Exploring the Potentials of Pakistani Exports in Chinese Economy: A New Approach Based on the Calculation of Extensive and Intensive Margins

*Anabia Maham

Abstract: This study attempts to explore that whether Pakistan should follow Export Intensification or Export Diversification policy for increasing its trade share in Chinese market. By employing the dataset for the period 2003-2015 the study initially computes the trade intensity index to observe the intensity of Pakistan-China bilateral trade relations and afterwards it evaluates the export growth of Pakistani products by calculating extensive and intensive export margins based on the methodology followed by Hummels & Klenow, (2005). Disaggregated trade data at HS six digit level has been extracted for two categories i.e. top most and bottom least products being exported by Pakistan to China. The findings indicate that in case of top most products exported by Pakistan to China, Pakistan is following the policy of export intensification, and the export penetration index shows that the share of Pakistani products in Chinese market is increasing by 15% per annum while on the other side in case of products which are least exported, Pakistan is following the policy of export diversification with the growth rate of exports 5% per annum. These findings helps in asserting this fact that export intensification can be more effective in increasing share of Pakistan's exports in Chinese market instead of export diversification.
Key Words: Trade Policy, Chinese Economy, Exports, Penetration, Diversification, Intensification, Trade Margins, Trade Intensity Index, Growth.

1: Introduction

Trade expansions can be associated with: a) Enlarged varieties of tradable goods b) Expanded volumes of traditional goods c) Improved quality of traded goods d) Intensified efficiency of exporting firms. Traditional trade theories (the Ricardian model and the Hecksher-Ohlin model) highlighted the gains from specialization in exports by emphasizing the role of productivity and factor endowments which determine a country's comparative advantage.
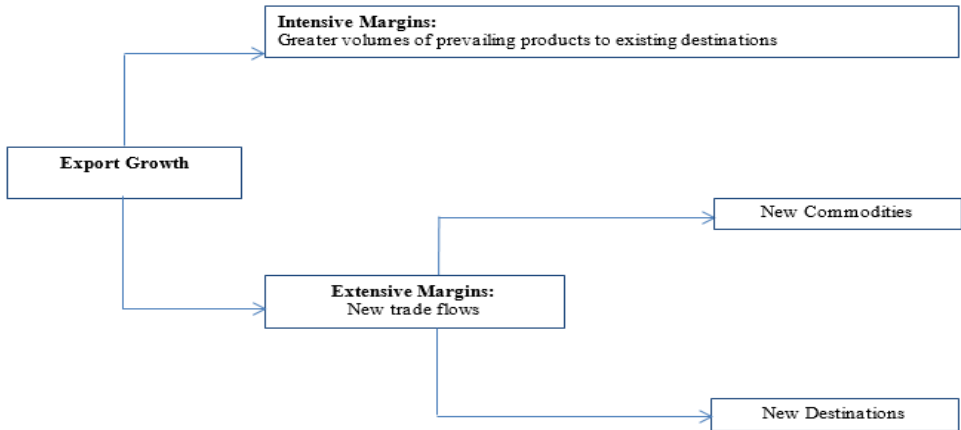
In 1980s, various economists, among others,(Helpman & Krugman, 1985) established a "New Trade Theory" which included consumers' preference for product varieties and increasing returns to scale. This new theory

describes how increasing returns to scale and product differentiation lead to intra-industry trade emphasizing the importance of product diversification. More recently, research done by some economists, particularly (Melitz, 2003) has directed to a "New New Trade Theory" which focuses on the role of heterogeneous firms in international trade. According to this theory globalization and trade liberalization lead to shifts of production from inefficient firms to efficient firms within an industry. There is now a large empirical literature on trade flows that directly or indirectly explores the relevance of the above theories. One aspect of the empirical research has analyzed the outcomes of trade liberalization on firm productivity and product diversification among others, specifically by the authors Baldwin & Gu, (2003, 2004). Another aspect of the empirical literature has examined the extensive and intensive margins of trade like the research conducted by the authors Andrew, (2009); Hummels & Klenow, (2005).

