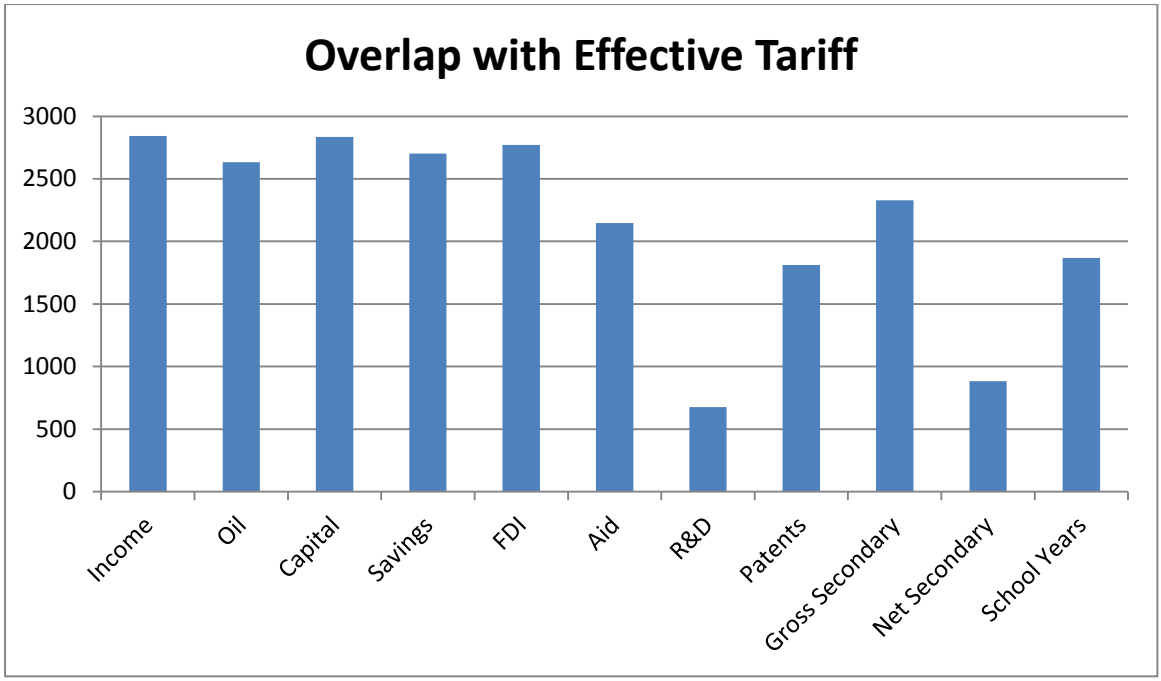

Figure 15: Overlapping observations when Effective Tariff is regressed against other variables.

Figure 16 shows cross correlations between the variables identified above. GDP/Capita correlates negatively with Aid and tariff. Savings/GDP only correlates positively with Capital/GDP. Capital/GDP correlates positively with Trade/GDP. FDI/GDP has no significant correlations. Oil output correlates with Aid. Trade/GDP ratio correlates negatively with Effective Tariff and Effective Tariff correlates negatively with Remoteness Gap. Overall there is quite a low level of cross correlation in the table suggesting that the chosen variables are reasonably independent of each other.

Cross Correlations R squared	GDP/Capita	Savings /GDP	Capital /GDP	FDI/GDP	Oil	Aid/GDP	Log Trade/GDP	Log Effective Tariff	Remoteness Gap
Log GDP/Capita									
Savings/GDP	0.11								
Log Capital/GDP	0.09	0.19							
FDI/GDP	0.02	-0.00	0.01						
Log Oil Production	0.09	0.08	0.00	-0.01					
Aid/GDP	-0.17	0.05	0.00	0.00	0.16				
Log Trade/GDP ratio	0.05	0.07	0.13	0.02	0.01	0.00			
Log Effective Tariff	-0.40	-0.03	-0.05	-0.01	-0.01	-0.04	-0.12		
Remoteness Gap	0.08	0.00	0.01	-0.01	0.01	-0.01	-0.00	0.15	

