

Estimating Extensive, Quantity and Price Margin in Export Growth of Pakistan

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Abstract: The paper examines the role of extensive margin, price, and quantity margin in the export growth of Pakistan. Extensive margin is the exports of a country to new markets and new products while intensive margin is the exports of a country to existing markets and quantity growth of already exported items. We decompose Pakistan's export growth into extensive and intensive margin by applying methodology of Feenstra (1994) and Hummels and Klenow (2005). We estimate main cause of Pakistan's export growth in this study through decomposition methodology of extensive margin, Price margin and quantity margin between 2003 and 2020 using HS 6-digit trade data. We conclude that Pakistan's export growth is primarily led by quantity growth which accounts more than 100 percent in Pakistan's export growth. This is approximately same for all major trading partners, and it implies that Pakistan is producing larger quantities of existing goods. Quantity driven growth shows abundance of labour in the country. However, it shows that Pakistan is over-reliant on same type of goods and partners and external factors may severely impact Pakistan's exports due to the quantity margin. Pakistan should diversify export goods and export markets to improve price margin which is better strategy for a country's export as well as economic growth.

Keywords: Extensive margin, export diversification, external demands

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I. Introduction

The international trade flows have shown an unprecedented trend. Since 1950, world trade has registered an increase of 20-fold (by value). World exports were US\$ 6.1 trillion in 2001 and reached up to US\$ 17.14 trillion in 2020. Past studies in international trade have analyzed the impact of trade liberalization on total aggregate bilateral trade flows. However, recent theories analyzed the impact of trade liberalization and diversification through two margins i.e. extensive margin and intensive margin. Extensive Margin defines a newly established bilateral trade relation between two countries while Intensive margin existing bilateral trade relation between two countries. There is a considerable discussion in the literature on the relative importance of each margin; some writers have determined that the extensive margin is the key source of export growth (Hummels and Klenow, 2005), while others have discovered that the intensive margin is the primary source of export growth (Hummels and Klenow, 2005). (Helpman et al., 2008).

Products are homogenous in conventional trade theory. There are no horizontal or vertical product disparities, and export growth is solely attributable to an increase in the amount of exports. According to Krugman (1979), there are many different types of items with horizontal variations but the same price in horizontal intra-industry trade theory. As a result, the development of product diversity can help exports grow. Products are distinguished by various qualities and prices under vertical intra-industry trade theory, as discovered in Falm and Helpman (1987), thus exports can expand with quality upgrades and subsequent price increases. According to Melitz (2003)'s New-New trade theory, commerce can expand as a result of the acquisition of new exporting businesses or partners. The vast margin is what we call it. To conclude, exports can expand at three distinct margins: extensive margin, quantity, and price, with extensive margin referring to the number of trade partners and diversity of items in this article.

The focus of this study is on the empirical work of the New-New trade theory of export diversification. According to Melitz (2003), all businesses engage in exporting, therefore the number of exporting firms exists empirically as one source of vast margin. Helpman et al. (2008) expanded the Melitz model and discovered that not all nations trade with each other, and that there are a lot of zeros between them. As a result, the number of trade partners that exist experimentally is another source of significant margin. According to Bernard et al. (2006), multi-product businesses do not export all of their goods, therefore the number of exporting items is the third source of significant margin. According to the New-New trade theory, the wide margin is made up of the number of exporting businesses, trade partners, and exporting items. Helpman et al. (2008) deconstruct world trade growth at the nation level into extensive and intensive margins, finding that intensive margin trade growth is more significant for total trade growth. Bernard et al. (2009) similarly separated US trade growth into two types: extensive and intense margins. They discovered that new exporting businesses and new exporting goods accounted for much of the export increase at the firm level, indicating the relevance of a wide margin.

