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Assessing the Export Competitiveness of Chinese Industries

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ABSTRACT

The article presents a framework for measuring, illustrating and comparing industry export competitiveness that takes into account (a) industry specialization, (b) industry export growth rate, and (c) relative industry size. We apply the framework to a dataset of 97 different industries from China over a five year period (2001-2005). According to our results, over 70% of Chinese industries are "dynamic," meaning that their export growth is higher than the world average export growth. Almost 50% of the Chinese industries examined are competitive in global markets, with 20-25% of the world export market share in their respective industry. Our results also suggest that the more an industry becomes specialized, the higher its world market share in terms of exports. The framework developed is innovative in its conceptualization and can be used in a variety of contexts to model industry export competitiveness.

Keywords: Comparative Advantage, Export Competitiveness, Balassa Index, China, International Trade, Industry Analysis

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INTRODUCTION

Competitiveness has been assessed and studied at various levels: at the country level (Murtha & Lenway, 1994; Jones, 1994; Enright et al., 1999), the regional level (Uysal et al., 2000), the industry level (Roth & Morrison, 1992; Mitchell et al., 1993; Contractor et al., 2005; Fetscherin & Alon, 2007), and the network/group level (Peng et al., 2001). Country level assessments are provided in *the Global Competitiveness Report* (World Economic Forum, 2008) and the *World Competitiveness Yearbook* (Institute for Management Development, 2008) and elsewhere (Eckhard, 2006), but are oftentimes too general to be applied to a single country (Krugman, 1994). In contrast, individual company cases and studies are too specific and may not be applicable to an entire industry or to all industries from a single country (Peng, et al., 2001). Analyzing competitiveness at the industry level, however, provides greater detail and a better understanding of the competitive dynamics of an industry than the country or company level for several reasons: (1) examining the degree of specialization for a given industry can identify the comparative (dis)advantage of a national industry; (2) industry-specific analysis permits international comparisons of an industry's degree of specialization and rate of growth, and (3) an industry-level analysis permits comparisons with other industries.

One dimension of industry competitiveness is export competitiveness. A key indicator of the extent of export competitiveness of an industry is the degree of its participation in international trade. According to data published by the World Trade Organization (WTO, 2007), the volume of world merchandise trade in 2006 grew by 8 per cent to about US$ 11.8 trillion, compared to world gross domestic product growth of just 3.5 per cent. In the past two decades, world trade

has grown much faster than world GDP, suggesting that the international economy is a source of dynamism and opportunity.

The theory of comparative advantage (Heckscher, 1949; Marshall, 1890; Ohlin, 1933; Ricardo, 1871; Smith, 1776) underscores the importance of specialization and trade in enhancing productivity and consumer well-being. Smith (1776) argued that, under free unregulated trade, each nation should specialize in the production of the goods that it can make most efficiently, and import those goods in which it has a comparative disadvantage. In order to sustain export competitiveness in an industry, companies operating within that industry must understand the concept of revealed comparative advantage, since it allows them to understand and benchmark their position within an industry in terms of, for example, specialization, growth rate, and export market share. How to model the export competitiveness of an industry has hitherto remained an unresolved issue, however, particularly when comparing across industries within one country. The purpose of this paper is to present a framework that measures, illustrates and compares the export competitiveness of an industry compared to other industries from the same country. Although this framework can also be applied to compare a single industry across various countries, cross-country comparison is not the focus of this paper.

China's globalization has been one of the most dramatic economic developments of recent decades (Alon and McIntyre, 2008). During the period 1979-2005, China's annual growth rate has averaged 9.6 per cent, and its integration into the world trading system has been remarkable. Its share in world merchandise trade has increased from less than 1 per cent in 1979 to 7.4 per cent in 2005. In the same year, China became the third largest trading nation after the United States and Germany (Greene et al., 2006). The expansion of China's international trade has been the key to its rising prominence in the world economy, and China's economy has a strong

potential to become the world's top exporter by the beginning of the next decade (Green et al., 2006). Current studies investigating and assessing Chinese export competitiveness can be grouped into two main research streams. One stream of research focuses on the relationship between FDI and China's trade performance (e.g. Liu et al., 2001, Zhang & Felmingham, 2001; Xing, 2007; Khun, 2007). This is an important topic, and most of these studies use the country as the unit of analysis, although some studies (e.g. Zhang & Felmingham, 2001) use China's provinces. The other stream focuses on the export performance of industries (e.g. Greene et al., 2006; Van Assche et al., 2008). Since the unit of analysis of this study is the industry, its contribution is to the second stream of research.

Greene et al. (2006) provide an overview of China's trade policy environment and examine China's impact on world prices and the deterioration of its own terms of trade. The study by Van Assche et al. (2008) focused on export market share only and concluded that China continues to have a comparative advantage in low technology activities and a comparative disadvantage in high-technology activities. Our study contributes to this literature by providing a multi-dimensional framework that allows us to measure, identify and compare which Chinese industries have a comparative advantage/disadvantage, which are growing faster or slower than the world average, and their relative importance in international trade.

The remainder of this article is structured as follows: in the next section, we present three variables for measuring the export competitiveness of industries, namely: industry specialization (a proxy for the degree of industry comparative advantage/disadvantage); industry growth rate; and the relative size of the national industry. In the subsequent section, we present a 2x2 matrix that uses these three variables to create four categories of export competitiveness. Finally, to illustrate the applicability and usefulness of our framework, we apply the framework to a large

number of China's industries, allowing the reader to better understand the dynamics of this fast-growing and emerging economy. Our analyses utilize data from the United Nations Conference on Trade and Development (UNCTAD) and the World Trade Organization (WTO) for the years 2001-2005, which allow analysis over time, across industries, and at different levels of aggregation.

