

Product variety, International Trademarks, and the Size of Economies

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Abstract Some authors have recently found a positive empirical relationship between the variety and quality of produced and exported goods and the largeness of economies. Krugman style models regarding international trade seem adequate to explain the observed phenomena. The flows of international trade are usually used to measure the degree of vertical and horizontal product differentiation within each country. In this paper we propose international trademarks as a tool to estimate product variety, and the results of previous studies are confirmed.

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Product variety, international trademarks, and economic growth

I. INTRODUCTION

While almost all theories predict that large economies export more in absolute terms than small economies, there is no agreement on how this happens. Models that assume national differentiation emphasize the “intensive” margin: a country with double the resources will trade twice as much but will not trade a greater number of goods. Monopolistic competition models in the vein of Krugman (1980, 1981) stress the “extensive” margin for exports: economies twice the size will produce and export twice as many goods. Romer’s (1994) model displays an extensive import margin because of the fixed costs of importing each variety: larger economies import a wider diversity of products from a wider array of foreign suppliers. Vertical differentiation models such as Falm, Helpman (1987) feature a quality margin, with richer countries producing and exporting higher quality goods¹.

In order to shed some light on this issues, Hummels, Klenow (2002) analyze exports in 1995 from 110 countries to 59 importers and decompose the greater trade of larger economies into contributions from intensive and extensive margins. In addition they compare the prices and quantities of exports by different countries to given market-categories and estimate quality differences across exporters.

The main finding is that the extensive margin accounts for two-thirds of the greater exports of larger economies, and one-third of the greater imports of larger economies. For both imports and exports, larger economies trade in more categories, and trade with more partners. Richer countries export more units at higher prices, therefore producing a higher quality. "Krugman" style models

with increasing returns to scale and product differentiation come closer to fitting the facts relating to intensive/extensive export margins. However, for a complete explanation of the observed phenomena one should modify these models to include quality differentiation and the fixed costs of importing each variety. Similar results are obtained by Feenstra et al. (1999) and Funke and Ruhwedel (2001).

Hummels, Klenow (2002) widely extend the results of previous studies regarding the relation between largeness of an economy, international trade, and product variety. As it is reasonable to expect, the problematic issue of these studies is the measurement of variety and/or quality of products. In this paper we propose trademark data in order to estimate the variety of goods and services produced by a set of countries. In particular, we focus on the finding of a positive relation between *horizontal* product differentiation and the largeness of an economy. This can be done especially using the Community trademark as well as the International trademark protected by the World Intellectual Property Organization (hereafter WIPO). In general, trademarks provide additional information with respect to the data on international trade. The results of the cross section analyses confirm the Hummels, Klenow (2002) conclusions concerning the robustness of Krugman style models. This leads us to believe that trademark data can be profitably used to analyze the characteristics of international trade and the specialization of countries.

So far, the economic literature has not studied in any great depth the use of trademarks. The analysis of the manifestations of intellectual property is focused on other issues, like the use of patents. Recently some authors put forward a theoretical analysis of firms trademark strategies. First, there are works which use a historical or law and economics approach (Greenhut, 1957, Landes and Posner, 1987, Wilkins, 1992). Other theoretical contributions devote greater attention to trademarks, such as Lane, (1988), Perry and Groff (1986), Veall (1992) and Rozek (1982). On the

¹ Different results matter because they each bring very different consequences in terms of consumer welfare. For an analysis of welfare changes associated with different patterns of international trade see, among others,

other hand, empirical research is still lacking. The paper by Allegrezza, Guards-Rauch (1999) is the only one that attempts to analyze the determinants of trademark deposits. These authors analyze at a firm level the determinants of trademark deposits, using a 2500 Benelux firms sample.

The paper is organized as follows. In the next section we discuss the advantages and disadvantages of using trademarks to measure the variety of produced and traded goods. In the third section we describe the data and we show the results of the cross sections. Some final comments are provided in the last section.

II. THEORETICAL CONSIDERATIONS

The aim of our empirical analysis is to verify the positive relation between large economies and the variety of produced and traded goods. As in the previous studies on this topic, we link the issues concerning the variety of *produced* goods and those regarding the variety of *exported* goods. In fact, it is likely that the firms which exploit an international trademark are those most interested in exporting their goods and services.

Krugman (1980, 1981) models countries that produce an endogenous number of varieties. Love of variety in utility and/or production plus free entry by firms leads to a proliferation of varieties. This is limited by fixed costs of production, so the number of varieties produced in a country increases with country size². Higher GDP increases the number of varieties produced rather than the quantity produced per variety. A simple model with these properties is described by Hummels, Klenow (2002). To be more concise, we do not reproduce it here.

The data we exploit to measure the variety of goods are given by the community and international trademark. It is well known that a trademark does not define particular goods, but, rather, the

Brown (1987), Acemoglu, Ventura (2001), and Romer (1994).

