Trade Policy and Trade Flows

An Empirical Investigation of the Measurement and Effect of Trade Policy

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Abstract

Trade Policy is normally used to discourage imports, encourage exports and to raise taxes. Trade Policy typically includes a mixture of taxes, subsidies and regulations. A literature review showed that there was little empirical research on the effect of Trade Policy and no agreed understanding on how Trade Policy might be measured. This paper reviews available measures and tests their effect on trade value using a modified gravity equation. The first finding is that Trade Policy has an equal effect on imports and exports, as theorised by Lerner (1936). The second finding is that Effective Tariff is the best way to measure Trade Policy. A third finding is that non-tariff barriers have no significant effect on trade value. These results suggest that Trade Policy cannot differentially affect imports and exports and is therefore economically useless except for raising taxes.

1.0 Introduction

Most countries have an active Trade Policy. A typical Trade Policy generates tax revenue to the local government through tariffs charged on imports, provides encouragement to exports either through direct subsidies or government assistance, and has some non-tariff based regulations. The typical Trade Policy therefore aims to raise revenue for the government and differentially encourage exports over imports.

The Literature review in section 2.0 shows that mercantilists saw trade as a means of accumulating currency, whilst Smith (1776) argued that trade was an extension to the market and should be allowed unhindered. Lerner (1936) showed that in the presence of zero balance of payments, Trade policy would have the same effect whether applied to imports or exports. Grossman (2016) showed that a country might be able to increase its overall welfare through a tariff which created a negative externality for its trading partners, thus explaining the need for trade negotiations. Measuring Trade Policy has proved to be difficult because of the variety of types of policy in use.

Section 3.0 compares various measures of Trade Policy. Section 4.0 uses an adapted gravity equation in a cross-country panel to investigate the effect of trade Policies on trade flows. Section 5.0 concludes that trade policy is unable to differentially affect imports and exports and that its only economic function is therefore tax collection.

This study adds to the literature in three ways:

- The results confirm the prediction of Lerner's Theory that Trade Policy has no differential impact between imports and exports
- Effective Tariff is shown to be the best way to measure Trade Policy
- Non-tariff barriers are shown to have no significant effect on trade value.

2.0 Literature Review

Early thinkers, the Mercantilists, believed that the measure of a country's wealth was the weight of gold the country held in its treasury. Mercantilists therefore recommended that countries should seek to have a trade surplus with others in order to accumulate gold. This became the established approach in the Middle Ages and countries provided all sorts of inducements to export and restraints and taxes on imports.

Smith (1776) argued that trade was an extension to the market and that it would be better to allow unhindered trade to enable mutually beneficial specialisation between countries. Together with Ricardo's Comparative Advantage this became the basis of Classical Economics which assumed a world of perfect competition where any restriction on trade would lead to lower local country welfare. Further to Classical Economics, Lerner (1936) showed that when there is a zero balance of payments, the effect of a trade barrier is the same whether it is applied to imports or exports. Under perfect competition the other countries in the world can simple switch their trade elsewhere if faced by a tariff in one country. Thus the cost of a country's tariff under perfect competition must be paid from local income and any tariff would then have the same effect on both import and export values.

More recent work on models with imperfect competition by Krugman, Venables and Grossman reflect different underlying assumptions on the way trade works. The imperfect competition models often feature just two or three countries and, as a consequence, restrict trade diversion and thus permit trade policy to impose an externality on trading partners. The cost of a tariff is then paid for out of a reduction in both local and foreign income, making it welfare improving for the country that imposes the tariff since only part of the cost is borne locally. The likelihood is that reality falls somewhere between the Classical and imperfect competition models and Bloch and Zissimos (2008) show that the optimum tariff identified by Grossman (2016) reduces towards zero as the number of countries in the model increases.

The majority of developing countries are small compared with the rest of the world suggesting that developing countries might operate in a situation closer to the Classical model of perfect competition. A possible conclusion from Grossman's work is that there is an economic logic for larger economies like the USA and EU to impose tariffs and negotiate mutual trade agreements, but developing countries would be better off without any Trade Policy.

Pritchett (1996) analysed 72 developing countries and showed that six different measures for openness used in various studies were poorly correlated to each other.

> "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).