Study of intensive and extensive trade margins develops the understanding of trade patterns and the comparative efficiency with which economies distribute resources. Before moving further let us clearly define these two terms; Extensive Margins and Intensive Margins. The extensive margin is defined as growth of trade resultant to an increase in the number of product varieties while the intensive margin is measured as growth of trade due to an increase in existing bilateral trading relationship (Figure 1). This study aims to explore the possibilities of beneficial trade between Pakistan and China by using this new approach of margins product wise just to know that in which case Pakistan should use the policy of intensive margins and where Pakistan can have more chances to enhance its exports by introducing product diversification to the same destination.

Figure 1: Disintegration of export growth – a structure for determining trade competitiveness

Intensive Margins:
Greater volumes of prevailing products to existing destinations

Export Growth

New Commodities

Extensive Margins:
New trade flows

New Destinations

Source: Author's own compilation

1.1 Objectives of the study:

The research will contribute to literature in a number of ways.

- First, it will provide a comparative perspective to check the relative significance of both margins in the economy of China which has already become a successful exporter.

- Secondly, it will contribute in the calculation of extensive and intensive margins of Pakistan exports in the market of China by employing the methodology of (Hummels & Klenow, 2005) taking top most and bottom least products exported by Pakistan to China.

1.2 The China-Pakistan Strategic Relationship

Here in this section there is a brief history of Pak-China trade relations. China and Pakistan signed the border demarcation agreement in 1963. Since then, the relationship between the two nations has steadily grown in strength. The Sino-Pak relationship has been become stronger since the year 2000. Trade between Pakistan and China in 2003 was $697 million which has been increased to $12 billion in 2015, while the exports of Pakistan to China have increased from $260 million in 2003 to $2 billion in 2015. On the other hand, the exports of China to Pakistan have been increased from $957 million in 2003 to $11 billion in 2015. The following

Table and figure demonstrate Pakistan exports to and imports from China from 2003 – 2015.

Table 1: Pakistan Exports to and Imports from China

Year	Pakistan Exports to China US$ Million	Pakistan Imports from China US$ Million
2003	260 M	957 M
2004	287 M	1140 M
2005	436 M	2349 M
2006	507 M	2915 M
2007	614 M	4164 M
2008	727 M	4738 M
2009	998 M	3780 M
2010	1436 M	5248 M
2011	1679 M	6471 M
2012	2620 M	6688 M
2013	2652 M	6626 M
2014	2253 M	9588 M
2015	1935 M	11019 M

Source: UNCOMTRADE Database

Table 1 has also been shown graphically in figure given below. Two trend lines are depicting the pattern of Pakistan's trade with china, blue line showing exports from Pakistan to the Chinese economy and red line is reporting the story of other side of coin i.e. how much Pakistan is importing from china. And the situation is quite clear that our exports are very much low than imports.
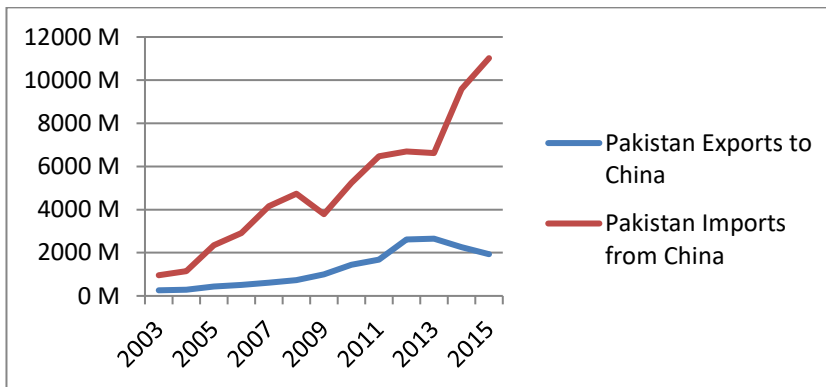
Source: UNCOMTRADE Database
Figure 1. Pakistan Exports to and Imports from China

Exports of a country grow because of two margins. Exports rise because of exporting new products to new markets or existing products to new markets or new products to existing markets, which is called extensive margin. On the other hand, exports can grow because of exporting more products to existing firms, which is considered as intensive margin.