MEASURING EXPORT COMPETITIVENESS

The industry is the location where firms win or lose market share and it is the industry level that permits an examination of the dynamic nature of industrial evolution and reformation in the global business environment (Passemard & Kleiner, 2000). In the academic literature, there is still a general paucity of research on industry export competitiveness, with previous studies consisting mostly of examinations of a single domestic industry and the use of subjective measures (Makhija et al., 1997). Multiple measures have been suggested: Mandeng (1991) examined the size or increase of export market share, while others used export competitiveness (e.g. Balassa 1965; Balassa & Bauwens, 1987), price ratios (e.g. Durand & Giorno, 1987), and cost competitiveness (e.g. Siggel & Cockburn, 1995). Our conceptualization of export competitiveness attempts to combine appropriate elements from previous studies and follows the recommendation of Buckley et al. (1992) and Porter (1990) for the use of multiple indicators. Specifically, the framework that we present here provides a contribution to the existing literature as it not only uses multi-dimensional measures but also allows an examination of industry export competitiveness using either an intra-country or an inter-country analysis. The use of multiple-dimensions is superior to the use of single measures as it puts into better perspective an industry's export competitiveness (Balasse index), dynamism (growth rate) and importance (export market share) in comparison with other industries. For example, an industry which is

highly specialized but not important in terms of export market share can be compared with an industry which might be less specialized but has a larger world export market share. Having only one dimension might lead to a wrong assessment and conclusion. The proposed framework tries to address some of those issues.

Industry Specialization (IS)

The concept of comparative advantage has been widely accepted as one of the foundations for international trade. A country has a pattern of specialization that is determined by what goods it exports and the volume of each good it exports, both of which change over time (Hoskisson & Yiu, 2003; Kelleher, 2003; Vernon, 1966). Krugman (1994) argues that international trade is not a zero sum game and that the rise or fall of particular industries and nations reflects changing factor endowments and the need to shift to new areas of competitive advantage. When a nation enjoys a comparative advantage in a particular industry, it is natural that firms make investments in order to profit from this advantage, resulting in a relatively high degree of specialization within that industry (Dunning, 1993). A commonly used measure of industry specialization, based on export data, is revealed comparative advantage, often referred to as the Balassa Index (BI) (Balassa, 1965). Richardson and Zhang (1999) used the Balassa Index for the U.S. to analyze variations in U.S. patterns of trade across time, sectors and regions. They found that the patterns differed by region and over time and also for different levels of aggregation of the export data.

Since industry specialization can be viewed as a proxy for comparative advantage, it is used here to assess one dimension of export competitiveness. Underlying the Balassa Index is the notion that the direction of trade flows reveals a country's specialization patterns and hence its

revealed comparative advantage, though not the source of this advantage. The *BI* is calculated as the share of a given industry in a country's exports to the share of the same industry in *total world exports*. The Balassa Index does not differentiate among the destinations of exports, whether they are regional or international. It is assumed that the world economy comprises *N* countries and *m* industries; then country *i* exports for industry *j* is x_{ij} and the total exports of country *i* are given by $X_i = \sum_{j=1}^{m} x_{ij}$. Total world exports of industry *j* amount to $X_j = \sum_{i=1}^{N} x_{ij}$ while total world exports can be seen either as the sum of all industries or as the sum of all countries, i.e. $X = \sum_{j=1}^{m} X_j = \sum_{i=1}^{N} X_i$. To evaluate revealed comparative advantage of country *i* in the sector or industry j, Balassa (1965) suggested the following index:

$$B_{ij} = \frac{\frac{x_{ij}}{X_j}}{\frac{X_i}{X}}$$ country i = 1,2,… N; product j = 1,2…m

If the market share of country *i* in industry *j* is higher than its total market share, i.e. if $\left(\frac{x_{ij}}{X_j}\right) > \left(\frac{X_i}{X}\right)$, then the country is classified as having a revealed comparative advantage in the industry *j*. The simplicity and highly intuitive nature of the Balassa Index explains its wide utilization in the literature on trade and international business. The formula uses $\frac{X_i}{X}$ to "normalize" $\frac{x_{ij}}{X_j}$, proposing a threshold level of 1. Besides this dichotomous feature of distinguishing between countries that have a revealed comparative advantage for a given industry and those that do not have one, the *BI* can also be used as a ordinal measure, allowing interpretations either among countries in a given industry or, for the purpose of this paper, across

industries in a given country. A *BI* score greater than 1 indicates that a country's domestic industry is relatively more specialized than the world industry, indicating that this industry is more specialized and has a comparative advantage compared to the rest of the world on average. Thus, the *BI* can be used to compare the relative degree of industry specialization of a country. The index has a lower bound of $BI_{ij} = 0$ in the extreme case where country *i* does not export any product from the industry *j* ($x_{ij} = 0$); at the other extreme, it is infinite. Normally, the *BI* scores range from 0 to +1, but the effective upper bound can be infinite when X_i tends to 0, i.e. when the share of country *i* in total world exports is negligible. Given that X_i and X vary across time, the upper bound changes not only across countries but also across time.

Industry Growth (IG)

Studies of industry competitiveness have tended to take a static rather than a dynamic or longitudinal perspective, and have provided little insight into globalization trends. As we want to assess the past, present and future export competitiveness of Chinese industries, an assessment of industry trends can shed light on the manner in which Chinese industry as a whole is globalizing and at what pace (Makhija, et al., 1997). Our framework includes industry export growth because, over time, a country may start to specialize more in some industries and less in others, thus changing its pattern of specialization. This also highlights the difference between dynamic and static industries. Some studies (e.g. Alessandrini et al. 2007; Hinloopen & van Marrewijk, 2001) measure this change of pattern of specialization by using Shorrocks' (1978) mobility index. However, the mobility index does not provide sufficiently detailed information since it just ranks industries or sectors of a country according to export volume, groups them into quintiles, and calculates the net change between quintiles; industries that do not have a net change between quintiles are considered to be static rather than dynamic. Other studies (e.g.

Amador et al., 2006; Baldwin & Gu, 2004; Cooper, 2006) have used a simpler but perhaps more precise measure of changes in specialization by calculating the compound annual growth rate (CAGR) of exports in certain sectors over a certain period of time. It can be assumed that export growth in a given industry and country, particularly growth that is higher than the average global industry growth, implies a greater degree of globalization for that industry. However, this measure suffers from the weakness that domestic production and consumption, which are important for competitiveness, are omitted. Nevertheless, given the focus of our framework on export competitiveness, this weakness is not significant. Therefore, we use CAGR as a measure of growth in exports.