Figure 16: Cross Correlations of Growth variables

The next stage of analysis is to place each of the Market Access variables in an equation with other independent variables. First the equation is set up without a Market Access term and then the Market Access measures are tested in the equation. An equation without a Market Access measure is as follows:

Income Growth = f (Income level, Savings/GDP, FDI/GDP, Aid/GDP, LogCapital/GDP, LogOil)

A Hausman test shows that this equation should be run with fixed effects. The independent variables which appear to be most significant are: Income, Savings, FDI and Aid. Oil Output is not significant in the equation. Capital/GDP is not significant and takes a wrong sign when combined with Savings/GDP. The oil and capital terms are therefore eliminated. This equation is then run with each of the Market Access variables included in turn, the results are shown in Figure 17.

	1	2	3	5	6	7
Market Access measure included	Basic Equation	Redding and Venables	Head and Mayer	Trade/GDP Ratio	Effective Tariff	Remoteness Gap
Observations	3588	2937	2937	3569	2004	3560
R squared	0.01	0.00	0.00	0.03	0.01	0.01
Redding and Venables		0.000 -7.02 ***				
Head and Mayer			0.000 -4.22 ***			
Trade/GDP Ratio				0.000 +10.18 ***		
Effective Tariff					0.010 -2.58 **	
Remoteness Gap						0.164 +1.39
Income	0.000 -12.96 ***	0.000 -11.16 ***	0.000 -9.58 ***	0.000 -11.28 ***	0.000 -8.60 ***	0.000 -12.94 ***
Savings	0.000 +10.83 ***	0.000 +8.49 ***	0.000 +8.58 ***	0.000 +7.89 ***	0.000 +6.79 ***	0.000 +10.74 ***
FDI	0.000 +6.49 ***	0.000 +6.49 ***	0.000 +6.76 ***	0.000 +5.35 ***	0.006 +2.74 **	0.000 +6.49 ***
Aid	0.001 +3.27 **	0.001 +3.22 **	0.005 +2.82 **	0.023 +2.27 *	0.006 +2.74 **	0.001 +3.19 **

Figure 17: Growth panel fixed effects regressions

The independent variables used in the basic equation remain significant in each subsequent variation, with foreign aid being the least strongly significant variable. Both the Redding and Venables and the Head and Mayer variables are highly significant, but with the wrong sign. Yet again these variables are producing strange results. Trade/GDP ratio is highly significant and positive. Effective Tariff is significant and negative showing very good evidence that tariffs are damaging to income growth. The Remoteness Gap measure has the expected sign but is not significant.

These results show that the best performing "measure" of Market Access appears to be Trade/GDP ratio. However this may be affected by endogeneity. It is likely that countries that are successful in growing their incomes will also have firms which will both export abroad and import from abroad, it is therefore possible that causality runs both ways between income growth and Trade/GDP ratio and therefore that the coefficient in the above equation might be overstating the true influence of Trade/GDP ratio on growth.

A final step is to use a 2 stage least squares instrumented equation to compensate for possible endogeneity. This equation form gives the potential to test the complete theoretical mechanism that is being hypothesised that trade policy influences Market Access which in turn affects growth. If Trade/GDP ratio is used as the proxy measure for Market Access, then Trade/GDP ratio can be compared with Growth and Trade/GDP ratio can be instrumented by Trade Policy. From the equations linking Trade/GDP ratio with trade policy (Figure 5) Effective Tariff, Real GDP and Remoteness Gap were identified as the key country specific drivers.

The initial form of the equation before instrumenting is Column 5 in Figure 17 above, a fixed effects panel regression. The equation is then run as an instrumented equation with Effective Tariff, Real GDP and Remoteness Gap as the instruments for Trade/GDP ratio. These results are shown in Figure 18.

