An Empirical Investigation of the Effect of Trade Policy

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1.0   Abstract

Trade and trade policy are largely misunderstood; exports are widely seen as favouring economic growth whilst imports are seen as restricting growth. There is considerable evidence suggesting linkages between open trade policy and economic growth; however there is little understanding of how trade policy should be measured, how trade policy works, or of the mechanisms which might link trade policy and growth. This paper uses cross-country panel regressions and a recently available trade policy data set to investigate how trade policy affects trade value and income growth. An analysis of trade policy and trade value showed that the conditions of Lerner's Theorem (1936) apply, resulting in any trade policy having a similar effect on imports and exports. This finding can be explained using Smith's ideas of specialisation and extensions to the market (Smith 1776). Trade is thus a facilitating mechanism for specialisation with exports assisting specialisation towards a country's relatively productive sectors and imports assisting specialisation away from relatively unproductive sectors. An analysis of trade policy and growth used a 2 stage least squares instrumented equation to avoid endogeneity problems and to model the relationship between trade policy restricting trade (and thus specialisation) and so restricting income growth.

2.0   Introduction

There is a widespread and fundamental belief that exports are more useful to an economy than imports. This misunderstanding leads countries to attempt to promote exports and reduce imports using Trade Policy. Section 3.0 is a review of key trade literature, Section 4.0 discusses the literature. Section 5.0 describes the results of empirical analysis comparing value of imports and exports with Tariff levels and shows that Trade Policy is ineffective because any barrier to trade affects imports and exports equally. Section 6.0 demonstrates a negative link between trade policy and income growth and so shows that an active Trade Policy is damaging for development. Section 7.0 concludes.

This study is based on publicly available data, in particular trade policy data from the Long Time Series TRAINS project carried out by the United Nations Conference on Trade and Development (UNCTAD) with funding from the UK's Department for International Development (DfiD).

There are two areas of contribution. First, finding that the conditions of Lerner's Theorem (1936) apply to a typical country's trade makes a contribution by demonstrating that trade policy is ineffective and also makes a methodological contribution by showing that Effective Tariff is the best measure of trade policy. Second, there is a theoretical contribution in proposing specialisation as a mechanism which explains how trade contributes to growth together with a methodological contribution in demonstrating this through a 2 stage least squares instrumented equation.

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 1776). Smith concluded that the wealth of a country was not the amount of gold it held in its treasury, as had previously been thought, 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 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. 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 are most likely to 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)

At a national level economies are widely understood through the "circular flow" model (Figure 2) and thus "Exports represent a potential injection into the circular flow of income…imports represent a leakage" (Begg and Ward 2013). This suggests that exports are "good" for an economy and imports "bad". It is almost universally accepted that exports help an economy to grow and that imports