Where the world economy comprises *N* countries and *m* industries, for a given country *i* and industry *j*, the industry export growth rate *(IG_{ij})* takes into account the growth rate of the total trade value of exports of that industry and country (x_{ij}) over a certain period of time *n*. Therefore, for a specific time *t* in country *i,* exports of industry *j* are expressed as x_{ij_t} ; exports from the previous period are expressed as $x_{ij_{t-1}}$. Therefore, the industry growth rate in terms of exports, derived from the well-known and widely used compound annual growth rate (CAGR) formula, for *n* periods for a given country *i* and industry *j* can be expressed as the following:

$$IG_{ij(t_0,\,t)} = \left(\frac{x_{ij_t}}{x_{ij\ t_0}} \right)^{\frac{1}{t-t_0}} - 1$$

Relative Industry Size (W)

The previous two measures allow a country *i* and its industry *j* t\o be positioned in a 2x2 matrix that permits a comparison of industry *j* in country *i* with other industries from that country. What has been omitted so far is the importance or weight of the industry in country *i* in

relation to the size of the global industry. Industry size is recognized as a factor in competitiveness by various authors (e.g. Mandeng, 1991; Porter, 1990). Therefore, industry size needs to be taken into account in the framework in order to put the size of the domestic industry into the global context.

Relative industry size or weight (*W)* is measured by the share of exports of a given industry *j* and country *i* (x_{ij}) relative to the total global exports of that industry *j,* expressed as X_j. The domestic industry's relative share of the global industry is an outcome of global specialization and is indicative of export market share.It is represented in our framework by the size of a circle indicating the relative size of each country's domestic industry. The measurement variable is expressed as the exports of industry *j* for a certain country *i,* with x_{ij} relative to total world exports of the industry *j*, X_j. The circle area can be expressed as $\prod r^2 = Y$ or $\frac{1}{4}\prod d^2$; for total global exports of industry *j*, the total area would be equal to 100%, and *r* or *d* can be freely chosen. However, the circle area for the country *i* and industry *j* is relative to this function. The total exports of industry *j* is given by $X_j = \sum_{i=1}^{N} x_{ij}$ and, since $\prod r^2 = Y$, the following formula for the circle area of industry *j* of country *i* can be expressed. In the case of a specific industry the formula would be:

$$\frac{\prod r^2}{X_j} x_{ij} = y_{ij}$$

.

The relative industry size (*W*) measure provides a good proxy for the relative importance of that industry in country *i,* compared to the global industry. In order to illustrate the usefulness of our framework, the following section presents an application of the framework for Chinese industries over a 5-year period.

TYPOLOGY OF INDUSTRY EXPORT COMPETITIVENESS

The three measures discussed previously can be represented in a 2x2 matrix in which a country's industry can be plotted, using the Balassa Index as a proxy for industry specialization, the CAGR of exports as a measure for industry export competitiveness, and circles of various sizes for relative export market share. In the matrix, four different types of industry export competitiveness can be distinguished: (1) 'domestic static', (2) 'domestic dynamic', (3) 'global dynamic', and (4) 'global static' industries. This typology of export competitiveness of industries is shown in Figure 1.

Insert here Figure 1

Dynamic industries are seen as growth oriented, whereas static industries have a below-average industry growth rate. Global industries are specialized and export oriented, while domestic industries focus on the home market. 'Domestic static' industries neither grow fast nor are specialized. In contrast, 'global dynamic' industries are the industry champions of a nation, growing faster than other industries and having a high degree of specialization.

The matrix is useful in two ways: (1) it enables an *intra*-country analysis by assessing the degree of export competitiveness of an industry and its sub-industries with other industries and sub-industries of the same country, (2) it might also be used to conduct an *inter*-country analysis by comparing the domestic industry's export competitiveness relative to that of the same industry from other countries. Herein, our focus is on the former.

METHODOLOGY AND DATA COLLECTION

We used data from the United Nations Conference on Trade and Development (UNCTAD) and the World Trade Organization (WTO) for the years 2001-2005. The 5-year time period in our data allows for an analysis of changing global dynamics, especially important in the case of China. During the time period of our investigation, China had undertaken many market reforms and joined the WTO in 2001, events which changed the competitive position of China's industries.

The data were classified using the international Harmonized Commodity Description and Coding Systems, generally referred to as the Harmonized System (HS). HS was designed to replace the local systems used by countries, allowing them to have a common classification system by which to track trade and apply tariffs. The system is used by more than 200 countries and economies as a basis for their customs tariffs and for the collection of international trade statistics. Over 98 % of the merchandise in international trade is classified in terms of the HS, which classifies international trade into 99 sectors or industries; two of these (HS class 77 and 98) are reserved and are not used in the analyses, resulting in 97 specific industries. The two-digit HS industry codes are listed in Appendix 1. The above mentioned framework can not only be used for two-digit level analysis (industry level) but also 3-digit (sub-industry level) or 4-digit level analyses (product group level).

We first provide a brief overview of the overall pattern of international trade for China compared to other Asian countries. Then, for the 97 Chinese industries, we calculate the degree of industry specialization and the industry growth rate in terms of exports over the selected period of time. Finally, we apply our framework to assess the degree of export competitiveness of the various industries in China.

RESULTS

International Trade Comparison

Table 1 provides an overview of the total export value in US dollars for various countries from Asia for the years 2001 to 2005 as well as the corresponding compound annual growth rate (CAGR).

Insert here Table 1

Overall, during the period 2001 to 2005, all countries in Table 1 registered a positive compound annual growth rate in terms of exports, ranging from 10 per cent in the case of Japan to 30 per cent in case of China (with India the next highest, with 24 per cent). In absolute terms, the highest value of exports for the main Asian countries in 2005 was recorded by China with US$ 762bn, followed by Japan with US$ 595bn and Hong-Kong (SAR) and South Korea with US$ 292bn and US$ 284bn, respectively. In the same year, India had only US$ 103bn worth of exports, positioning it as a relatively weak exporting country.

Table 1 also shows that countries from Asia, and specifically China, continue to gain in importance in the global market as, for most of these countries, the average growth rate of exported products is higher than the average global export growth rate of 14 per cent between 2001 and 2005. The main product groups exported by China were ‘Electrical, electronic equipment’ (US$ 172.3bn); ‘Boilers, machinery, nuclear reactors’ (US$ 149.6bn); ‘Articles of apparel, accessories not knit or crochet’ (US$ 35bn); ‘Articles of apparel, knit and crochet’ (US$ 30.8bn), and ‘Optical, photo, technical, medical apparatus’ (US$ 25.4bn).