Equation Type	Panel Fixed Effects	Instrumented Fixed Effects
Dependent Variable	Change in Log Income	Change in Log Income
Sample	All Countries	All Countries
Observations	3569	2003
Number of Countries	144	112
R squared	0.03	0.04
Log Income	Coeff -0.082 P 0.000 Z -11.28 Sig ***	Coeff -0.063 P 0.000 Z -5.41 Sig ***
Savings/GDP ratio	Coeff +2.481 P 0.000 Z +7.89 Sig ***	Coeff +0.880 P 0.199 Z +1.29
FDI/GDP ratio	Coeff +0.291 P 0.000 Z +5.35 Sig ***	Coeff +0.112 P 0.352 Z +0.93
Aid/GDP ratio	Coeff +0.115 P 0.023 Z +2.27 Sig *	Coeff +0.183 P 0.071 Z +1.81
Log Trade/GDP Ratio	Coeff +0.091 P 0.000 Z +10.18 Sig ***	Coeff +0.246 P 0.000 Z +5.23 Sig ***
Instruments		Log Effective Tariff Log Real GDP Remoteness Gap
Hausman Test		Chi2(6) = 14.09
		Prob>chi2 = 0.029

Figure 18: 2 Stage Least Squares Instrumented Equation

The first column in Figure 18 shows the basic equation and the second column shows the instrumented equation. As can be seen the significance levels of all the coefficients drop between the two equations and only Income Level and Trade/GDP ratio remain significant in the instrumented equation. The drop in the significance of the coefficient for Trade/GDP ratio does suggest that there may be problems of endogeneity in the original equation. A Hausman test shows a clear preference for the instrumented equation over the original equation. These results suggest that the mechanism of trade policy to Market Access to growth is sound and that the use of Trade/GDP ratio as a proxy for Market Access is reasonable.

8.0 Conclusions

The objective of this work was to test whether there was a link between trade policy and growth working through the mechanism of market size, where market size allowed greater opportunities for division of labour and specialisation. Three research questions were identified from the literature review:

How can trade policy be measured?

What theoretical mechanism can link trade policy to growth?

How can this mechanism be tested empirically?

A gravity type trade equation showed that the most significant determinant of the level of a country's imports and exports once size of economy is taken into account is that country's trade policy. The equations showed that exports and imports were affected similarly by trade policy and this empirical result suggests that the conditions of Lerner's theorem that tariffs have the same effect whether applied to exports or imports in the presence of zero balance of payments are met in practice. Given this finding, the first research question, How should trade policy be measured, could be answered. Effective Tariff is the only measure of trade policy that takes into account both policy action on imports and policy action on exports in the numerator and includes the full value of trade flow in the denominator; it is therefore the only unbiased measure and the only measure consistent with Lerner's theorem.

The second research question was theoretical, how could trade policy be linked to income growth. The hypothesised mechanism is that trade increases Market Access allowing more opportunities for specialisation and hence growth and that the effect of trade policy is to restrict trade. This hypothesis provides a single unifying concept suggesting that imports and exports are equally useful for income growth and that both richer and poorer countries can benefit, whilst avoiding crediting trade with any special capability over and above normal business. This contrasts with current growth theory which identifies a variety of different mechanisms which might link trade and growth, but which have varying effects between imports and exports and between rich and poor countries.

The third research question was empirical, how can the hypothesised mechanism be validated. Starting from the basis of work done by Economic Geographers, possible measures or proxy measures of Market Access were identified. The measures of Market Access produced by the Economic Geographers were found not to perform in a useful way and this may be as a result of flaws in the methodology used to create these measures. Effective Tariff on its own correlated strongly and negatively with Income Growth, demonstrating the overall hypothesis that Trade Policy restricts growth. The best performing proxy for Market Access was Trade/GDP ratio, which was hypothesised to be a reasonable measure for countries where the domestic market was small compared to the global market and thus Market Access would primarily be influenced by trade rather than by local opportunities.