2: Literature Review

The empirical literature on this relationship between export margins and export performance is quite thin however the summary of recent available research works is given below just to highlight the importance of idea developed under this study.

Del Rosal (2019) examined the relationship between export diversification and export performance using the dataset for Spain and its partner nations. The main finding of the study was a positive relationship between these two variables. However by employing export demand function, disentangling product and geographical diversity are considered to be important factors when focusing on the issue of export diversification.

Fan et al. (2018) utilized disaggregated trade data on China's imports from the United States of America and progressive rates between Chinese Yuan (CNY) and US Dollar (USD) on the non-deliverable exchange market. They showed that the impact of current exchange rate on import is different from the impact of future exchange rate on import. That is, due to increase in spot exchange rate, both the extensive and intensive margins of imports will be expanded. On the other hand, due to increase in future exchange rate

the extensive margin rather than the intensive margins of imports will be expanded.

Aldan et al. (2016) investigated the effect of extensive margin on Turkish export growth between 1995 and 2013, in contrast with other countries. Turkey enlarged its extensive margin contrasted to other less developed countries successfully. The extension of the extensive margin is still short as of 2013 contrasted to the other countries. They examined that Turkey still has significant chances to enlarge its exports through extensive margin particularly in products.

Naknoi (2015) utilized quarterly data of US bilateral trade with 99 countries. The work provided new confirmation that over the business cycle, the extensive margins of trade vary. They displayed that the extensive margin of exports to US and the extensive margin of imports from the US are better instable than the output of almost all trading partners.

Feenstra et al. (2014) studied the link among export variety and trade facilitation. They studied trade facilitation utilizing port efficiency. By utilizing port efficiency, they studied trade facilitation. They formed that port efficiency is significantly affected by the extensive margin on the other hand bilateral import tariff influenced negatively by the extensive margin of export. They examined that positive effect is established when inspecting trade between countries without communal land borders, or between OECD member countries and Non-OECD countries. They further clarified that results are not as strong when looking at within-OECD trade, or focusing on bilateral trade in the intensive margin.

Reis et al. (2013) observed that parallel to many other countries, Pakistan put up an excessive absorption of exports in the hands of large exporters. Less product modernization & experimentation and a low capability of the Pakistani export sector to join new higher growth sector is due to the dominance of few exporters which leads to depressed extensive margin contribution to export growth.

Debaere et al. (2010) considered the effect of emending tariffs on the variety of commodities countries export to the United States, with disaggregate tariff data. Their analysis with country and good outcomes clarified tariffs incline to have a statistically significant but minor impact: at best 5% of the rising extensive margin for 1989-1999 and 12% for 1996-

2006 is described by tariff cut, which recommend that the extensive margin has not expanded the effect of tariffs on trade flows to such a level that the comparatively reasonable tariff cutback since world war II can describe the intense growth of world trade.

Amurgo-Pacheco (2008) analyzed geographic and product heterogeneousness patterns by utilizing highly disaggregated trade data. By taking the group of Less Developed Countries (LDC's) from the period 1990-2005, the analysis demonstrated that across nations, the gravity equations fits the observed differences in heterogeneousness. The study presents that export at the intensive margin account for the most significant proportion of overall trade growth. At the extensive margin, geographic diversification is more significant than product heterogeneousness, especially for emerging countries. Taking part in free trade concurrences, thereby diminishing trade costs, and trading with countries in the North are also initiated to have reversed effects on export heterogeneousness for emerging countries.

Hummels and Klenow (2005) used 1995 trade data for multiple countries in various product categories and analyzed the extent to which huge economies export large volumes of each commodity (the intensive margin), export a large set of commodities (the extensive margin), and export high quality goods. They found that the extensive margin comprises of 62 percent of the greater exports of huge economies, prosperous countries export more units of high prices consistent with better quality to a given market.