However, while understanding international trade data in terms of absolute and relative values at the country level is necessary (Table 1), it is insufficient for assessing the export competitiveness of industries because it lacks specificity and comparative data at the industry level across multiple indicators. Our proposed framework will take these factors into account and it will be discussed in the next section.

Industry Export Competitiveness

We calculated the values for the three key variables for each of the 97 Chinese industries. Figure 2 provides an overview of the different industries from China and their degree of export competitiveness in terms of industry specialization, growth and size. The reference point for the Balassa Index (horizontal axis) was a threshold value of 1 (which, as mentioned before, has been used in previous studies); while for industry growth (vertical axis), the reference point was the world average export growth of 14 per cent for the period 2001-2005.

Insert here Figure 2

To recall, those industries located in the upper right quadrant are said to be both 'global' and 'dynamic', whereas those in the opposite quadrant (bottom left) are said to be 'domestic' and 'static'. For each of the four quadrants, the proportion of Chinese industries in each and their average specialization (IS), average export growth rate (IG) and export market share (W) are illustrated in Figure 3.

Insert here Figure 3

One interesting result is that the majority of Chinese industries (73%) are categorized as ‘dynamic’ industries, either domestic (39%) or global (34%), both having a higher than average export growth rate (30% and 28% respectively) compared to the world average of 14%. For the period of the investigation, most Chinese industries grew faster than their world counterparts, not surprising perhaps given the higher relative GDP growth of China in general.

Only 14 per cent of Chinese industries have grown at a rate below the world average and have a low Balassa Index. These are areas where China does not exhibit exceptional export competitive strength and where Chinese industries may be lagging behind the rest of the world. As expected, many of these industries are commodities, such as live, fresh or chilled animals, meat, fish, or coffee, spices oils, grains, zinc and tin. In ‘Tobacco and alcoholic beverages’, too, China is not gaining ground. Surprisingly for some, ‘Arms and ammunition’ also fall in the ‘domestic static’ quadrant of our model, but the 13 per cent growth rate for this industry borders the dynamic quadrant cutoff, suggesting that if exports of arms and ammunition increase at a faster rate than before, this industry, too, will soon be classified as ‘global dynamic’.

The ‘domestic dynamic’ industries are those in which exports are fast growing, but where the Balassa Index is relatively low. Many commodities-related industries belong to this category as well, including trees, plants, animals, sugars, cocoa, organic chemicals, paper, iron, copper, nickel, aluminum, and so forth. Some manufacturing and technology-intensive sectors of the economy also fall into this category, including pharmaceutical products, photographic goods, as well as vehicles, aircraft, ships, and even works of art. The above average growth rate suggests that, in each case, exports are growing, but export specialization is not growing commensurately. A strong domestic market may fuel some of this growth, as is the case, for example, for the

automotive industry (Toncar & Fetscherin, 2007). Over time, some of these industries may cross over to the 'global dynamic' category as they develop higher level of international specialization.

In China, the 'global static' category consists of light manufacturing, such as travel goods, clocks, umbrellas, textiles and commodities such as wool, silk, bird skin, and salt, earth, and stone. China has established a specialization in international markets for these types of products, thus exhibiting a high Balassa Index, but the growth rate of these industries lag behind the world average.

Among the star performers are those Chinese industries that exhibit both a relatively higher rate of export growth and a high Balassa Index – the 'global dynamic' group (which represent 34% of the total) such as cotton, mica, ceramic products, glass, lead, and various metals. But also present in this group are the industries that consumers around the world associate with "made in China", including footwear, headgear, cutlery, boilers, machinery, electrical and electronic equipment, musical instruments, furniture, lighting, toys, games, and sports tools and equipments. China has also in this category a few sophisticated optical, technical, and medical related products.

A question arises as to whether the thresholds used in the framework are appropriate and if the industries within each quadrant are more homogenous than between the quadrants. Therefore, in order to assess the statistical significance of the framework, an ANOVA analysis was conducted to test the differences in the mean values of the three variables across the four categories. The results of all multivariate hypothesis tests associated with the empirical data are summarized in Table 2, which provides the mean values, the F-test and its significance level. Overall, we found two-way multivariate interactions among the four categories, indicating significant differences among the four categories.

Insert here Table 2

Univariate F-tests show that each category ('domestic static', 'domestic dynamic', 'global dynamic' and 'global static') is significantly different and we can conclude, with a 95% confidence level, that they represent different types of export competitiveness and that there are differences in the degree of export competitiveness among the four categories. Post hoc multiple comparison tests were then conducted to investigate further differences among the various means, using Tukey's (1953) honestly significant differences (HSD) method. Table 3 shows that the majority of the mean differences were significant ($p<0.05$), confirming distinctions among the four categories in the presented framework.

Insert here Table 3

One non-significant difference was between the 'domestic static' and 'domestic dynamic' categories in terms of industry specialization (IS) as well as export market share (W). In terms of industry specialization (IS), the lack of significance was not surprising since all industries in these two categories have a Balassa Index that ranges between 0 and 1, allowing only little room for differentiation. The non-statistical difference in terms of relative market size of exports further confirms the dimension "domestic," indicating that industries in both 'domestic static' and 'domestic dynamic' categories are focused mainly on domestic markets (low export market share of 3.0 per cent and 3.1 per cent respectively).

Another non-significant difference was for 'global static' and 'global dynamic' categories in terms of industry specialization (IS) and industry size (W). This means that the non-statistical

difference in terms of relative market size of exports further confirms the dimension 'global,' indicating that industries in both 'global static' and 'global dynamic' categories are focused mainly on global markets with a higher export market share (19 per cent and 24.3 per cent respectively). Finally, in terms of industry growth rate, the only non-significant difference found was between 'domestic static' and 'global static' as well as 'domestic dynamic' and 'global dynamic'. Again, this result makes intuitive sense and confirms the dimension "static" or dynamic", since no significant difference between the growths rates of the industries in these two categories was expected. The data appear, therefore, to support the view that industries can be categorized into one of the four categories of our framework and that each quadrant has its own distinct and differentiating set of characteristics.