The six measures used included two incidence measures: average tariff and frequency of non-tariff barriers. There were three trade output measures: a structural adjusted trade intensity, which is the residual from a regression of trade to GDP ratio with per capita GDP, size and some other variables, Leamer's Openness Index, which is similarly constructed based on residuals from a regression of trade to GDP ratio against factor endowments and Leamer's trade distortion index which is based on analysis of the differences between actual trade and the trade predicted from his factor endowment model. The final measure used related to prices: a measure of price distortion using a purchasing power parity exchange rate from price survey data compared with the official exchange rate and adjusted for GDP per capita.

> "The results suggest disappointingly low correlations between the various measures. The only "right" signed and significant relationships are between Leamer's openness measure and the average level of tariffs and between the level of tariffs and non-tariff barriers. For the rest of the variables, the relationships are weak, often perversely signed and statistically insignificant" (Pritchett, 1996).

In contrast, Edwards (1998) analysed a number of trade related variables: the Sachs Warner variable, the World bank's openness classification, Leamer's 1988 index of openness, the average black market currency premium, the average import tariff from UNCTAD, the average non-tariff barrier coverage from UNCTAD, the Heritage Foundation index of trade distortion, the ratio of import and export taxes to total trade and an index by Wolf in 1993 of import distortions. Edwards showed that 6 out of these 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 lack of correlation between openness measures might not be a relevant problem after all and that each measure might be picking up a different aspect of openness.

Analysis of trade flows between countries has largely been carried out using the Gravity Model. When applied to a cohesive group of countries like the EU, a gravity model can give a good prediction of how trade will flow. Gravity models typically give high levels of correlation and show that trade volume is a function of log GDP country a + log GDP country b - log distance. The coefficients in the equation are generally close to 1 for the GDP terms and close to -1 for the distance term, so trade increases approximately linearly with log of GDP and declines approximately linearly with log of distance.

Despite its widespread use, the gravity model has some limiting issues:

- When used at a regional level it is necessary to put in a term to represent the rest of the world and Baldwin (2006) shows that errors in specifying this term can bias the results of the model considerably
- In general the way the model is specified can considerably influence the outputs of the model; Brun et al (2005) and Carrere (2004) showed that different independent variables and running a model on panel data rather than cross-country data made significant differences to the coefficients of key variables.
- The model runs into difficulties when extended beyond a region because not all countries actually trade with each other and there are therefore an increasing number of zero observations in the actual data when the model is extended. There are statistical techniques for coping with this, but this isn't ideal.
- There is very little available data on trade policy measures at the detailed level between pairs of countries, so it is often not possible to directly include measures of trade policy in gravity equations. Trade policy is sometimes represented by dummy variables, for example to distinguish countries inside and outside a trade agreement. In panel models the effect of trade policy usually ends up being accounted for by a fixed effects term, which also includes other unspecified country pair specific factors.

Fundamentally the gravity model has given answers to how geography and broader political and social factors affect trade, but it has not given much information on how Trade Policy itself affects trade.

Miller (2016) showed that members of the public are overwhelmingly in favour of protection of industries, across 16 countries an average of 72% of respondents polled agreed with the statement "it is important to protect industries and jobs by using tariffs and other barriers against competing products from other countries". Countries continue to negotiate "trade concessions" in an entirely mercantilist way, albeit Page (2004) points out that for the current development round at the WTO "We need to consider the more fundamental question of whether it is possible to combine a basically mercantilist process…. With a development objective." The debate on the utility of Trade Policy persists.

The literature shows confusion on how trade policy might be measured and, perhaps as a result, there is no clear understanding of the practical effects of trade policy on an economy.

3.0 Measuring Trade Policy

Countries 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"

The basis of this empirical investigation is a cross-country panel of trade and other variables. The availability of Trade Policy variables was greatly improved by the work of UNCTAD and the publication of their Long Time Series TRAINS (LTS TRAINS) database. The main trade variables in this study came from the LTS TRAINS database (UNCTAD, 2012) and additional information received from UNCTAD (UNCTAD Rozanski, 2012). The LTS TRAINS data has many gaps and, given that these gaps significantly outnumbered the actual data, it was considered preferable to use the data as is rather than fill the gaps. Stata 11 was chosen as the software for the analysis of this study in part because of its ability to operate with data gaps. Additional variables came from the World Bank (World Bank, 2012) and the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII, 2012). A series of dummy variables were created using a variety of sources including the websites of the UN, the EU, the US State Department and the CIA.