² See also Ethier (1979, 1982).

productive or commercial source of one or more goods and services. Therefore measuring product variety by observing the number of deposited or registered trademarks may seem misleading. However, if the objective of the empirical research is to examine the degree of differentiation *perceived* by consumers, the trademark has an important role, because it indicates the variety of sources from where consumers think they are able to purchase a product. In addition, firms often create and deposit a trademark in order to link it to a certain product. In recent years we have observed the intense phenomenon of brand extensions, where a certain brand relates to several goods and services. In actual fact, if one analyzes the trademarks actually registered, each of them corresponds, in the majority of cases, to a specific product.

In this context, the main question is if the trademark can be used as an approximate measure of product variety as well as exports/imports flows. If this is the case the following advantages and disadvantages are involved.

The first advantage of using trademarks is its simplicity. The number of total trademarks registered or deposited by firms of a particular country indicates the effective differentiation in the markets of goods and services. Trademarks do not measure the quantity of goods produced by an economy and possibly exported, but rather the commercial methods of production and export. In fact a trademark distinguishes a seller's product from those of other sellers, and such differentiation is perceived by consumers. Naturally a firm may deposit several trademarks, but each has to be different or cover distinct product classes. Greater information would be acquired if one also observed the distribution of trademarks across product classes: we would be able to determine the degree of variety in each class. However, many firms deposit their trademarks over product classes in which no product is offered, thus such additional information could be misleading (in addition, note that a trademark deposit does not require an immediate economic activity in *any* product class for five years).

Broadly speaking, the total number of trademarks summarizes the information regarding effective product differentiation, and this feature is important if we assume that product differentiation affects consumer welfare.

Naturally the use of trademarks also implies some disadvantages. Firstly, a trademark does not correspond to a real trade of goods and services. Notwithstanding this, a firm that deposits an international trademark is likely to shortly begin to trade its goods and services, although this does not happen at the time of the deposit. It is possible to check that almost all registered trademarks correspond to real goods and services.

Another disadvantage is that the trademark does not provide any direct information concerning the degree of vertical product differentiation, that is, information regarding the quality of a country's products. However, the usual measures of product quality are often questionable. In addition, because trademarks indicate the inherent quality or other distinguishing features of identified products, the consumer costs of searching for preferred quality characteristics are lowered. This gives firms an incentive to maintain or improve quality over time in order not to erode the value of their marks. Thus, trademark protection may be expected both to raise the average quality of products on the market and to generate further product differentiation. In this sense the number of trademarks could be also used as an indirect measure of product quality within a country.

The last objection is that international trademarks (community and WIPO trademarks) do not correctly measure the variety of goods produced within an economy because they probably regard only those marks deposited by medium-large companies which export their products in the area where trademarks are protected. Therefore we should also collect the data on national trademarks. Note, however, that previous studies on this topic also use *international* data to infer information about the *national* economic structure. In addition, it is not easy to collect national trademarks for a large number of nations, although this will be a natural extension of the present study.

Broadly speaking, we propose the use of international trademark data along with those regarding international trade. This way the analysis of national product variety may be enriched and reinforced, especially when the trademark data confirm the results previously obtained.

III. DATA AND REGRESSION RESULTS

The Community trademark was introduced in 1996 and is protected against unfair use within the EU Member States. The International trademark is protected by the WIPO and is in force within the countries adhering to the Treaty of Madrid.

The data regarding trademarks come from the OHIM and WIPO official statistics. For all observations - 103 countries - we collected data concerning GDP, population, and an index of openness to international trade. Information on exports in the European Union area is available just for a sub-sample - 20 countries - which includes UE members and its main commercial partners - Canada, Japan, Norway, Switzerland, USA. All these data come from World Bank - Global Development Finance & World Development Indicators- with the exception of exports in the EU whose source is EuroStat.

We used GDP at international prices (PPP) in billions of units; values are the average for 1993-1996; exports in UE are calculated as the GDP. We also took the 1996 total population in thousands of units and the usual index to measure the openness of national economic structures - the sum of exports and imports over the GDP between 1993-1996³.

We ran three sets of linear regressions. In two of them (CT1 e CT2, for brevity) the dependent variable is the total number of community trademarks registered by each country in the period 1997-2001, while in the third (see below) it is the amount WIPO trademarks.

³ We use average values in order to get stable economic indicators concerning countries included in the dataset.

All the regressions have PPP GDP, population and the index for economic openness as regressors. In CT1 we also added a geographical dummy distinguishing European from non European countries. In CT2 exports in EU are inserted: they dramatically reduce the number of valid records.

In relation to population, it is likely that in a scarcely populated country firms have a great incentive to protect a mark in a large economic area such as the European Union. This way, in fact, firms have access to a potential demand which is much larger than the internal one. For this reason we expect a negative relationship between population and registered trademarks.

In addition, we assume that the openness to international trade may have some effect on the attitude of a country to using the community trademark. In fact, an international trademark not only eases the marketing practices of exporting firms, but it is also useful for importing firms, since it legally protects the commercial *presence* in a wider economic area. In general, it is likely that the countries open to international trade are more interested in using methods to internationally protect their intellectual property.