Now after reviewing the past literature, this study attempts to calculate the export and import margins for Pakistan in case of Chinese market for the first time. The following section

3: Methodology and Data Sources

By following the methodology introduced by Hummels and Klenow in 2005, the export structure from the given country j (Pakistan) is examined to a destination country m (China). Supposing that in the market of destination country m, country j compares with the 'rest of the world' (k) the extensive margin equals the exports of country k to m in Ijm relative to the exports of country k to m in all I categories.

$$EM_{jm} = \frac{\sum\limits_{i \in I_{jm}} p_{kmi} X_{kmi}}{\sum\limits_{i \in I} p_{kmi} X_{kmi}}$$

38 Exploring the Potentials of Pakistani Exports in Chinese Economy: A New Approach Based on the Calculation of Extensive and Intensive Margins

This is a cross-exporter analogue of Feenstra's novel varieties adjustment to an import price index. Ijm is the set of observable sets in which country j has positive exports to m, i.e., xjmi > 0. (In our empirical application, the I categories will be 5,224 six-digit U.N. HS product codes.) Reference country k has positive exports to m in all I sets (in our empirical application, k will be rest of the world).

Where:
EM = Extensive margins of export
P = Price of the relevant product
X = Quantity of export
j = refers to the exporting country
m = refers to destination country
k = refers to the rest of the world

The range of extensive margin is from 0 to 1. The interpretation of the value of extensive margin can be as how much of the exports by a country, in our case Pakistan to China can be described by export varieties.

Whereas, intensive margin of export is given by

$$IM_{jm} = \frac{\sum_{i \in I_{jm}} p_{jmi} X_{jmi}}{\sum_{i \in I_{jm}} p_{kmi} X_{kmi}}$$

Where:
IM= Intensive margins of exports

IMjm equivalents j's nominal exports relative to k's nominal exports in those categories in which j exports to m (Ijm).

The ratio of country j to country k exports to m equals the product of the two margins. This will give us export penetration index.

$$S = \frac{\sum_{i \in Ij} p_{jmi} X_{jmi}}{\sum_{i \in I} p_{kmi} X_{kmi}} = IM_{jm} EM_{jm}$$

S = Export penetration of country j relative to k

This might be observed that the *depth* of a country's export shows its intensive margin, while the *breadth* of a country's export shows the extensive margin. To calculate extensive and intensive margins of exports, we utilized highly disaggregated trade data at the HS 6-digit level from UN-COMTRADE database attained through World Integrated Trade Solution (WITS). The UN-COMTRADE database comprises of broad information regarding trade value and number of export relations. We utilized data on exports from 2003-2015 reported by Pakistan and 'rest of the world'. Here exports with 'rest of the world' show the summation of exports from 2003-2015 conveyed by all nations (eliminating country j).

4: Measuring Trade Intensity Indices

Before moving towards comparison between Pakistan's extensive and intensive margins of exports by taking top most and bottom least products exported to China, trade intensity index has been constructed to examine the intensity of Pakistan – China bilateral trade relations. The trade intensity index shows whether an exporter exports more, as a percentage, to a partner than the world does on average. It is calculated as the exports of country i to country j relative to its total exports divided by the world's exports to country *j* relative to the world's total exports.

$$\textbf{Numerically}: 100 * \left[\frac{\frac{xijk}{Xik}}{\frac{xwjk}{Xwk}} \right]$$

Here X is total exports from i of product k, *x* is the value of exports of product *k* from origin country *i* to destination *j*, and *w* shows the world as origin. The range of trade intensity index lies between 0 to $+ \infty$. If the value of TII (Trade Intensity Index) is more than 100, it indicates a relationship for the trade partner is more intense than the world average.

Table 2: Pakistan Trade Intensity Index with China

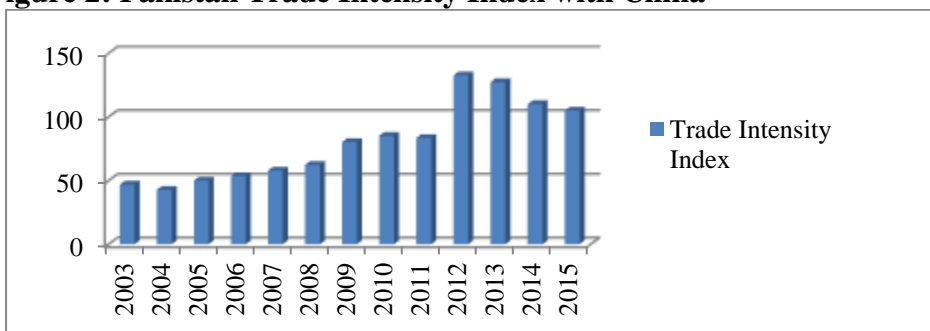| Year	Trade Intensity Index
2003	46.75%
2004	42.65%