All nations for which any data was available were included in the database and the result is a database from 1960 to 2011 consisting of 185 countries and 52 years, but containing many gaps. 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 1, together with number of observations available, analysis of distortions/biases present in the measure and overall comments. In simple numerical terms the lack of data on trade policy is startling, out of 9620 potential data points for 185

countries over 52 years, the largest data set, Effective Tariff, has just 2904 observations or 30% coverage

Measure	Observ-ations	Definition	Numera-tor Bias	Denomi-nator Bias	Comments
Coverage of non-tariff barriers (UNCTAD, 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, 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, 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, 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 1: Available Trade Policy Datasets

Note: In recent years UNCTAD carried out a research project on historical tariff information, Long Time Series TRAINS, with support from the UK's Department for International Development. The LTS-TRAINS project is no longer active.

The coverage of non-tariff barriers is likely to be a poor measure because it only records where a restriction exists and not the extent of the restriction. Measures of tariff levels have the advantage that both the number of restrictions and their size can be captured by a single average of tariff divided by imports. Most of these tariff measures have biases however. The measures based on Most Favoured Nation Tariff (MFN) have a bias in the numerator since tariffs which are actually applied are frequently lower than the MFN rate due to trade agreements. Weighted Average Applied Tariff removes this bias, but still maintains a bias in the denominator since it does not take into account any imports which are not cleared through customs. This denominator bias is particularly extreme for EU countries where the majority of imports come from other EU countries and are not passed through customs. For other countries this is also a problem because of the increasing use of export processing systems where a country's imports are processed into exports without clearing customs. An example of this problem is China where roughly half of imports are now processed directly for export and thus a Weighted Average Tariff figure for China is much higher than China's Effective Tariff as shown in Figure 2. Effective Tariff differs from the other measures in that it includes trade policy both for imports and exports and it takes into account all imports.

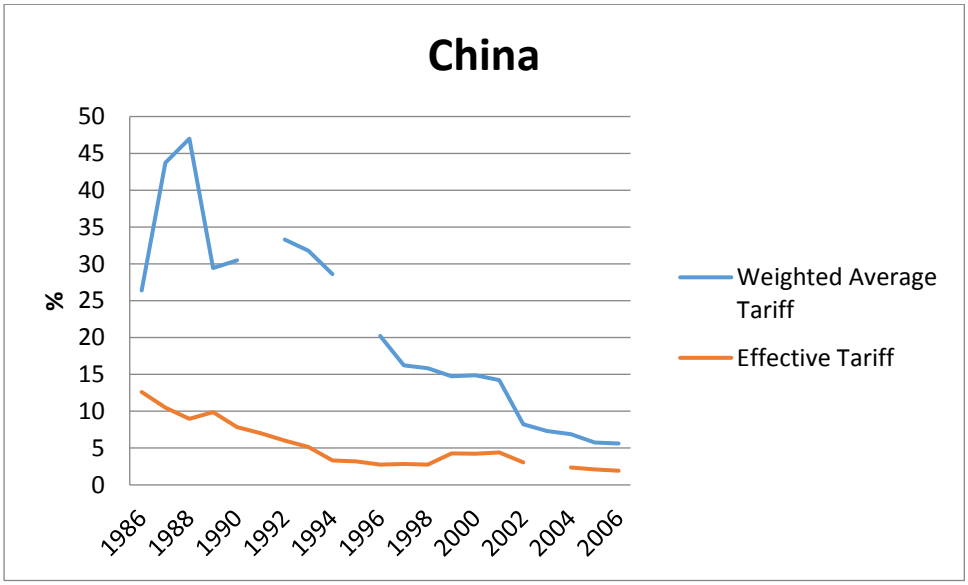

Figure 2: Effective and Average Tariff for China

UNCTAD's Trade Restrictiveness Index uses price elasticities in the importing country together with the actual level of tariff, the idea being that a given tariff on a product category with a low price elasticity will have a lower restrictive effect on an economy than the same level of tariff on a product category with a higher elasticity.

Finally no data exist specifically measuring Trade Policy on exports, this is simply astonishing. There is evidence that some countries restrict export or levy a duty on export of particular items, for example oil in many oil producing countries, and some countries subsidise exports, for example food products exported from the EU. The gene pool of trade data is narrow as well as shallow.

Cross correlations between these trade policy datasets are shown in Figure 3.

