

RESEARCH PAPER**Link between Export and Productivity: Industry-Level Analysis****1. INTRODUCTION**

In this paper, I explore the link between export activity and industry productivity. While the role of trade in promoting economic well-being has a long tradition in trade literature, discussions of the role of exports in stimulating growth in general, and productivity in particular, has been a much-debated topic and an ongoing one for many years. However, economic theory links international trade and export in the sense that, participating in international trade increases productivity. It is believed that there is a direct link between export and productivity even though empirical evidence has been mixed and inconclusive. In studying the relationship between export and productivity, a few issues arise: Is there causality between trade and productivity and, if causality exists, what is the direction of causality? Does productivity cause export growth or does export cause productivity growth?

Although a couple of models have been constructed to explain the relationship between export and productivity, we cannot simply say that export and productivity are causally related. Different unanticipated and unaccounted factors could be driving the relationship between export and productivity. Hence this review aims to summarize relevant papers on the relationship between export and productivity and hopefully serve as a guide for future research.

The review is organized as follows: In section two, I introduce the export-led productivity and the growth-driven export hypotheses. In section three, classical and new trade models will be introduced and explore on how these models explain the hypotheses in section two. In section four, I examine empirical literature aimed at examining the relationship between export and

productivity. In section five, I review briefly the link between exports and productivity in light of the rise of China. Lastly, I write a conclusion and summarize what this term paper tried to accomplish.

2. EXPORT-LED GROWTH HYPOTHESIS VS GROWTH-DRIVEN EXPORT HYPOTHESIS

Over the years, several hypotheses have been formulated to explain the relationship between exports and productivity. These formulations mainly focus on whether export causes productivity growth or productivity growth rather causes export expansion. The core hypotheses formulated for this phenomenon are the Export-Led Growth Hypothesis and the Growth-Driven Export Hypothesis. (Kunst and Martin, 1989; Henriques and Sadorsky, 1996).

The literature on international trade, which suggests that export growth causes positive productivity growth through various externalities is known as the export-led-growth hypothesis. This hypothesis postulates that export expansion or growth leads to productivity growth in the sense that an external demand enables a small open economy to exploit economies of scale which will make domestic firms competitive internationally and boost productivity growth. The proponents of this hypothesis argue that export promotion through policies such as exchange rate depreciation or export subsidies will increase have a significant effect on productivity. Proponents use several arguments to prove their points. However, the heart of the arguments underlying the export-led growth hypothesis is that competition in international markets boost productivity and increases efficiency by concentrating resources in sectors in which the country has a comparative advantage in. (Kunst and Martin, 1989; Henriques and Sadorsky, 1996)

The second hypothesis, the productivity growth-driven export hypothesis, proposes a contrasting relationship between exports and productivity. It is based on the idea that productivity growth induces trade flows. It can also create comparative advantages in certain capacities leading to

specialization and facilitation of exports (Konya, 2004). That is, when a country achieves high and sustained growth in productivity, it will lead to an expansion of that country's exports. Hence this hypothesis typically stresses the causality that runs from home-factor endowments and productivity to the supply of export.

However, these two hypotheses to explain the relationship can co-exist as far as the relationship between export and productivity growth is concerned. There exist a notion of a feedback relationship between exports and economic growth called the bi-directional causality which has gained much attention in empirical research these days (Konya, 2004; Kunst and Martin, 1989).

The direction of causation is therefore important to know because discovering the direction of causation has important policy implications for development strategies. It is worthy of note that if a definite unidirectional causality running from productivity to exports is found, then it would imply that a higher level of productivity is needed for export expansion. If the direction of causation is running from export expansion to productivity, then it would lead credence to the export-led growth strategy. If the causation is bi-directional, then exports and productivity have a reciprocal relationship. If there is no causality between exports and productivity, then it implies alternative strategies rather than export promotion may be needed to structurally transform an economy. So for a future project based on the relationship between export and productivity, the following study hypothesis can be tested,

Ho: There is no link between exports and productivity at the industry level.

vs

Ha: There is a link between exports and productivity at the industry level.

If a link is found, that is if Ho is rejected, what is the direction of causality? Does export cause productivity growth (export-led growth hypothesis) or does productivity growth cause export (growth-driven export hypothesis)? Or is there a bi-directional causality? The direction of the

relationship between exports and productivity has very crucial insinuations for the way industrial policy can be conducted to stimulate productivity growth.