2005	49.95%
2006	53.5%
2007	57.8%
2008	62.3%
2009	80.3%
2010	85.08%
2011	83.39%
2012	132.67%
2013	127.26%
2014	110.05%
2015	104.85%

Source: Author's own calculation using UN COMTRADE Database

The Table 2 shows the current bilateral trade value displays that the trading history of Pak-China has started improving since 2012 but before this it was not as strong as it should be for the better economic health of the nation. economic relations.

Figure 2: Pakistan Trade Intensity Index with China

Source: Authors's own using UN COMTRADE Database

The same has been depicted in figure 2 which is reporting clearly that Pakistan's trade intensity with respect to China has increased significantly over the years, which may be observed from the fact that trade intensity index has increased from 46.75% during 2003 to 104.85% during 2015.

The results from calculated indices show that Pakistan has a huge potential in trade with China.

4.3: Decomposition of Results for Pakistan

This section examines the Pakistan's intensive and extensive margins of exports in the market of China with reference to the Rest of the World, European Union, the United States of America and Japan. Here IMP= Intensive margin of Pakistan exports with respect to the rest of the world, EMP= Extensive margin of Pakistan exports with respect to the rest of the world, Sp= The share of Pakistan in Chinese market with respect to the rest of the world, r= Average annual growth rates calculated by applying semi – logarithmic regressions.

Table 3: Intensive And Extensive Margins of Pakistan in Chinese Market with Reference to the rest of the world (Taking Pakistan top most products exported to China)
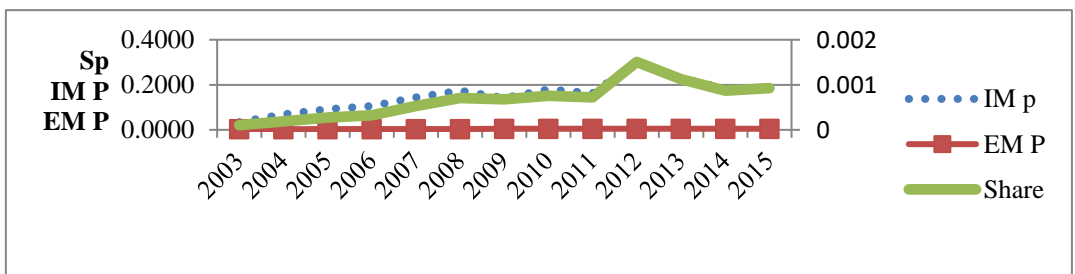
	Pakistan top most products exported to China		
Year	**Intensive Margins**	**Extensive Margins**	**Export Penetration (Share)**
2003	0.0340	0.0031	0.00010
2004	0.0692	0.0028	0.00019
2005	0.0917	0.0029	0.00027
2006	0.1054	0.0031	0.00032
2007	0.1439	0.0037	0.00053
2008	0.1743	0.0041	0.00071
2009	0.1416	0.0048	0.00068
2010	0.1800	0.0042	0.00076
2011	0.1629	0.0044	0.00072
2012	0.3014	0.0050	0.00151
2013	0.2292	0.0049	0.00112
2014	0.1823	0.0048	0.00087
2015	0.1862	0.0050	0.00093
r (Growth Rate)	**0.1123**	**0.0371**	**0.15184**
r%	**11%**	**4%**	**15%**

Source: Computed from data available from the UNCOMTRADE and WITS.