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 3: Comparison of Trade Policy Measures

The regressions show very low correlations between these various datasets, apart from the weighted average calculations, which do correlate with each other – albeit not to a great extent. This is a striking finding and suggests that the biases in the various measures might indeed be high, also supporting Pritchett's finding (Pritchett, 1996) 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 (this result is likely also to be influenced by opposing trends, downwards in tariffs and upwards in non-tariff barriers). Given the relative simplicity of the calculation method of Effective Tariff and its inclusion of export trade policy this would seem a priori to be the most accurate and unbiased measure of trade policy and it also happens to have the most observations. The Trade Restrictiveness Index has low correlation with any of the tariff measures, perhaps suggesting that the inclusion of price elasticity may be dominating the measure.

Three trade policy measures are prioritised: Effective Tariff, Weighted Average Tariff with EU correction and World Average Tariff.

4.0 Adapted Gravity Model

A test of the effect of trade policy was done using an adaptation of the standard gravity model. 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.

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

The country data sets used in this study consist of single annual figures for each country and so cannot be used in a standard gravity equation operating with country pairs. A way to overcome this difficulty is by simplifying down the gravity equation so that instead of pairing each country up with each of the other countries in the sample, each country is paired up with the world as a single pairing for each country and year.

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

The number of observations for each year is therefore the same as the number of countries in the sample. 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, 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".

To test the effect of Trade Policy each equation is repeated three times with imports, exports and total trade as the dependent variable. The equations are of the form:

Country Trade = function of: Distance, country trade policy, country GDP, world trade policy, world GDP, dummy variables.

Gravity equations usually consider population, so this is also included. This equation was then run as a panel regression and Figure 4 summarises the changes from the standard gravity model.

	Normal Gravity Model	Revised gravity model
GDP 1	Country 1	Country 1
GDP 2	Country 2	World
Distance	Distance Country 1 to country 2	Distance to Country 1 from all other countries weighted by their GDP
Trade policy	A component of fixed effects term	Country 1 trade policy, World trade policy
Other Variables	Common borders, common languages etc	Island, landlocked, trade agreement membership etc

Figure 4: Comparison of Gravity Models

The first equations have 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, world 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.

There is a problem with the data sets used in that there are significant gaps and whilst regressions can be carried out despite the data gaps, statistical testing cannot be done. A reduced panel of 73 countries over 26 years was made up to a completely balanced panel by filling in of gaps by interpolation and extrapolation. This balanced panel was used to carry out panel unit root tests on each of the variables. Most of the variables do not have unit-roots, however Log Effective Tariff does unless with a trend and for this reason a time variable is included in the analyses. Remoteness has the opposite problem of 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 measure is positive if a country is less remote than the USA and is thus expected to take a positive coefficient in any equations, the measure for the USA is of course zero in every year.

Country trade policy in these equations is measured by either Weighted Average Tariff or Effective Tariff. The measure used for country population is the percentage of the population between the ages of 15 and 64, i.e. the working age population percentage, 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 two tariff variables, 1 is added to each observation such that the log of zero tariff is then also 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. The Breusch and Pagan Lagrangian test suggested a need for individual country effects and a Hausman test confirmed that fixed country effects is the more valid form for the equation. The results are shown in Figure 5.

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 -1.3088	0.092 -7.3081	0.405 -2.9036	0.000 +11.9640 ***	0.004 +9.6983 **	0.000 +10.8881 ***
Log of Weighted Average Tariff	0.002 -0.5343 **	0.007 -0.5670 **	0.000 -0.6519 ***			
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 -0.9171 ***	0.000 -0.9795 ***	0.000 +0.2035 ***	0.003 +0.2107 **	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 +0.4309 ***	0.000 +0.7363 ***	0.000 +0.5962 ***	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 +1.6843 ***	0.000 +1.1643 ***
Log of World Population	0.000 -0.9279 ***	0.000 -1.1877 ***	0.000 -1.0737 ***	0.000 -0.8701 ***	0.000 -0.7820 ***	0.000 -0.8505 ***
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 +1.3830	0.000 +12.905 ***	0.000 +6.9186 ***	0.000 +1.9351 ***	0.000 +5.3925 ***	0.000 +4.2324 ***

Figure 5: Results of Trade Value equations. In each square the reported results are the p value, then the coefficient and then significance where * = 5%, ** = 1% and *** = 0.1%.