We also sought to assess which Chinese industry has the highest export market share, and to take one industry to demonstrate how our model can be applied to products within an industry. Table 4 summarizes the various industries for which China has a relative market share of over 30% in terms of exports. This shows that China holds a dominating market share for those industries that are both 'global dynamic' and 'global static'.

Insert here Table 4

Not surprisingly, for all these industries the Balassa Index is well over the threshold of 1, ranging between 4.1 and 8.4. There is also a correlation between the degree of specialization and the relative market share, indicating that there is a positive relationship between those two variables. In contrast, the correlation between degree of specialization and export growth rate is small (r=-.09), and not statistically significant.

Sub-Industry Export Competitiveness

Having examined aggregate Chinese data and its underlying industries and in order to show the usefulness of the framework, we also provide one example of a sub-industry or product group level analysis. Figure 1 showed one industry as an "outlier" with appreciable growth and specialization, namely industry HS 43 ('Fur skins and artificial fur, manufactures thereof'). We want to examine the export competitiveness of that industry and its underlying product groups by further understanding in which product groups China is a competitive player in terms of specialization and export growth, and how dominant China is in this industry and its underlying product groups. Figure 4 provides an illustration and break-down of industry HS 43:

Insert here Figure 4

In accordance with the literature, we have chosen a threshold value of 1 for the Balassa Index (IS) and the world average export growth rate of 14 per cent for the growth rate cut-off point. This analysis clearly shows the usefulness of this framework and its flexibility for conducting analyses not only at the industry-level but also at the product group level. It shows that the HS 43 industry consists of four product groups (4301 'Raw furskins & pieces suitable for furriers' use'; 4302 'Tanned or dressed furskins & pieces, unassembled or assembled'; 4303 'Articles of apparel, clothing access and other articles of furskin'; and 4304 'Artificial fur and articles thereof') and in each China has a different competitive position. For HS 4303, China is a significant exporter nation, holding over 60 per cent of world exports in that product group, growing at 34 per cent over a five year period and with a high industry specialization value of approximately 8.4. In contrast, in the HS 4301 sub-sector, with an IS value of less than 1, China is not specialized and it is a minor player in the export market, with a total export market share of less than 1 per cent, growing at only 8 per cent between 2001-2005.

CONCLUSIONS & FUTURE RESEARCH

The purpose of this study was to present a novel framework that allows us to measure, illustrate and compare the export competitiveness of industries. The framework is innovative as it takes into account multiple measures: (1) the degree of industry specialization, (2) the industry export growth rate, and (3) the export market share. Using these variables, this model provides a basis for intra-country comparisons of industries of various competitive postures. It could also be used for inter-country comparisons of one industry among countries (which is not shown in this paper). The use of multiple variables in the framework provides more meaningful information than the single variable analyses which previous studies have generally used (e.g. Van Assche et al., 2008). The use of multiple measures, such as specialization, growth rate and export market share of an industry, allows us to put into perspective the competitiveness, dynamism and importance of one industry compared to others. Our framework also allows for a comparative analysis of sub-industries or product groups depending on the dataset used.

The proposed framework has been applied to China, a leading emerging economy and one of the largest trading nations in the world. Most of China's industries (73%) are dynamic, showing above average export growth rates. Many reasons account for this rapid growth, including market liberalization, falling trade barriers, and a favorable exchange rate. Our results show that most Chinese industries have increased their specialization over time, which is in line with various OECD studies (e.g., Greene et al. 2006). However, our study further reveals that less than half of these "dynamic" industries are globally competitive, according to the Balassa Index. China therefore still has a long way to go in fortifying its position as a leader in world exports across a spectrum of various industries. Two important relationships are confirmed by

our study. First, there is a positive and significant correlation between the degree of specialization and the relative market share, and, secondly, there is no significant correlation between degree of specialization and the export growth rate. In other words, industry specialization may affect the relative market share of Chinese exports, but not their rate of growth. Overall, 46 per cent of Chinese industries are categorized as "global" in our framework, with a world export market share of between 19 and 24 per cent. This finding indicates that these industries are not only strong global players but are also influencing the international competitive landscape. Over 70 per cent of those industries are also "dynamic" with exports growing on average at about 28 per cent annually, compared to the remaining 30 per cent which are 'static' and growing at 11 per cent on average for the period 2001 to 2005. This result further suggests that the more an industry is specialized, the higher its world market share in terms of exports.

The framework presented herein is useful for companies to see where they stand in terms of exports compared to other companies in their industry. It can also be used by industry associations and policy makers to identify where a particular industry stands in relation to other industries (either from the same country or from other countries) and how they perform in terms of export size, growth and market share. Also, it is useful for policy makers to help identify weak and strong industries, as well as relevant (large export market share) and irrelevant (small export market share) industries, in order to identify macro-level imbalances and take specific actions through policies for promoting or hindering exports or imports.

Future studies can apply this framework in several useful ways. As mentioned earlier, our framework permits a systematic measurement of export competitiveness and allows both *intra*-country analysis, as shown in this paper, and *inter*-country comparisons. We focused here on an intra-country analysis, but clearly a comparison between countries and across industries is

possible both regionally or globally. Another approach would be to differentiate between exports and export-oriented FDI, since the framework could be expanded by taking into account the relationship between FDI and trade performance on an industry level. Specialized analyses of this sort may follow the specific needs of policymakers, government officials, industry associations, and company executives who may need to understand the export dynamics of relevant countries and industries. Future research might also examine whether our framework is useful in identifying emerging champions of global trade. Such predictive abilities may allow relevant stakeholders to calibrate their strategies accordingly. For example, it would be revealing if it can be identified that industries follow a "life cycle", whereby they start as 'domestic static', then become 'domestic dynamic' as their rate of growth increases, then become 'global dynamic' and finally 'global static'. Should such a trend by identified, it would be interesting to examine its antecedents. While it is not possible to investigate such issues with the current database, future research may attempt to unravel this notion to better understand the nature and dynamics of export competitiveness. Related to this investigation, the Balassa Index indicates revealed comparative advantage but does not specify the source of such advantage. Future research may attempt to discover the source of such specialization to reveal the underlying factors associated with shifts in national export competitiveness.