3. CLASSICAL TRADE THEORIES AND NEW TRADE THEORIES

The starting point of the discussion comes from a basic question: whether countries engaging freely in international trade benefit from improved growth in general, and improved productivity in particular.

However, because different countries are associated with different kinds of specializations, they must engage in international trade. The theory of absolute advantage provided by Adam Smith in 1776 supports this claim and states that countries should only produce goods in which it can produce at a lower cost than another country (implying that the country has an absolute advantage in that good). Furthermore, when a country has an absolute advantage in the production of a good, it also means that fewer inputs and less time are needed to provide the same amount of goods as compared to producing it in another country. Greater overall efficiency and particularly higher productivity in production create an absolute advantage, which allows for beneficial trade for all countries whereby countries can specialize and then, through trade, benefit from other countries' specialization. Hence, a country can improve its wealth if it is specialized in producing goods and services that it has an absolute advantage in, as compared to the other nations and should import those goods and services that it carries absolute disadvantage in. Theory of absolute advantage, however, had a certain limitation because it inherently suggested that a country will not import any good or service in case it had an absolute advantage in all goods and services it produces. (Dunn and Mutti, 2004).

The limitation in the theory of absolute advantage was overcome by the theory of comparative advantage advocated by Ricardo. The comparative advantage developed by David Ricardo in 1817 stated that a country under free trade will have a comparative advantage over other countries in

producing a particular good or service if it can produce that good at a lower relative opportunity cost or higher relative productivity. Hence a country should specialize in the production of goods and services, which can be produced more economically as compared to other countries. So even if one country is more efficient in the production of all goods (absolute advantage) than the other countries, all countries will still gain by trading with each other, as long as they have different relative efficiencies and productivity. This implies that, despite a country having absolute disadvantages in producing a good and service, the country can still export the goods and services that it carries the smallest absolute disadvantage in and import the goods and services it has the largest absolute disadvantage in. (Dunn and Mutti, 2004).

Likewise in the framework of comparative advantage, as it was in the theory of absolute advantage, a country whose labor was more efficient and productive at producing a good will produce and export that good.

These classical theories also suggest that productivity causes export growth. Absolute advantage indicates that a country will specialize in a good with a lower unit labor requirement and higher labor productivity than another country. Also, comparative advantage indicates that a country will specialize in a good in which the country has a relative productivity advantage (disadvantage) is the greatest (smallest). Furthermore, the Dornbusch-Fischer-Samuelson (DFS) model which extends the widely accepted theory of comparative advantage posits that growth in productivity causes more trade: intra-marginal trade rises (we export more of the same products) and marginal trade (we start to export in new product categories). These theories taken together suggest that countries will engage in exporting goods of an industry if that industry is productive as compared to industries of the same nature in other countries.

Notwithstanding the assumptions about labor made in classical trade theories, these classical trade

theories also assumed the homogeneity of goods. However, in the 1980s, the so called new trade theories assumed the heterogeneity of goods. The new trade theories initially associated with Paul Krugman suggested that an important factor in determining patterns of trade are the very significant economies of scale and network effects that can occur in key industries of different countries (Krugman 1987). These network effects and economies of scale can be so substantial that they outweigh the more classical trade theory of comparative advantage. In some industries, different countries may have no discernible differences in opportunity cost at a particular point in time. But, if a country specializes in a particular industry then it may gain economies of scale and other network benefits from its specialization. Economies of scale in this sense occurs when increasing production leads to lower long-run average costs. This means that as firms become big, they become more efficient. Also, the new trade theories suggest that opening to trade allows countries to take advantage of increasing return to scale at either the firm or the industry level. Hence, trade promotes productivity (Neary, 2009). However, it should be noted that trade can lower productivity as sectors contract. Each of the above theories (absolute advantage, comparative advantage and new trade theories) basically supports the export-led growth hypothesis. (Deme, 2002)

More recently, numerous research has emerged investigating why exporting and productivity might be linked at the firm level and ultimately at the industry level. These recent researches collectively referred to as the “new” new trade theories proceeded from firm heterogeneity in explaining the benefits of global production networks. These theories (prominent example being Melitz’s 2003 model) provide a theoretical framework suggesting that as more firms opened up to export trade, other firms within the industry would either rationalize or exit from the export market. Implying that resources are reallocated from the less efficient firms to the more efficient firms. In

this way, more productive firms will tend to enter export markets, forcing less productive firms to focus on the domestic markets and unproductive firms to exit the market. Therefore, this results in productivity gains at the level of the industry. Furthermore, the productivity of individual firms might stay unchanged, however, a country can still raise the level of productivity in an industry and even across all sectors through engaging in trade with other countries. However, these firms can increase their productivity as a consequence of exporting too. Hence, these “new” new trade theories eventually arrive at the conclusion that the trade induced reallocations towards more efficient firms explain why engaging in trade may generate aggregate industry productivity without necessarily improving the productive efficiency of individual firms.