The first three columns of Figure 5 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. Figure 6 shows the 95% confidence intervals of the coefficients of Weighted Average Tariff in columns 1-3 of Figure 5 and illustrates that the coefficients of the three equations are all within the confidence intervals of the other equations.

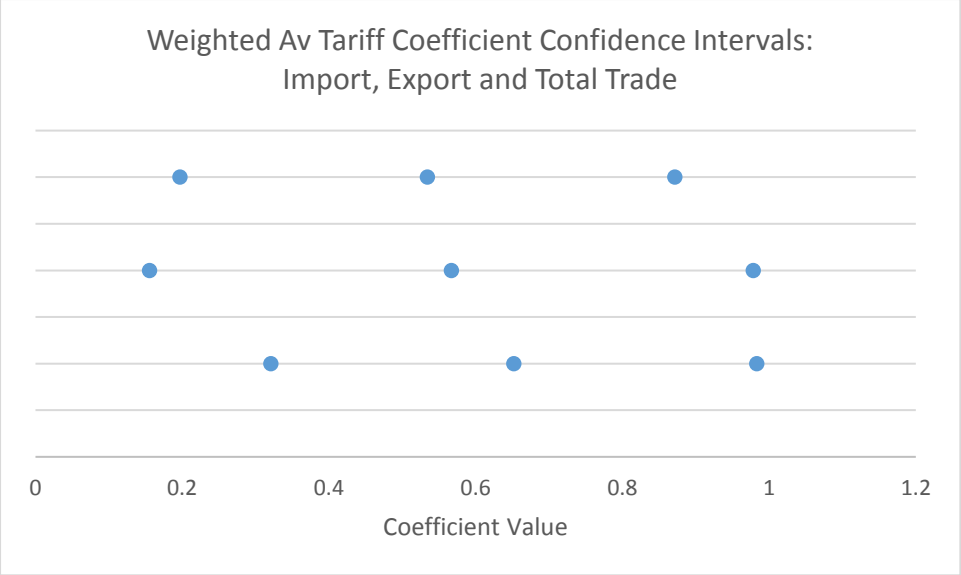

Figure 6: Confidence Intervals for Weighted Average Tariff Coefficient, the upper points are the import equation, the middle points the export equation, and the lower points are the total trade equation.

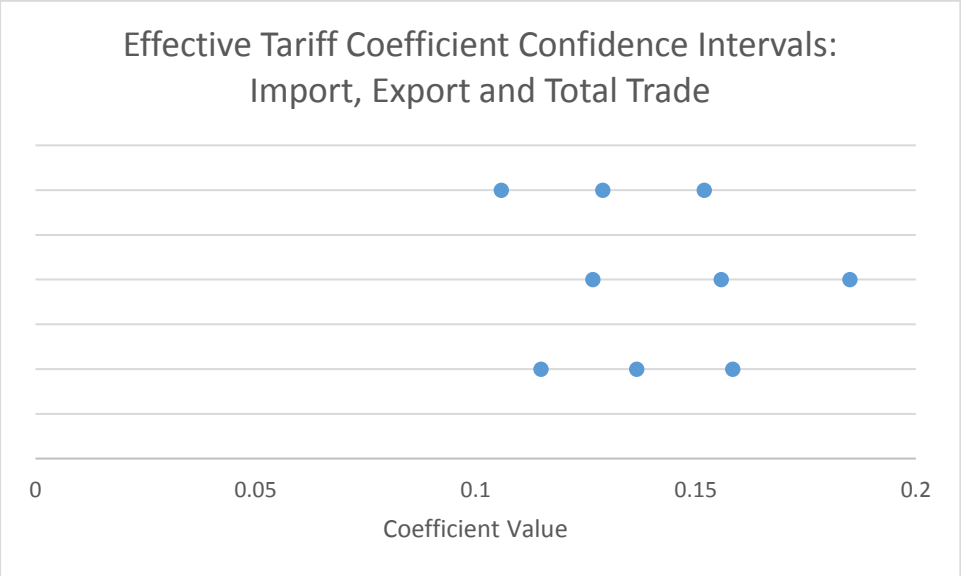

Figure 7: Confidence Intervals for Effective Tariff Coefficient, the upper points are the import equation, the middle points the export equation, and the lower points are the total trade equation.

Figure 7 shows the confidence intervals of the coefficients of Effective Tariff in the three different equations, columns 4-6 in Figure 5. Again there is an overlap between the confidence intervals, however in this case the coefficient for the export equation is outside the import equation confidence interval.