The goal of this research is to break down Pakistan's export growth into two margins, each of which may be further broken down into price and quantity margins. Furthermore, from a policy standpoint, it makes little difference whether trade growth is primarily driven by extensive or intense margin. Whether trade growth is fueled by quantity or price, though, is crucial. If trade growth is mostly quantitative, this country will have

to use a lot of capital, labour, and natural resources to create a big number of items, which is not beneficial for long-term growth. If, on the other hand, trade growth is mostly driven by price increases, and pricing reflects product quality, this type of export growth may necessitate additional human capital and technical innovation, both of which are beneficial to long-term economic growth.

Before analyzing that extensive or intensive margin it is better to understand export growth of a country by analyzing role of both margins in determining a country's export growth. This paper gives analysis on defining role of extensive and intensive margin on the growth of Pakistan's trade. This paper investigates existing margin of Pakistan trade whether its an Extensive margin i.e diversification of export markets or intensive margin i.e strengthening of prevailing exporting partners.

The rest of the paper is organized as follows. Sections II provide literature review of extensive and intensive margins. Section III discussed methodology and data sources. Section IV provides results of estimation and Section V provide the concluding remarks and policy implications.

II. Literature Review:

The economic literature on extensive and intensive margin of international trade growth has conflicting implications. However, a substantial discussion was determined on the effect of each margin. Few research studies evident that extensive margin is the engine of export growth while others highlighted significant role of intensive margin. The trade literature is exploring relative importance of both margins of international trade day by day in explaining growth in exports.

Paul S. Armington's (1969) highlights the role of intensive margin and stated that a larger economy produces and export of goods. Paul R. Krugman (1981) focus on extensive margin and stated that larger economies produce and export wider varieties of goods. Armington emphasize that countries may increase aggregate exports by exporting more of one variety of a good while Krugman feature the endogenous number of export varieties. The theory of extensive and intensive margins is investigated by considerable researchers recently. Hummels&Klenow (1995) find the proof of intensive margin and stated that larger economies may export more than smaller economies. Aldan&Culha (2003);Mustafa, Abro, Awan. (2021)examine the role of extensive margin for Turkish export performance by applying two complementary methods and found that extensive margin of Turkey is low as compared to other countries.

According to Hummels and Klenow (2005), the wide margin accounts for 60% of the rise in larger economies' exports. Evenett and Venables (2002) for exports from 23 developing countries, Berthou and Fontagne (2008) for French exports to euro area countries, Bernard et al. (2009) for US exports, and Dutt et al. (2011) for exports from more than 150 countries have all documented the importance of the extensive margin in export growth. Several other research, on the other hand, have indicated that the intense margins have a larger influence in export growth than the extensive margin.

Helpman et al. (2008) show that the intense margin was primarily responsible for the rapid expansion of trade between 1970 and 1997, using data from 158 countries. Felbermayr and Kohler (2006) for world trade, Eaton et al. (2007) for Colombian exports, Amiti and Freund (2008) for Chinese exports, Amurgo-

Pacheco and Pierola (2008) for exports of 24 developed and developing countries, Besedes and Prusa (2010) for manufacturing exports of 46 countries, and Bingzhan (2011) for Chinese exports are some examples of papers that have shown the importance of the intensive margin in export growth. Overall, the empirical research shows that, rather than exporting new varieties, the rise of exports is mostly due to exporting more of current kinds.

Brenton and Newfarmer (2007) looked at the role of extensive and intense margins in emerging nations and discovered that extensive margins contributed less to a country's growth. Besede&Prusa (2008) compared export performance growth through extensive and intensive margins by three separate components and identified intensive margin in developing nations' export growth. China's export growth is decomposed by Amiti and Freund (2010) and Bingzhen (2011), whereas Chile's export growth is decomposed by Berthelon (2011). Markusen (2013) discovered that trade profits may be obtained directly by using a large margin. By using a gravity model to deconstruct India's manufacturing export performance into widespread and intense margins, Veermani& Gupta (2015) discovered that China has a pricing advantage in exports while India has a unique pattern of specialisation.