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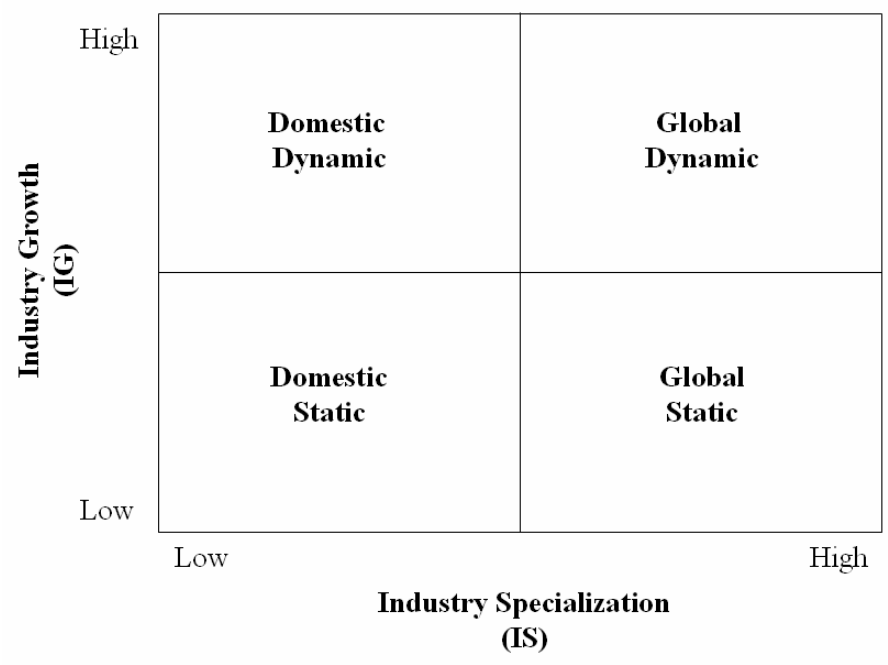


Figure 1: A Typology of Industry Export Competitiveness

Table 1: Exports of Leading Trading Nations 2001-2005 (US$ billion)

Country	**2001**	**2002**	**2003**	**2004**	**2005**	**CAGR (%)**
China*	***266***	***326***	***438***	***593***	***762***	***30%***
Japan	403	417	472	566	595	**10%**
Hong Kong , SAR China	191	202	229	266	292	**11%**
South Korea	150	162	194	254	284	**17%**
Singapore	122	125	160	199	230	**17%**
Taiwan	123	131	144	174	189	**11%**
Malaysia	88	94	105	127	141	**13%**
Thailand	65	68	80	96	110	**14%**
India	44	52	63	80	103	**24%**
Indonesia	56	57	61	64	86	**11%**
World	**6,065**	**6,346**	**7,449**	**9,069**	**10,300**	**14%**
* Share of China in World exports	*4.4%*	*5.1%*	*5.9%*	*6.5%*	*7.4%*	

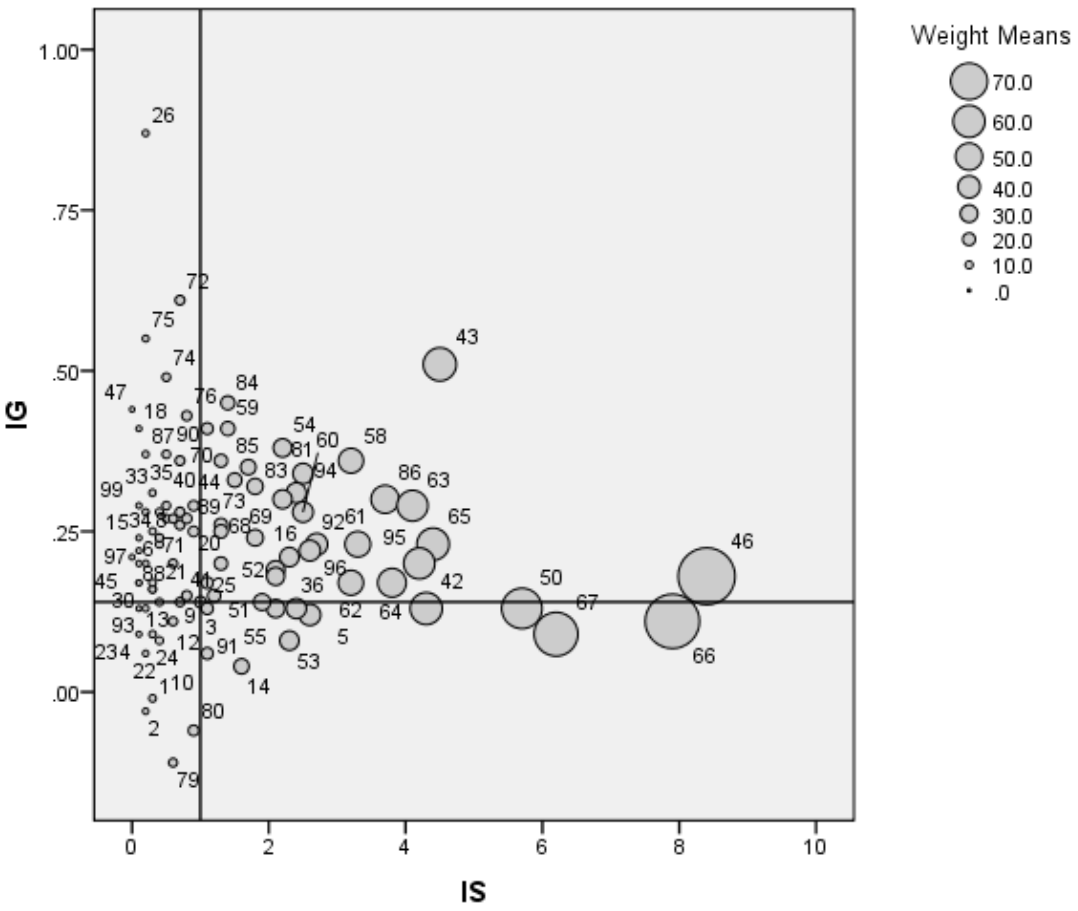
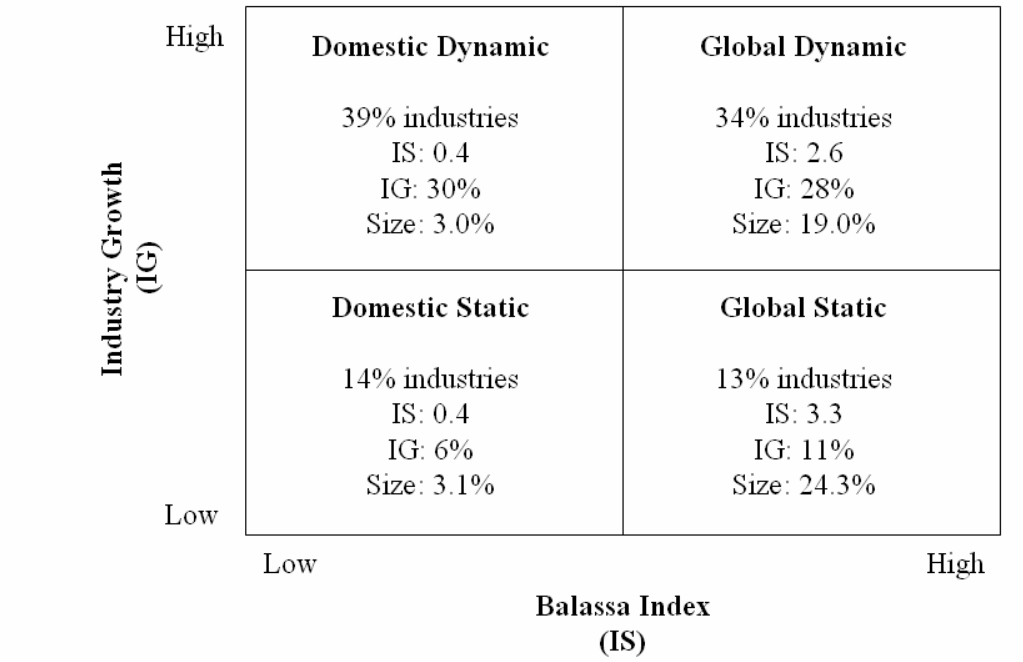