Finally a 2 stage least squares instrumented equation was used to illustrate the complete hypothesised mechanism. The equation uses Income level, Savings ratio, Foreign Direct Investment, Foreign Aid and Trade/GDP ratio. Trade/GDP ratio is instrumented by Effective Tariff, Real GDP and Remoteness Gap both to control for endogeneity and to model the hypothesised mechanism of tariffs affecting trade which in turn affects growth. Trade/GDP ratio remained highly significant in the instrumented equation and a Hausman test showed that this equation was preferable to the basic fixed effects panel regression.

Overall the empirical results support the hypothesis that trade policy restricts Market Access in turn restricting income growth. There is a clear direct correlation between Effective Tariff and Income

Growth, which is negative, and an even clearer demonstration of the proposed theoretical mechanism when a 2 stage instrumented equation is used. Trade policy can be measured and it can be shown to have a detrimental effect on growth.

This work adds to the literature in two ways:

The research shows that the conditions of Lerner's Theorem apply in practice and that Effective Tariff is the best measure of trade policy. This finding supersedes some of the literature where analysis is based on Average Tariff. This finding also invalidates the rationale of most government policy on trade as an attempt to increase net exports.

A new theoretical mechanism is suggested to explain the effects of trade on growth showing that economic growth is higher when available markets are larger and that openness to trade can enlarge available markets. This mechanism does not contradict classical trade theory, but it suggests an overall framework within which the partial explanations of classical static and dynamic gains from trade can fit. This mechanism allows trade to be included in growth equations. The new theoretical mechanism was tested empirically with positive results. A fixed effects equation showed a clear negative connection between trade policy and income growth. A 2 stage least squares instrumented equation demonstrated that the proposed theoretical mechanism of trade policy affecting scale and then growth could be modelled and shown to work better than a simple correlation of trade/GDP ratio to growth.

There is also a practical contribution from this work. Almost every country pursues an active trade policy; the results of this work suggest that these trade policies are detrimental to growth and development. Smith observed that countries should refrain from either restricting imports or promoting exports and should allow trade to occur freely with other countries.

> "There should be no interruptions of any kind made to foreign trade, that if it were possible to defray the expenses of government by any other method, all duties, customs, and excise should be abolished, and that free commerce and liberty of exchange should be allowed with all nations and for all things." (Smith 1999)

This remains as accurate an insight today as it was 240 years ago.

References:

Actionaid et al 2005 Actionaid, Eurodad, Oxfam and others, *EU Heroes and Villains*, Joint NGO briefing paper 10.00 Monday 14 February 2005

Baldwin 2002. Robert E. Baldwin and L. Alan Winters. *Challenges to Globalisation: Analysing the Economics*. University of Chicago press, ISBN 0-262-03615-4 chapter 13

Baldwin 2006. R. Baldwin and D. Taglioni. *Gravity for Dummies and Dummies for Gravity Equations*, Graduate Institute of International Studies (HEI), Geneva, August 2006.

Bannister and Thugge 2001. G. J. Bannister and K. Thugge, *International Trade and Poverty Alleviation*. IMF working paper policy development and review and African departments, IMF WP/01/54 May 2001

Barro and Lee 1993 R. Barro and J. Lee, *International Comparisons of Educational Attainment*, paper presented at conference "How do National Policies Affect Long-run Growth", World Bank, Washington DC, 1993

Barro 1996 Robert j. Barro, *Determinants of Economic Growth: A Cross-Country Empirical Study*, NBER Working Paper 5698, August 1996

Bergoeing 2003 Raphael Bergoeing and Timothy J. Kehoe, *Trade Theory and Trade Facts*, Federal Reserve Bank of Minneapolis, Research Department Staff Report 284.