impede growth, as a consequence almost all countries have a Trade Policy involving attempts to encourage exports and restrain imports.
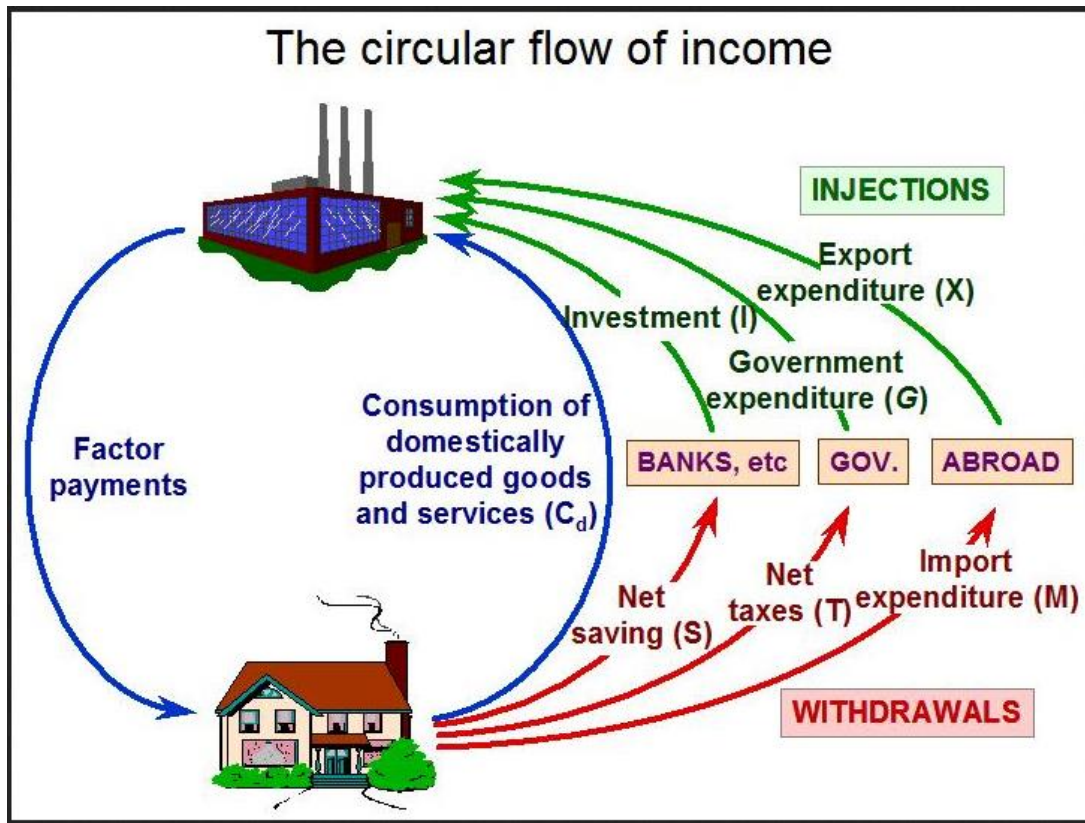

Figure 2: The Circular Flow of Income

A survey by Singh (2010) considers 61 macroeconomic trade and growth studies. Analysis of the studies referenced by Singh (Figure 3) 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. 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 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 3: Summary of Macroeconomic Trade and Growth Studies in Singh 2010

Two things stand out from Figure 3: 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.

The first observation also applies to Singh's survey of Microeconomic trade studies (Singh 2010). Singh examined 44 firm and industry level studies to survey the microeconomic evidence for trade benefits and these are shown in Figure 4. 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.

		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 4: 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 measurement or effect of trade policy.

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. The literature does not answer how trade policy should be measured, how it affects trade value, nor how it might link to growth.

Trade is largely seen in the context of the circular flow of income model. If exports are "injections" into the circular flow and imports "leakages", it seems clear that trade policy which promotes exports and impedes imports should help growth. This results in almost all countries pursuing an active trade policy. Unfortunately flow of income is not the appropriate model for understanding how trade works. Trade, as suggested by Smith (1776), is about specialisation and specialisation has two aspects: specialising towards one thing and specialising away from other things. Exports help a country to specialise towards what it does relatively well and imports help a country to specialise away from what it does less well. Seen from the perspective of specialisation you can't have one without the other and it would make no sense to try to promote one over the other. Thus attempting to have more exports than imports is conceptually absurd.

5.0   Empirical Analysis of Trade Policy and Trade Value

The concept behind Trade Policy is that encouragement for exports and barriers to imports can lead to a higher level of exports than imports. If Trade Policy were effective then countries with high levels of trade barriers would have higher levels of exports than imports. Lerner (1936) however suggested that trade policy would have no differential impact between exports and imports if there is a zero balance of payments.

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, giving a single pairing for each country and year. This enabled country annual average trade policy measures to be compared to imports, exports and total trade.

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

In a normal gravity specification the independent variables include the distance between the two countries. In this case with each country paired with the world market, 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". Tests for unit roots were conducted as shown in Figure 5 and a time trend was added to the equations to avoid unit root problems. A Remoteness Gap measure was also used to avoid unit root problems. This was constructed from the remoteness value for the USA minus country remoteness, thus any country less remote than the USA would have a positive Remoteness Gap. Other typical gravity variables were included subject to availability of data.