The introduction of the role of firm heterogeneity in international trade has unleashed literature that analyses the role of investment, innovation and labor market implications of trade liberalization in the context of heterogeneous firms. One such literature is the “porter hypothesis” introduced in 1991 by Michael Porter. This hypothesis introduces a new perspective on the relationship between environmental regulation and the degree to which a country can produce goods and services to meet the test of international markets under free and fair market conditions. The porter hypothesis postulates that stringent environmental regulation, can induce efficiency and encourage innovations in firms that will not inevitably hinder competitive advantage. These strict environmental regulations cause the unearthing and introduction of environmental improvements and cleaner technologies (the innovation effect), making products and the production processes more efficient. In short, strict environmental regulation increases productivity and this exerts an influence on exporting (trading) activities of firms. (Marcus Wagner, 2004).

Hence all these theories, both the classical, the new trade theories and dynamic trade theories taken together provide a concrete foundation to believe that there is a link between exports and

productivity and provides us with more theoretical grounds to investigate this relation at the industry level.

4. SOME EMPIRICAL LITERATURE ON THE LINK BETWEEN EXPORT AND INDUSTRY PRODUCTIVITY

While this paper focuses on the relationship between export activity and industry productivity, it should be stated that import (access to import market) activities have a relationship with productivity as well. Productivity is affected by imports by expanding input variety as well as improved input quality. Halpern, Koren and Szeidl (2005) explored this relationship using product-level import data for a panel of Hungarian manufacturing firms from 1992 to 2001. To do this, a model of importers that captures the fixed cost of importing a given product variety is built. This leads to a production function where productivity depends on the import share of inputs. The production function is estimated by using entry into import markets to back out productivity. The conclusion from the analysis indicated that greater imports have a large and significant effect on the productivity of firms. Irrespective of the importance of the relationship between imports and exports, it doesn't matter for some sectors. Imports matter for some industries, export for others. This paper will very much focus on the industries and sectors where export matters.

The first real issue that arises when carrying out an empirical investigation of the association between export and productivity is how productivity is going to be defined because the word has become synonymous with different purposes. The meaning of productivity has ranged from efficiency to effectiveness, to a measure of rates of turnover, to a measure of customer satisfaction. But in general, productivity refers to output per unit of input. In many contexts, it may mean multifactor productivity, or partial productivity (e.g. labour productivity). It can also refer to total factor productivity (TFP), which adjusts labour productivity due to differences in capital and other inputs. Depending on the direction of the research or the availability of data, any of these

definitions could be used.

Measuring productivity can be taken from the perspective of a single enterprise, industry or economy as a whole. Also, for any measure, there exist numerous approaches in estimating those measures. However, it is common to find studies of this nature using TFP growth as a measure of productivity. This implies that capital, labour, and materials and their changes in value are aggregated and analyzed using the measure of total factor productivity index. However, a new issue arises which is that, in practice, both measurements of inputs and outputs involve aggregation problems. (Burinskiene 2012)

Testing methodologies also varied in research. One approach examines causality using aggregate data. The second approach uses firm-level data to test empirically the exporting-productivity relationship.

By examining causality between export and productivity using aggregate data, Kunst and Martin (1989), Yamada (1998), Nurhani (2011), Nessel (2004) and Dhiman and Sharma (2019) tested the export-led growth hypothesis. These literatures used the volume of export of goods as the export variable in their study. Hence, in this case, the volume of trade mattered.

Measuring productivity as output per employee in the manufacturing sector, Kunst and Martin (1989) used Austrian time series data to test the export-led growth hypothesis. The granger causality method was applied using a four-variable vector autoregressive (VAR) model to assess the causality and the results from the analysis implied that export did not cause productivity growth, but productivity growth may Granger-cause export. Furthermore, the GDP of the OECD countries was included in the analysis to control for export growth which resulted from productivity but growth in the world economy. A Subset Model Autoregression (SMAR) was

implemented by restricting statistically insignificant lags to zero to account for medium-term influences. The export-led growth hypothesis was rejected after analysis.