Bernstein 2008 William J. Bernstein, A Splendid Exchange, Atlantic Monthly Press, New York ISBN-10 0-871113-978-0, 2008 p107, p203, p372

Bigsten et al 2004 Arne Bigsten, Paul Collier, Stefan Dercon, Marcel Fafchamps, Bernard Gauthier, Jan Willem Gunning, Abena Oduro, Remco Oostendorp, Catherine Pattillo, Mans Soderbom, Francis Teal and Albert Zeufack, *Do African Firms Learn from Exporting?* The Journal of Development Studies, Vol 40, No3, pp115-141, Feb 2004Butler 2007 Eamonn

Bird 2004 Kate Bird. *A framework to analyse linkages between trade policy, poverty reduction and sustainable development*, Overseas Development Institute, March 2004

Brun et al 2005 Jean-Francois Brun, Celine Carrere, Patrick Guillaumont and Jaime de Melo, *Has Distance Died? Evidence from a Panel Gravity Model*, The World Bank Economic Review, vol 19, No1 pp99-120 2005

Burkey 1995 Tormod V. Burkey, Extinction Rates in Archipelagoes: Implications for Populations in Fragmentes Habitats, Conservation Biology, vol 9, issue 3, 1995, pp527-541

Butler 2007 Eamonn Butler, *Adam Smith – A Primer*, Institute of Economic Affairs, 2007 ISBN 978 0 235 36608 3 p42, pp96,97

Butler 2013 Eamonn Butler, *Foundations of a Free Society*, Institute of Economic Affairs, ISBN 978-0-255-36687-8, 2013, p173

Carrere 2004 Celine Carrere, *Revisiting the effects of regional trade agreements on trade flows with proper specification of the gravity model*, European Economic Review 50 pp 223-247 2006

Cass and Haring 1998 Ronald A. Cass and John Haring, *International Trade in Telecommunications*, The AEI Press, Washington, ISBN 0-8447 40713, 1998 pp1,2,23,24

CEPII 2012 http://www.cepii.fr/cepii/en/bdd_modele/presentation.asp?id=9, accessed May 2012

Clemens and Williamson 2004 Michael Clemens and Jeffrey Williamson, Why did the Tariff-Growth Correlation Change after 1950? Journal of Economic Growth, vol 9, pp5-46, 2004

Conway 2004 Tin Conway, *Trade Liberalisation and Poverty Reduction*, Overseas Development Institute, London, February 2004

Cooper 2014 George Cooper, *Money, Blood and Revolution*, Harriman House ltd, UK, ISBN 9780857193827, p63

Cuadros et al 2004 Ana Cuadros, Vicente Orts and Maite Alguacil, *Openness and Growth: Re-Examining Foreign Direct Investment, Trade and Output Linkages in Latin America*, The Journal of Development Studies, Vol 40, No 4, pp167-192, April 2004

Dagdeviren et al 2002 Hulya Dagdeviren, Rolph van der Hoeven and John Weeks, *Redistribution Does Matter*, WIDER discussion paper No 2002/5

de Castro 1998 Steve de Castro, *Technological Implications of New Growth Theory for the South*, Cooperation South number 2 p68, Special Unit for TCDC, UNDP 1998

Deraniyagala 2001 Sonali Deraniyagala and Ben Fine, *New Trade Theory Versus Old Trade Policy: A Continuing Enigma*, Cambridge Journal of Economics, Vol 25 pp809-825 2001

Diamond 1998 J. Diamond. *Guns, Germs and Steel*. Random House 1998. ISBN 0 09 903278 0, p312.

Dinopoulos and Thompson 1998 Elias Dinopoulos and Peter Thompson, *Schumpeterian Growth Without Scale Effects*, Journal of Economic Growth 3, 313-335, December 1998

Dollar and Kraay 2001. D. Dollar and A. Kraay, *Trade, Growth and Poverty*. WIDER Conference on Economic Growth and Poverty Reduction. Helsinki, May 2001. http://www.wider.unu.edu/conference/conference-2001-1/dollar%20and%20kraay.pdf

Edwards 1998. S. Edwards. *Openness, Productivity and Growth: What Do We Really Know*, The Economic Journal 108 (March) 1998, Royal Economic Society, pp383-398.

Fajgelbaum et al 2011 Pablo Fajgelbaum, Gene M. Grossman and Elhanan Helpman, *Income Distribution, Product Quality, and International Trade*, Policy Research Working Paper 5843, The World Bank development research group trade and integration team, Oct 2011.