Figure 2: Chinese Industry Export Competitiveness



IS: Industry Specialization; IG: Industry Growth Rate; Size: Export Market Share
% = percent of the total number of Chinese industries

Figure 3: Typology of Industry Export Competitiveness: Aggregated Data (2005)

Table 2: ANOVA Test of Category Differences

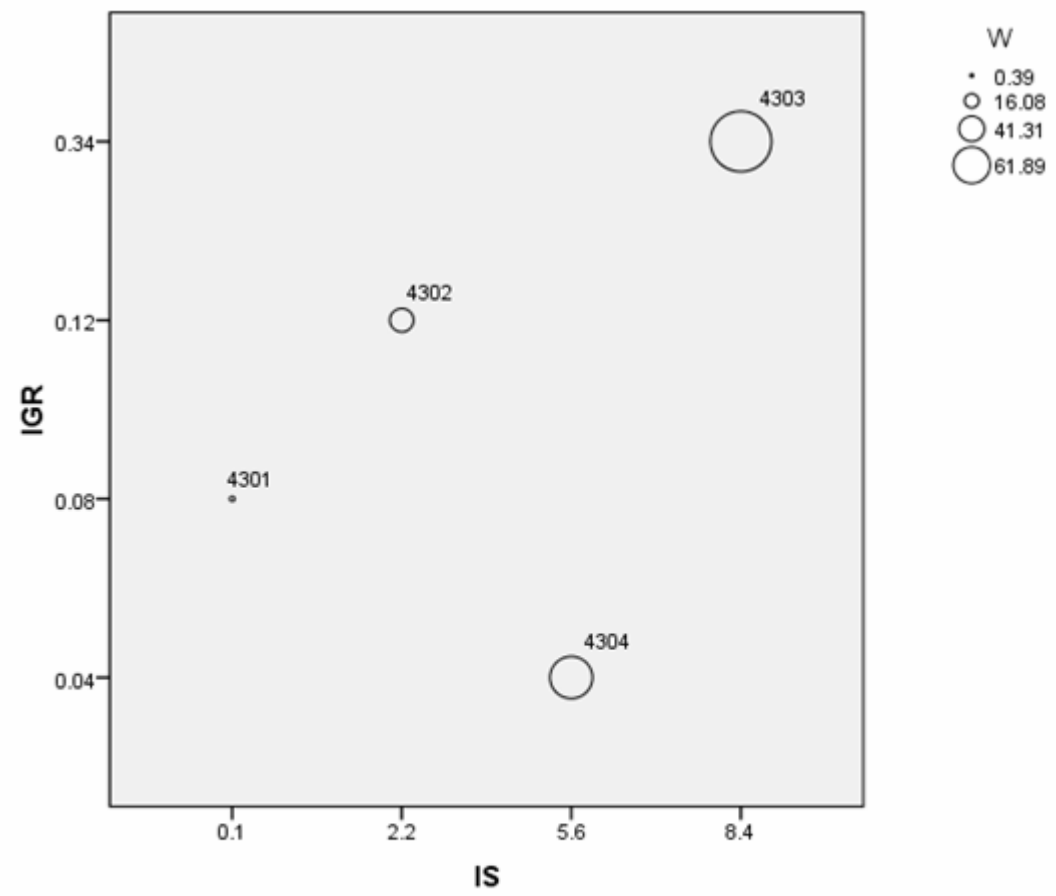
	Mean					
	Domestic Static (1)	**Domestic Dynamic (2)**	**Global Static (3)**	**Global Dynamic (4)**	**F**	**Sig.**
IS	0.43	0.40	3.27	2.56	33.29	.000*
IG	0.06	0.30	0.11	0.28	22.77	.000*
Size	3.14	2.96	24.26	18.96	33.42	.000*
Note: Figure in parentheses are standard deviations * Significant at the 0.05 level.						