Even though Kunst and Marin (1989) studied the direction of causality between exports and productivity using a four-variable vector autoregressive (VAR) model (comprised of export, labor productivity, terms of trade, and GDP), their study suffered from a major weakness and their empirical results must be considered with an appropriate degree of caution. The weakness exhibited by their study is that they failed to consider the cointegration properties of the variables. To deal with this weakness, Yamada (1998) set up a four-variable VAR model for the analysis with the consideration of the cointegrated properties of the variables. He applied a Lag augmented VAR model and used the Granger causality test with the maximum order of integration of each variable, which was at most two. He essentially arrived at the same conclusion as Kunst and Marin (1989) found which was that there was no causal link from export to productivity. However, the research by Yamada (1998) also suffered from a weakness which was that although his study took the possibility of cointegration relations of the variables into account, the specification of his econometric model could be feasibly inaccurate because it imposes the assumption that at most one cointegrating relationship exists among the variables.

Nurhani (2011) has examined the direction of the causality between exports and productivity growth for Malaysian industries by using causality tests within an error-correction framework. The error correction mechanism (ECM) was applied to model the dynamic movement of the variables in any period that was related to the previous period's gap from its long-run equilibrium. Applying the ECM, the Engle–Granger two-step procedure was used. The first step involved estimating the long-run models and the second step involved transforming variables to first difference and lagging the error terms by one period. After confirming the long run or cointegration relation, the results

of the ECM are checked to see if they are robust to the Granger multivariate causality models. The measure of productivity used in this study was Labor productivity which was defined as the real gross output (in US\$) divided by the number of employees. Further, using a panel of 63 manufacturing industries and a total of 1197 observations for the period of 1981 to 1999 obtained from the United Nations Industrial Development Organization (UNIDO) dataset, the findings lend support to both the export-led growth and the growth-driven export hypotheses. This implied that there was a bidirectional causality between exports and productivity, and according to the author, it added to the possibilities of the existence of indirect causalities between them through capital intensity and size.

Nesset (2004) studied the direct relationship between growth in export and growth in productivity (the export-led growth hypothesis) using aggregated Norwegian quarterly time series data from 1968 to 1992. Techniques of multivariate cointegration and statistical congruent vector autoregression (VAR) model were employed for the identification of causal links. Productivity was measured as the value-added labor productivity in manufacturing and construction. The results indicated that labor productivity can be regarded as “super exogenous” concerning the parameters in a simultaneous system of export price and export volume. This lent support to the growth-driven export hypothesis as foretold by the Ricardian model of international trade or some of the models within the “new” trade theory. According to the author, this implied that the export model under consideration for this study seemed to be autonomous concerning productivity initiatives or to put it another way, productivity structurally causes export volume and prices. This lead to the policy recommendation that we should not promote policies that are export-oriented e.g. subsidies but instead give more preference to policies that provided direct productivity stimulus e.g. R&D, infrastructure or general educational support.

Much modern research and literature in this area do not put much emphasis on the causal relationship between export and productivity at the industry level due to problems associated with the use of aggregate data that might influence the results of the study. One of the main points of this researches is that it might be more proper to examine the association between international trade and productivity at the firm level rather than at the industry level. Aggregate data is too high for trying to use it to answer the question of whether participation in international trade influences trade because these data could be affected by a country's macroeconomic policies. This trend of research is amplified by the prominent Melitz's (2003) model.

Using firm-level data, Wagner (2007), Imbruno (2009), Lu & Tao (2020), and Brakman et al (2020) have investigated empirically the exporting-productivity linkage from the perspective of the Melitz (2003) model. These literatures were more focused on exports as a firm's exposure to international trade or export markets. Hence, in this case, just the exposure to trade was enough for analysis to be carried out.

Imbruno (2009) used a panel of Italian manufacturing firms for investigation and concludes that exporters were more productive than non-exporters and this productivity gap could be due to high-performance firms being able to serve foreign markets rather than post-entry effects. The econometric methodology to arrive at this conclusion was divided into two. First, the correlation between firm productivity and sector trade intensity was analyzed to stress the gap between exporters and non-exporters. OLS estimation for panel data (Fixed effect, Random effect and pooled models) was used at this point. Second, the direction of causality between firm performance and exporter status was examined to test whether firms became productive by exporting or only highly productive firms entered the export market. At this point, only a cross-section OLS estimation was used. The results from this analysis found that solely the high-productive firms

enter export markets as emphasized by Meltiz (2003) model.