Fletcher 2005 Ian Fletcher, *Trading Up. A New School of Economic Thought Better Fits the Facts*, The American Conservative, October 2005

Fugazza and Nicita 2011 Fugazza and Nicita, *On The Importance of Market Access for Trade*, Policy issues in international trade and commodities study series No 50, UNCTAD, New York and Geneva 2011

Gave et al 2005 C. Gave, A. Kaletsky, L-V. Gave. *Our Brave New World*. GaveKal Research 2005 ISBN-13 978-988-98790-1-3, p9

Girma et al 2004 Sourafel Girma, David Greenaway and Richard Kneller, *Does Exporting Increase Productivity? A Microeconometric Analysis of Matched Firms*. Review of International Economics 12(5), pp 855-866 2004

Greenaway et al 1999 D. Greenaway, W. Morgan and P. Wright, Exports, Export Composition and Growth, Journal of International trade and Economic Development, Vol 8, Issue 1, 1999 pp 41-51

Greenaway et al 2002. D. Greenaway, W. Morgan and P. Wright. *Trade Liberalisation and Growth in Developing Countries*. Journal of Development Economics Volume 67, issue 1, pp229-244.

Guillaumont et al 1999 Patrick Guillaumont, Sylviane Guillaumont Jeanneney and Jean-Francois Brun, How Instability Lowers African Growth, Journal of African Economies, Vol 8, No 1, pp 87 – 107

Head and Mayer 2011 Keith Head and Thierry Mayer, *Gravity, Market Potential and Economic Development*, Journal of Economic Geography, Vol 11, Issue 2, 2010 pp281-294

Jacks 2013 David Jacks, "*From Boom to Bust: A Typology of Real Commodity Prices in the Long Run*", NBER Working Paper 18874, 2013.

Jackson 2007 Stuart Jackson, *Where Value Hides*, *knowing your strategic market position or when wanting to be number one or two can hurt you*, Ivey Business Journal online, Vol 71, Issue 1, 2007

Kling 2012 Arnold Kling, *Patterns of Sustainable Specialisation and Trade, A Smith-Ricardo Theory of Macroeconomics*, Adam Smith Institute, ISBN: 1-902737-84-9 p18

Krugman 1980 Paul Krugman, *Scale Economies, Product Differentiation, and the Pattern of Trade*, The American Economic Review, vol70, No 5, p958

Landes 1999 David Landes, *The Wealth And Poverty Of Nations*, Abacus, ISBN 0 349 11166 9 pp 143,

Lerner 1936 A.P.Lerner, *The Symmetry between Import and Export Taxes*, Economica No5, 3(II), august 1936, pp308-313

Lewis 1954. Arthur Lewis, *Development with Unlimited Supplies of Labour*, www.globelicsacademy.net/2008/2008_lectures/lewis unlimited labor supply 1954.pdf

Lin 2010 Justin Yifu Lin and Celestin Monga, *The Growth Report and New Structural Economics*, World Bank Policy Research Paper 5336, June 2010

Madsen 2001 Jakob B. Madsen, *Trade Barriers and the Collapse of World Trade During the Great Depression*, Southern Economic Journal, 4 Jan 2001

Malthus 1798 T. R. Malthus, *An Essay on the Principle of Population*, 1798

Marx 2009 Karl Marx, *Das Kapital*, Regnery Publishing inc, Washington DC, ISBN 0-89526-711-X

Mayer 2003. Jorg Mayer, *The Fallacy of Composition: a Review of the Literature*, UNCTAD discussion papers No166, UNCTAD Feb 2003

McKinnon 1996 Ronald McKinnon, *Intermediate Products and Differential Tariffs: A Generalisation of Lerner's Symmetry Theorem*, The Quarterly Journal of Economics, Vol 80, No 4, 1966 pp584-615

Miller 2015 Doug Miller, *Can the World be Wrong?*, Greenleaf Publishing 2016, ISBN 978-1-78353-421-0, p44