Table 3: ANOVA results - Post hoc Tukey HSD Test

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
W	1	2	0.18	2.71	1.00
		3	-21.11*	3.41	0.00
		4	-15.82*	2.76	0.00
	2	3	-21.30*	2.87	0.00
	2	4	-16.00*	2.06	0.00
	3	4	5.29	2.92	0.27
IS	1	2	0.03	0.37	1.00
		3	-2.83*	0.46	0.00
		4	-2.13*	0.37	0.00
	2	3	-2.87*	0.39	0.00
	2	4	-2.16*	0.28	0.00
	3	4	0.70	0.40	0.29
IG	1	2	-0.23*	0.03	0.00
		3	-0.04	0.04	0.75
		4	-0.21*	0.04	0.00
	2	3	0.19*	0.04	0.00
	2	4	0.02	0.03	0.81
	3	4	-0.17*	0.04	0.00
*. The mean difference is significant at the 0.05 level.					

Table 4: China's Top Exporting Industries for 2005

Code	Industry	IS	IG (01-05)_	Size	Category
46	Manufactures of plaiting material, basketwork	8.4	0.18	61.8	Global Dynamic
66	Umbrellas, walking-sticks, seat-sticks, whips, etc	7.9	0.11	58.7	Global Static
67	Bird skin, feathers, artificial flowers, human hair	6.2	0.09	46.1	Global Static
50	Silk	5.7	0.13	42.0	Global Static
43	Furskins and artificial fur, manufactures thereof	4.5	0.51	33.4	Global Dynamic
65	Headgear and parts thereof	4.4	0.23	32.3	Global Dynamic
42	Papers of leather, animal gut, travel goods	4.3	0.13	32.1	Global Static
95	Toys, games, sports requisites	4.2	0.20	31.0	Global Dynamic
63	Other made textile papers, sets, worn clothing etc	4.1	0.29	30.6	Global Dynamic



43 Furskins and artificial fur, manufactures thereof
4301 Raw furskins & pieces suitable for furriers' use, nes
4302 Tanned or dressed furskins & pieces, unassembled or assembled
4303 Articles of apparel, clothing access and other articles of furskin
4304 Artificial fur and articles thereof

Figure 4: Example of Industry HS 43

Appendix 1: 2-Digit HS Codes

Nr. Industry	Nr. Industry
01 Live animals	50 Silk
02 Meat and edible meat offal	51 Wool, animal hair, horsehair yarn and fabric thereof
03 Fish, crustaceans, molluscs, aquatic invertebrates	52 Cotton
04 Dairy products, eggs, honey, animal product	53 Vegetable textile fibres nes, paper yarn, woven fabric
05 Products of animal origin	54 Manmade filaments
06 Live trees, plants, bulbs, roots, cut flowers etc	55 Manmade staple fibres
07 Edible vegetables and certain roots and tubers	56 Wadding, felt, nonwovens, yarns, twine, cordage, etc
08 Edible fruit, nuts, peel of citrus fruit, melons	57 Carpets and other textile floor coverings
09 Coffee, tea, mate and spices	58 Special woven or tufted fabric, lace, tapestry etc
10 Cereals	59 Impregnated, coated or laminated textile fabric
11 Milling products, malt, starches, inulin, wheat	60 Knitted or crocheted fabric
12 Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	61 Papers of apparel, accessories, knit or crochet
13 Lac, gums, resins, vegetable saps and extracts nes	62 Papers of apparel, accessories, not knit or crochet
14 Vegetable plaiting materials, vegetable products	63 Other made textile papers, sets, worn clothing etc
15 Animal,vegetable fats and oils, cleavage products	64 Footwear, gaiters and the like, parts thereof
16 Meat, fish and seafood food preparations nes	65 Headgear and parts thereof
17 Sugars and sugar confectionery	66 Umbrellas, walking-sticks, seat-sticks, whips, etc
18 Cocoa and cocoa preparations	67 Bird skin, feathers, artificial flowers, human hair
19 Cereal, flour, starch, milk preparations/ products	68 Stone, plaster, cement, asbestos, mica, etc papers
20 Vegetable, fruit, nut, etc food preparations	69 Ceramic products
21 Miscellaneous edible preparations	70 Glass and glassware
22 Beverages, spirits and vinegar	71 Pearls, precious stones, metals, coins, etc
23 Residues, wastes of food industry, animal fodder	72 Iron and steel
24 Tobacco and manufactured tobacco substitutes	73 Papers of iron or steel
25 Salt, sulphur, earth, stone, plaster, lime/cement	74 Copper and papers thereof
26 Ores, slag and ash	75 Nickel and papers thereof
27 Mineral fuels, oils, distillation products, etc	76 Aluminium and papers thereof
28 Inorganic chemicals, precious metal compound	78 Lead and papers thereof
29 Organic chemicals	79 Zinc and papers thereof
30 Pharmaceutical products	80 Tin and papers thereof
31 Fertilizers	81 Other base metals, cermets, papers thereof
32 Tanning, dyeing extracts, tannins, derivs,pigments	82 Tools, implements, cutlery, etc of base metal
33 Essential oils, perfumes, cosmetics, toileteries	83 Miscellaneous papers of base metal
34 Soaps, lubricants, waxes, candles	84 Boilers, machinery; nuclear reactors, etc
35 Albuminoids, modified starches, glues, enzymes	85 Electrical, electronic equipment
36 Explosives, pyrotechnics, matches, pyrophorics,	86 Railway, tramway locomotives, rolling stock
37 Photographic or cinematographic goods	87 Vehicles other than railway, tramway
38 Miscellaneous chemical products	88 Aircraft, spacecraft, and parts thereof
39 Plastics and papers thereof	89 Ships, boats and other floating structures
40 Rubber and papers thereof	90 Optical, photo, technical, medical, etc apparatus
41 Raw hides and skins and leather	91 Clocks and watches and parts thereof
42 Papers of leather, animal gut, travel goods	92 Musical instruments, parts and accessories
43 Furskins and artificial fur, manufactures thereof	93 Arms and ammunition, parts and accessories thereof
44 Wood and papers of wood, wood charcoal	94 Furniture, lighting, signs, prefabricated buildings
45 Cork and papers of cork	95 Toys, games, sports requisites
46 Manufactures of plaiting material, basketwork	96 Miscellaneous manufactured papers
47 Pulp of wood, fibrous cellulosic material, waste	97 Works of art, collectors pieces and antiques
48 Paper & paperboard, papers of pulp, paper/board	99 Commodities not elsewhere specified
49 Printed books, newspapers, pictures etc	