Table 3 describes the intensive margin (IM), the extensive margin (EM) and export penetration rate (S) computed for the period 2003-15 for Pakistan top most products exported to China. The export penetration rate of Pakistan risen from 0.00010 in 2003 to 0.00093 in 2015 with reference to the rest of the world registered a growth rate of 15% per annum. The relative significance of both margins can be computed by decomposing export penetration rate into intensive margin and extensive margin. The breadth of Pakistan's market presence changed much over the years, shown in the values of EM which improved from 3% in 2003 to 19% in 2015 with an average annual growth rate of 11%. The increase in Pakistan's intensive margin can be interpreted as a reflection of Pakistan's yield of competitiveness with reference to the Rest of the world. In contrast, the breadth of Pakistan's market existence did not change a lot which can be observed from the values of EM which improved from 0.0031 in 2003 to 0.0050 in 2015 registering the growth rate of 4% per annum. The value of EM can be interpreted as; only 0.0031 of the exports by Pakistan to China can be explained by export varieties.

Figure 3: Evolution of Pakistan's Export Margins, 2003 – 2015 (In Case of Pakistan Top Most Products Exported to China)

Source: Author's own by using UN COMTRADE Database

The analysis is presented graphically in the figure 3. It may be summed up that Pakistan is following the policy of export intensification in

the case of top most products exported by Pakistan to China and its share in Chinese market is increasing.

Table 4: Intensive And Extensive Margins of Pakistan in Chinese Market /with Reference to the rest of the world (Taking Pakistan bottom least products exported to China)

Year	Pakistan bottom least products exported to China		
	Intensive Margins	Extensive Margins	Export Penetration (Share)
2003	0.0002	0.0243	0.000005
2004	0.0003	0.0230	0.000006
2005	0.0001	0.0266	0.000002
2006	0.0001	0.0244	0.000002
2007	0.0001	0.0144	0.000002
2008	0.0003	0.0139	0.000004
2009	0.0003	0.0156	0.000005
2010	0.0002	0.0124	0.000003
2011	0.0002	0.0132	0.000003
2012	0.0002	0.0160	0.000003
2013	0.0001	0.0176	0.000001
2014	0.0001	0.0194	0.000002
2015	0.0000	0.0207	0.000000
r (Growth Rate)	**-0.0139**	**-0.0276**	**-0.069580**
r%	**-1%**	**-3%**	**-5%**

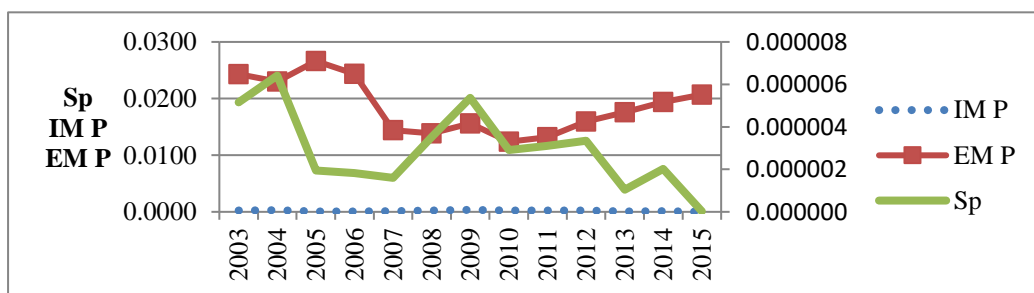Source: Author's own source using datasets of UNCOMTRADE and WITS.
Notes: IMP= Intensive margin of Pakistan exports with respect to the rest of the world, EMP= Extensive margin of Pakistan exports with respect to the rest of the world, Sp= The share of Pakistan in Chinese market with respect to the rest of the world, r= Average annual growth rates calculated by applying semi – logarithmic regressions.

Table 4 shows the export penetration rate of Pakistan declined at the rate of 5% from 2003-15, with reference to the Rest of the world. The *depth* of Pakistan's market presence decreased significantly as indicated in the values of Intensive Margin which decreased from 0.0002 in 2003 to 0 in

2015, with an average annual declining growth rate of 1%. In contrast, the **breadth** of Pakistan's market presence also decreased significantly as displayed in the values of Extensive Margin that decreased from 0.0243 in 2003 to 0.0207 in 2015, registering an average annual declining growth rate of 3%.