Nehru et al 1995 Vikram Nehru, Eric Swanson and Ashutosh Dubey, *A new database on human capital stock in developing and industrial countries; Sources, methodology and results*, Journal of Development Economics, Vol 46, Issue 2, 1995

Nordas et al 2006 Hildegunn Nordas, Sebastien Miroudot and Przemyslaw Kowalski, *Dynamic Gains from Trade*, OECD Policy Papers, ISSN 1816-6873, 2006

Nunn and Qian 2011 Nathan Nunn and Nancy Qian, *The Potato's Contribution to Population and Urbanization: Evidence from a Historical Experiment*, The Quarterly Journal of Economics June 2011 pp 1-58

O'Brien 2003 Anthony O'Brien, Lehigh University, *Smoot-Hawley Tariff*, eh.net encyclopedia, www.eh.net/encyclopedia/obrien.hawley-smoot.tariff.php

Ocampo and Taylor 1998 Jose Antonio Ocampo and Lance Taylor, *Trade Liberalisation In Developing Economies: Modest Benefits But Problems With Productivity Growth, Macro Prices, And Income Distribution*, The Economic Journal, September 1998 pp1523 - 1546, Royal Economic Society

Ohlin 1933 B. G. Ohlin. *Interregional and International Trade*. Re-printed Harvard University Press 1967 ISBN-13 978 0674460003

Olsen 1982. M. Olsen. *The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities*. Yale University 1982. ISBN 0300023073, p137.

Oxfam 2002 Oxfam, *Rigged Rules and Double Standards*, Oxfam International 2002

Page (2004) Sheila Page, *Conclusions, Department for International Development UK study contract CNTR 03 4777*, 2004

Paine 2013 Lincoln Paine, *The Sea and Civilization*, Atlantic Books, ISBN 978-1-78239-355-9, 2013 p115

Parente and Prescott 1999 Stephen L. Parente and Edward C. Prescott, *Barriers to Riches*, Third Walras-Pareto Lecture, University of Lausanne October 1999 p114

Parente 2001 Stephen L. Parente, *The Failure of Endogenous Growth*, University of Illinois at Urbana-Champaign

Peretto 2003 Pietro F. Peretto, *Fiscal Policy and Long-run Growth in R&D-based Models with Endogenous Market Structure*, Journal of Economic Growth 8, 325-347, 2003

Prebisch 1950 Raoul Prebisch, *The Economic Development of Latin America and its Principle Problems,* United Nations, New York, 1950, reprinted in The Economic Bulletin for Latin America 1962, 7, pp1-22

Preston 1962 F. W. Preston, *The Canonical Distribution of Commonness and Rarity: Part 1*, Ecology, Vol 43, No2, 1962

Pritchett 1996. L. Pritchett. *Measuring Outward Orientation in LDCs: Can it be Done?* Journal of Development Economics vol 49 1996 pp307-335.

Pritchett 1996. L. Pritchett, *Where has all the Education Gone?* World Bank, policy research working paper 1581, March 1996

Ranis 2004. Gustav Ranis, *Arthur Lewis' Contribution to Development Thinking and Policy*, Economic Growth Centre Yale University,Center discussion paper 891, June 2004 www.econ.yale.edu/growth_pdf/cdp891.pdf

Redding 1999 Stephen Redding, *Dynamic comparative advantage and the welfare effects of trade*, Oxford economic Papers, Vol51, issue 1, 1999

Redding and Venables 2004 Stephen Redding and Anthony Venables, *Economic Geography and International Inequality*, Journal of International Economics, Vol 62, Issue 1, 2004

Ricardo 1817. David Ricardo, *The Principles of Political Economy and Taxation*, chapter 7, 7.16 Library of Economics and liberty, http://www.econlib.org/library/Ricardo/ricP2a.html#Ch.7,%20On%20Foreign%20Trade

Rodriguez and Rodrik 1999. F. Rodriguez and D. Rodrik. *Trade Policy and Economic Growth: a Skeptic's Guide to the Evidence*, Centre for Economic Policy Research, discussion paper 2143, May 1999

Sachs and Warner 1995. J. D. Sachs and A. Warner. *Economic Reform and the Process of Global Integration*, Brookings Papers on Economic Activity. 1, 1995, pp1-118.