A regression was run using WIPO trademarks. In this case the sample is smaller than CT1's, because only 30 countries have adhered to the Treaty of Madrid at least since 1997. Here we do not introduce the geographical dummy variable, since the WIPO trademark is only in force within 30 countries, which do not form any homogeneous economic area.

In our econometric tests the implicit model is extremely simple, as we need to pool information regarding many countries. Moreover, apart from the theories of international trade, there is no model that explains the determinants of trademark deposits by a firm or by a country. Indeed, even a model with few independent variables - and no strong established theory - may be useful to conduct what we consider preliminary tests of our conjectured approach. The following table summarizes the results.

Insert table 1 here

GDP's coefficient is always statistically significant and positive. The larger the productive structure of an economy the higher the number of firms aiming to protect their marks outside domestic boundaries. If our conjecture is valid - taking registered trademarks as a measure of the perceived variety of products – the larger the economies the wider the spectrum of production.

To interpret the population's coefficient it is worth noticing how much this variable is correlated with GDP: 0.55 when considering the whole data set; 0.83 for the subset of 'WIPO records' and 0.99 for CT2's observations - strong evidence of the high economic homogeneity of the latter countries. It implies that, when the coefficient statistically differs from 0, it captures the variability not captured by GDP's coefficient, but it remains economically irrelevant. Economically relevant are the two remaining cases where population coefficients are highly significant and negative. It is likely that in scarcely populated countries firms have a strong incentive to protect their marks in a large economic area such as the European Union.

The results for the total trade index are not surprising if correctly interpreted. It is important to remember that it is constructed as the sum of exports and imports divided by the GDP. It is not an index of how dynamic a national economic productive structure is but of the degree of involvement of national economies with the rest of the world. Indeed, high values may well be associated with high rates of exchange of goods and services without any influence on the proliferation of varieties.

The geographical dummy appears in CT1. The positive value means that, *ceteris paribus*, being European consists of a linear advantage in registering community trademarks. Most European countries have been settling common free trade areas since immediately after the second world war. For countries involved in such agreements, it may well reflect the attitude of considering these arenas as natural markets for their products because of their proximity, which is not true - with the same intensity - for non-European countries.

Finally, let us comment on the resulting coefficient for exports in the EU. It is almost 7 times more relevant than the GDP's in the same regression, which is the highest of the three regressions. Firms whose demand basin was the EU area had a great incentive to exploit the new protection tool, once established. It is in line with the high level of horizontal competition in European markets. This is in turn consistent with our conjecture concerning trademarks as an effective proxy for varieties of products and with Krugman's conclusions on the extensive margin.

In order to check the robustness of results, we ran the same regressions using other years. For the PPP GDP, we considered the average 1991-1996 and 1996 on its own. For the population we considered the average 1993-1996, and in relation to the openness we included the averages 1991-1997 and 1995-1996. We ran cross sections for all the possible combinations, and the results we obtained are pretty similar to those described in table 1. This similarity is twofold: it refers to statistical significance as well as to the magnitude - and signs - of the coefficients.

IV. CONCLUSIONS

The relation between the extent of economies and product variety has recently attracted the attention of several authors. In this paper we tackled this issue by using international trademarks as a proxy of the degree of horizontal product differentiation within each country. In this context, the use of trademarks reduces the scope of the questions that can be examined, but it permits a synthetic analysis of product variety and is particularly simple.

We exploited data on community and international trademarks to verify the result obtained by Hummels, Klenow (2002), that larger economies not only produce and export more in absolute terms, but also produce and trade more goods. This empirical observation can be explained in the Krugman style models of international trade.

The cross section analyses confirm this result: the link between larger economies and product variety is strong, and this is important in terms of consumer welfare and benefits deriving from international competition. Another interesting result is that population is negatively related to trademarks: countries with lower populations deposit a higher number of trademarks. We also observed that the openness to international trade does not affect trademark deposits. Our results are subject to some limitations. First, international trademarks do not describe the same phenomena described by international trade, and some caution in the interpretation of results is required. In order to define the patterns of production and trade of each country more precisely we should also examine national trademarks. This is a possible extension of this study, although it will not be applicable to many nations. Moreover, community trademarks are chronologically limited, because they were only introduced in 1996. Therefore we will shortly be required to return to the analysis of data, to understand how the forms of intellectual property follow the flows of real goods and services.

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Table 1. Cross section results

Regressors	WIPO trademarks		Community trademarks			
			CT1		CT2	
GDP	13.07	(6.13)**	9.41	(16.87)**	21.16	(2.12)*
Openness	14.96	(0.43)	-1.03	(-0.13)	-88.55	(-1.35)
Population	-0.04	(-5.7)**	-0.02	(-7.04)**	-0.47	(-1.51)
Exp intra EU					139.98	(4.78)**
EU-NonEU			-4089.87	(-4.34)**		
Intercept	-1377.99	(-0.45)	3424.36	(3.06)**	4345.45	(0.77)
Adjusted R ²	0.62		0.76		0.88	
Number of observations	30		103		20	

Note: * = p-value below 5%; ** = p-value below 1%. t-statistics value in parentheses.