This recent literature also proposes that as more firms open up to export trade, other firms within the industry would also rationalize themselves and therefore this results in productivity gains at the industry level. Although the firm-level studies use highly disaggregated data and the industry-level studies use highly aggregated data, the conclusion remains that exports and productivity are linked at the firm level and ultimately at the industry level through different dynamics. Furthermore, although the industry-level studies are unable to capture the heterogeneity of firms in the industry, such a study is justified not just because of the same theoretical conclusions arrived at by the theories driving both industry-level and firm-level studies, but also because of the confidential nature and complex issues faced in obtaining firm-level data. Hence any future project based on this term paper will use industry-level data.

5. THE LINK BETWEEN EXPORTS AND PRODUCTIVITY BEFORE AND AFTER THE RISE CHINA

The rise of China, if it lasts, may be the most significant trend in the world for the next couple of decades because China's exports have risen since it entered into the World Trade Organization (WTO) in 2001 (Feenstra and Sasahara 2018). This, in turn, has made China a major commercial and trading partner of many countries. As China's economy has developed and increased its global economic influence, this will have significant implications on the economies of its trading partners. Most countries have become increasingly reliant on trade with China concerning exports from China (Morrison, 2014 & Kwan, 2013). Feenstra and Sasahara (2018) noticed for instance that U.S. imports of merchandise from China between the periods 1995 to 2011 led to reduced demand of 1.4 million jobs in manufacturing and 0.6 million in services.

China through the process of opening up its economy has expanded its exports by mobilizing surplus labor in the rural areas and specializing in labor-intensive products by bringing in foreign capital. This has increased the global supply of labor-intensive products as well as increased the global demand for primary commodities and technology-intensive products. These changes in the supply and demand relationship work through price changes to effect changes to the terms of trade (the comparative price of exports to imports) for China and for that of the rest of the world.

Changes in the terms of trade of countries through changes in relative prices concerning the rise of China is expected to result in industrial realignment on a global scale by prompting resource allocation. It is expected that in advanced industrial countries, the production of several labor-intensive products will be transferred to China through direct investment which will result in a hollowing out of industry unless new industries arise to replace them. This is expected to lead to a fall in exports of labor-intensive products from countries that move production of such products to China. Hence, in a resource-exporting country, the primary commodities' share of exports is expected to rise in contrast to industrial products' share of exports which is expected to fall. This implies that a country that is endowed with natural resources will likely lose its international competitiveness in many areas other than resources. (Morrison, 2014 & Kwan, 2013).

Further, as China's economic growth rate is expected to exceed the world average by a large margin (although it will start to decline), countries' dependence on trade with China is likely to continue to rise in the future. Other countries may gain or lose in terms of export share through changes in terms of trade and industrial realignment. However, the scale of the gain or loss will depend on that country's competitive and complementary relationships with China. These gains or losses are sure to trigger some productivity changes in industries of these countries. Hence, it will be of great importance to include as part of any study the impact of the rise of China. The rise of China can

be thought of as a natural experiment that allows us to see how increasing Chinese competitiveness on world markets has altered domestic productivities. This is interesting in that the China Shock should elicit productivity improvements if the export-led-hypothesis is correct. Thus, this analysis would be another way to test one of the hypotheses about the link between exports and productivity. A future project based on this term paper will try and achieve this objective. (Morrison, 2014 & Kwan, 2013).

6. CONCLUSION

This paper tried to explore the relationship between exports and productivity at the industry level. The paper starts by explaining the export and productivity hypotheses of export-led growth hypothesis and the growth-driven export hypothesis in detail as to how these hypotheses captured and explained the direction of causality between export and productivity. Furthermore, the major theoretical trade models of absolute advantage, comparative advantage, new trade models, the “new” new trade models championed by Melitz’s (2003) and the “Porter Hypothesis” were reviewed. Some empirical literature was provided for previous researches which aimed to study the nature of the link between exports and productivity using uniquely different approaches as well as literature on some studies that probed the link between exports and productivity by focusing on the characteristics of the industries studied. Additionally, I describe briefly the rise of China and its impact on the relationship between exports and productivity in a country could be a good area to explore in a future project. Finally, with the question as to if this term paper could be developed into a project, I believe that with an industry-level data, research could be carried out not just to investigate the conclusions of the classical trade models but also the conclusions made about aggregate productivity at the industry level by the “new” new trade models championed by Melitz’s (2003) who although advocate the use of firm-level data.

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