Sala-i-Martin 1997 Xavier Sala-i-Martin, *I just ran 2 million regressions*, The American Economic Review, Vol 87, Issue 2, 1997

Sally 2008 Razeen Sally, *Trade Policy, New Century, The WTO, FTAs and Asia Rising*, ISBN 978 0255 36544 4, the IEA, 2008 pp 15, 28

Sapsford et al 1992 D. Sapsford, P. Sarker and H. W. Singer, *The Prebisch-Singer Terms of Trade Controversy Revisited*, Journal of International Development, Vol4, No 3, pp315-332, 1992

Schor 2004 Adriana Schor, *Heterogeneous Productivity Response to Tariff Reduction: Evidence from Brazilian Manufacturing Firms*, NBER Working Paper 10544, June 2004

Schularick and Solomou 2011 Moritz Schularick and Solomos Solomou, *Tariffs and economic growth in the first era of globalisation*, Journal of Economic Growth, 2011

Schumpeter 1934 J. A. Schumpeter, *The Theory of Economic development: an Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*, 1934

Singer 1950 Hans W. Singer, *The Distribution of Gains between Investing and Borrowing Countries*, The American Economic Review, vol 40, No 2, May 1950

Singh 2010 Tarlok Singh, *Does International Trade Cause Economic Growth? A Survey*, The World Economy, Vol33, Issue 11, 2010

Singleton 2007 Alex Singleton, *Free Trade's Role in International Development*, speech given in Southwark Cathedral 4 June 2007

Smith 1999 Adam Smith. *The Wealth of Nations*, edited by Andrew Skinner, Penguin books, 1999, ISBN-10 0-140-43208-6 p114 and ISBN-13 978-0-140-43615-0

UNCTAD 2012. UNCTAD, *TRAINS database*, UNCTAD and World Bank, http://r0.unctad.org/ditc/tab/index.shtm Accessed May 2012

UNCTAD 2012 *tbl_IMF_GDP_IFS_imports*, spreadsheet received by e-mail from Jerzy T Rozanski, UNCTAD, 11th September 2012

UN DESA 2015 UN, Development Policy and Analysis Division, Definition of Least Developed Countries, 2015
http://www.un.org/en/development/desa/policy/cdp/ldc/ldc_criteria.shtml

Wacziarg 2001, R. Wacziarg. *Measuring the Dynamic Gains from Trade*, The World Bank Economic Review, vol 15, No 3, pp. 393-429.

Winters 2001 L. Alan Winters, *Trade Policies For Poverty Alleviation*, Programme for the Study of International Organisations, PSIO Occasional Paper, WTO series No10, October 2001

Winters 2004 L. Alan Winters, *Trade Liberalisation and Economic Performance, an Overview*, The Economic Journal, vol 114, issue 493, 2004

World Bank 1987. World Bank. *World Bank Development Report 1987*, Oxford University Press, ISBN 0-19-520562-6, p83.

World Bank 2002. World Bank. *World Bank Development Report 2002*, The World Bank, Washington, D. C.

World Bank 2012 World Bank. *World Development Indicators*, World Bank. http://go.worldbank.org/s15ssgavzo accessed July 2012

World Bank 2015 World Bank Data, Cereal Yield per Hectare, http://data.worldbank.org/indicator/AG.YLD.CREL.KG accessed August 2015

World Economic Forum 2012 Xavier Sala-i-Martin, *Global Competitiveness Report 2011-2012*, www.weforum.org/issues/global-competitiveness, ISBN-13-978-92-95044-74-6

Zavala and Burkey 1997 M. A. Zavala and T. V. Burkey, *Application of ecological models to landscape planning, the case of the Mediterranean basin*, Landscape and Urban Planning, Vol 38, issue 3, 1997