Overall the results of these equations are consistent with what would be expected under the conditions of Lerner's theorem. In both the Weighted Average Tariff equations and the Effective Tariff equations the coefficients for country tariff are highly significant and negative, showing that tariffs reduce import value, export value and the value of total trade.

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 5 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	Number of Countries
Effective Tariff	-0.1366	-12.30	0.000	0.93	2685	133
Weighted Average Tariff EU adjusted	-0.6519	-3.86	0.000	0.94	1421	151
MFN Tariff EU adjusted	-0.2004	-6.50	0.000	0.93	1877	157
Coverage of Non-Tariff Barriers	+0.3896	+1.76	0.079	0.92	1962	154
Trade Restrictiveness Index	-0.5374	-4.69	0.000	0.91	1810	134
Standard Deviation	-0.2170	-2.50	0.013	0.91	2002	157

Figure 8: Comparison of Performance of Trade Policy Measures

Weighted Average Tariff, MFN Tariff and Trade Restrictiveness Index had negative and significant coefficients, 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 and negative alongside Effective Tariff but significantly and 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 outweigh 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 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.

Weighted Average Tariff is the most widely used variable to describe trade policy. Weighted Average Tariff has the added advantage that it is made up from averaging of individual product tariffs, such that a comparable source of data can be used for both micro level analysis and macro analysis. By contrast Effective Tariff is only available as a single annual number at country level and the coefficient has a higher z value. The difference in performance between the two measures is most likely caused by the distortions inherent in the calculation of Weighted Average Tariff. Effective Tariff appears to be the best of these measures of trade policy.

Further analyses were carried out with ratios of trade/GDP and with changes in trade compared to changes in the independent variables, all with consistent results.

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 Edwards (1998), Winters (2001) and Rodriguez and Rodrik (1999). Edwards' finding that many measures of openness do not correlate well with each other may simply be because Edwards' openness measures are measuring different things which in reality do not correlate with each other. Winters advocates a complex measurement of trade policy, whilst Rodriguez and Rodrik favour use of simple tariff measures; this analysis suggests that the only reasonably accurate measure is Effective Tariff and that any process of combining tariff with other measures is likely to worsen the accuracy. In particular Coverage of Non-Tariff Barriers, which is the next most popular measure to tariff, 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 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.

5.0 Conclusions

The purpose of this paper was to investigate how trade policy works and, in particular, how it can be measured.

The gravity model analyses of levels of trade, trade/GDP ratios and differences all showed that trade policy variables had a similar effect on imports, exports and total trade. All of these results suggest that the necessary conditions for Lerner's theorem apply to country level data: imports and exports

are closely related and trade policies, both levels and changes, have similar effects on imports, exports and total trade. Overall these analyses show strong evidence that trade policy, regardless of where in the trade cycle it is applied, has a very similar effect on imports and exports. The results do not support the concept that exports can be prioritised over imports through changes in country or trading partner trade policy, which is the underlying assumption of most Trade Policy and negotiations.

Second there are clear differences in the ability of different measures to reflect trade policy. The levels of tariffs are significantly correlated to levels of trade whilst the Coverage of Non-tariff Barriers does not correlate to the level of trade. This suggests that Non-tariff Barrier Coverage is a poor measure and it would seem likely that this is because this measure only records the incidence of non-tariff barriers and not their severity; the lack of any correlation to trade value suggests that this measure is actually not a useful measure to use in analysis. The composite measure of Trade Restrictiveness Index was found to perform no better than the simple tariff measures, supporting the view of Rodriguez and Rodrik (1999) that simple direct measures are likely to be the best ones. Of the various measures of tariff, Effective Tariff correlates better than either Weighted Average Applied Tariff or Weighted Average MFN Tariff. Given the first finding this is not surprising. The results therefore confirm that Effective Tariff is the best measure of trade policy.

Third geographical variables seem to have little impact compared with trade policy variables. Much of the analysis of trade flows in the literature is based on gravity equations using distance as the key restricting variable. By contrast this analysis finds that at the national level Remoteness does not seem to play as significant a role in determining trade values as trade policy variables and the only significant dummy variable is for island countries which has a negative coefficient in the equations based on changes.

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. So a country's level of trade is largely determined by the size of the country's economy and by the openness of the country's trade policy.

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