Figure 4: Evolution of Pakistan's Export Margins, 2003 – 2015 (In Case of Pakistan Bottom Least Products Exported to China)

Source: Author's own source using dataset of UNCOMTRADE**.**

The analysis is presented graphically in the figure 4. It can be observed that Pakistan is following the policy of export intensification in case of bottom least products exported by Pakistan to China and its share in the market of China is declining.

5: Conclusion and Recommendation

The study finds that:

- In case of Pakistan's top most products being exported to China, the calculations showed that Pakistan is following policy of **export intensification**, and the export penetration index shows that the dividend of Pakistan's exports in Chinese market is increasing by 15% per annum.
- In case of Pakistan's bottom least products which are exported to China, Pakistan is following the policy of export diversification, and the export penetration index shows that the dividend of Pakistan in Chinese market is declining by 7% per annum.

The analysis proposes that Pakistan can attain utmost benefits by implementing strategies directed to accelerate export growth at the intensive margin in Chinese market.

References:

Aldan, A., & Çulha, O. Y. (2016). The role of the extensive margin in export of Turkey: A comparative analysis. Central Bank Review, 16(2), 59-64.

Andrew B. Bernard, J. B. J., Stephen J. Redding and Peter K. Schott. (2009). The Margins of US Trade. *CEP Discussion Paper No 906*, 1-13.

Baldwin, J. R., & Gu, W. (2003). Export-market participation and productivity performance in Canadian manufacturing. *Canadian Journal of Economics/Revue canadienne d'économique, 36*(3), 634-657.

Baldwin, J. R., & Gu, W. (2004). Trade liberalization: Export-market participation, productivity growth, and innovation. *Oxford Review of Economic Policy, 20*(3), 372-392.

Baier, S. L., Bergstrand, J. H., & Feng, M. (2014). Economic integration agreements and the margins of international trade. Journal of International Economics, 93(2), 339-350.

Bista, R., & Tomasik, R. (2017). Time Zone Effect and the Margins of Exports. The World Economy, 40(6), 1053-1067.

De Nardis, S., Pappalardo, C., & Vicarelli, C. (2008). The Euro adoption's impact on extensive and intensive margins of trade: the Italian case. Istituto di Studi e Analisis Economica Working Paper(101).

Del Rosal, I. (2019). Export Diversification and Export Performance by Destination Country. Bulletin of Economic Research, 71(1), 58-74.

Fan, H., Li, Y. A., & Zhao, C. C. (2018). Margins of imports, forward-looking firms, and exchange rate movements. Journal of International Money and Finance, 81, 185-202.

Helpman, E., & Krugman, P. R. (1985). *Market structure and foreign trade: Increasing returns, imperfect competition, and the international economy*: MIT press.

Hummels, D., & Klenow, P. J. (2005). The Variety and Quality of a Nation's Exports. *American Economic Review, 95*(3), 704-723. doi:doi: 10.1257/0002828054201396

Lee, H.-y., & Kim, C.-S. (2012). The impact of trade facilitation on the extensive and intensive margins of trade: An application for developing countries.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica, 71*(6), 1695-1725.

Reis, J. G., & Taglioni, D. (2013). Determinants of export growth at the extensive and intensive margins: evidence from product and firm-level data for Pakistan.

Naknoi, K. (2015). Exchange rate volatility and fluctuations in the extensive margin of trade. *Journal of Economic Dynamics and Control, 52*, 322-339.

Feenstra, R. C., & Ma, H. (2014). Trade facilitation and the extensive margin of exports. *The Japanese Economic Review, 65*(2), 158-177.

Reis, J. G., & Taglioni, D. (2013). *Determinants of export growth at the extensive and intensive margins: evidence from product and firm-level data for Pakistan*: The World Bank.

Debaere, P., & Mostashari, S. (2010). Do tariffs matter for the extensive margin of international trade? An empirical analysis. *Journal of International Economics, 81*(2), 163-169.

Amurgo-Pacheco, A., & Pierola, M. D. (2008). *Patterns of export diversification in developing countries: intensive and extensive margins*: The World Bank.