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 5: Tests for Unit Roots

The form in which the equation needs to be run was 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 form.

Results are shown in Figure 6. The first three columns of Figure 6 have Weighted Average Tariff (World Bank 2012) as the measure of country trade policy and the last three columns have Effective Tariff (UNCTAD 2012). In both cases the import, export and total trade equations are very similar and the coefficients on most of the independent variables are similar, showing that the conditions for Lerner's theorem generally apply.

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	P 0.712 Coe-13.09 sig	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 6: Results of Trade Value equations (in each box: p statistic, coefficient and significance where * = 5%, ** = 1% and *** = <0.1%)

A second set of results is shown in Figure 7. 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, and once again the conditions of Lerner's Theorem are shown to be met.

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 7: Results of trade ratio equations (in each box: p statistic, coefficient and significance where * = 5%, ** = 1% and *** = <0.1%)

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 and is not biased by imports that are not cleared through customs or by membership of trading blocks.

The results do not support the concept that exports can be prioritised over imports through changes in country or trading partner trade policy. This finding implies that trade needs to be understood as a single process of balanced exporting and importing and not as two distinct activities that can be differentially affected by trade policy. Trade policy cannot prioritise exports over imports, it simply doesn't work.

6.0   Empirical Analysis of trade Policy and Growth

The literature review showed that even economists expect exports to be the key driver of growth rather than imports, as illustrated by the preponderance of empirical studies of exports over those of imports. This paper suggests that economists need to widen their understanding of growth if the role of trade in growth is to be understood. The growth literature focuses on technology either exogenous or endogenous and this is reflected in Nordas's categorisations of Dynamic Gains from trade. Identifying technology as the sole ultimate driver of growth is the root of the problem; both specialisation and technology are growth drivers.

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 8: 2 Stage Least Squares Instrumented Equation (Sig * = 5%, ** = 1% and *** = <0.1%)

A specialisation focus suggests that exports and imports will be equally relevant to driving growth. Under this scenario trade policy reduces a country's trade, which reduces a country's opportunities for specialisation and hence will reduce a country's growth. Trade and growth tend to vary together and there are likely therefore to be considerable endogeneity problems with empirical analysis. Endogeneity was controlled for by the use of a 2 stage instrumented equation. Income growth was regressed against the ratio of Trade to GDP, which was instrumented by Effective Tariff, GDP and Remoteness Gap. Other likely growth drivers were included and a Hausman test was used to validate the instrumented equation (Figure 8, column 2) over a simple panel fixed effects equation (Figure 8, column 1).

The results of this analysis show a significant positive correlation between Trade/GDP ratio and income growth. The causality is therefore that Effective Tariff reduces the Trade/GDP ratio which in turn reduces the income growth rate. Trade Policy is thus shown to be counter-productive.

9.0   Conclusions

The objective of this work was to investigate the effect of Trade Policy on Trade Value and Income Growth.

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 is consistent with Lerner's theorem that tariffs have the same effect whether applied to exports or imports in the presence of zero balance of payments. Given this finding Effective Tariff, which is the only measure of trade policy that takes into account policy action on imports and policy action on exports in the numerator and includes the full value of trade flow in the denominator, is therefore the best measure of Trade Policy.

A 2 stage least squares instrumented equation was used to model the effect of Trade Policy on Income Growth. Trade/GDP ratio was 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.

This work adds to the literature in two ways:

The research shows that the conditions of Lerner's Theorem apply in practice meaning that trade policy measures are ineffective because they have a similar effect on both imports and exports. As a consequence the best way to measure a country's trade policy is Effective Tariff, meaning total customs income divided by total imports (this finding supersedes some of the literature where analysis is based on Average Tariff).

Second, there is a theoretical contribution in proposing specialisation as a mechanism which explains how both imports and exports contribute to growth, together with a methodological contribution in demonstrating this through a 2 stage least squares instrumented equation.

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 not just useless, but actively 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 1776)

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

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