Hummels and Klenow's work is the closest to this study (2005). They broke down a country's exports' world market ratio into three margins: extensive margin, quantity, and quality, with extensive margin expressing product diversity and quality expressing pricing. They discovered that large exporting nations also export greater diversity and higher quality items than small exporting countries, implying that variety and quality are key factors in determining trade volume. This study adds to the body of knowledge about Pakistan's economic migrants.

The results of this estimation provide some avenues for policy recommendations to governments to foster export growth through Price margin. The existing literature on trade margin mainly focusses on the analysis of firm data on six-digit level however this research focusses bilateral trade of a developing country Pakistan analysis of a country.

III. Methodology& Data Sources

We apply two different methods to estimate extensive, quantity and price margin growth. In literature different methodology were used by the researcher to decompose export growth.. In the first method, we simply analyze trading partners and tariff lines exported by Pakistan in two different periods. Top ten countries and the world are taken to report the results of the analysis. In the first method, extensive margin means the number of products or the number of trading partners. We use methodology of Feenstra (1994) and Hummel and Klnew (2005) in the second method to calculate trade variety. We disaggregate Pakistan's export growth by using share of the country's export to the world and top export partners into extensive margin, quantity, and quality margins. The quality margin is analyzed though price margin of export growth. The main objective of this paper is to decompose export growth rates whereas Hummel and Klnew decompose share of trade. We use trade growth rates instead of trade shares as both indexes have same type of data structure and we extend methodology of Hummel and Klnew by contributing export growth rates.

We Analyze Pakistan's export growth through export margin and analyzed number of tariff lines exported by Pakistan in two different time periods. In 2003, Pakistan exported 2,315 types of products to the world, so the extensive margin was 2,315. The extensive margin was 2865 in 2020; therefore, the average growth rate of the extensive margin was 24% for the world market. It is necessary to calculate Price and Quantity margin to analyze the export growth. If extensive margin is due to price margin which means country is invested in human capital and technology whereas vice versa noticed in quantity margin. As we have collected data on the quantity and price of all tariff lines exported in 2003 and 2020. we calculate weighted growth rate of tariff lines exported by Pakistan.

Consider two time periods, t and $t+1$, and assume that the exporting product sets are t and $t+1$, respectively, and that the overlapping exporting product sets are c , that is, $c=tt+1$. The export ratio between the two time periods may be stated as Eq.

$$R = \frac{\sum_{i \in \Omega_{t+1}} v_{it+1}}{\sum_{i \in \Omega_t} v_{it}} = \frac{\sum_{i \in \Omega_{t+1}} v_{it+1}}{\sum_{i \in \Omega_c} v_{it}} \times \frac{\sum_{i \in \Omega_c} v_{it+1}}{\sum_{i \in \Omega_c} v_{it}} \quad 1$$

Hummels and Klenow (2005), $\frac{\sum_{i \in \Omega_{t+1}} v_{it+1}}{\sum_{i \in \Omega_c} v_{it}} / \frac{\sum_{i \in \Omega_t} v_{it}}{\sum_{i \in \Omega_c} v_{it}}$ gives the extensive margin like Freenstra (1994). If there are more distinct products in period $t+1$ than there are in period t , then the extensive margin is greater than one; therefore, this equation explains the development of diversity or partners $\frac{\sum_{i \in \Omega_c} v_{it+1}}{\sum_{i \in \Omega_c} v_{it}}$ gives the intensive margin. v represents the export value. It can be further decomposed into price and quantity, as in Eq.(2):

$$\frac{\sum_{i \in \Omega_c} v_{it+1}}{\sum_{i \in \Omega_c} v_{it}} = \frac{\sum_{i \in \Omega_c} p_{it+1} q_{it+1}}{\sum_{i \in \Omega_c} p_{it} q_{it}} = \prod_i \left(\frac{p_{it+1}}{p_{it}} \right)^{w_i} \prod_i \left(\frac{q_{it+1}}{q_{it}} \right)^{w_i} \quad 2$$

In the ratio $w_i = \frac{\frac{S_{it+1} - S_{it}}{\ln S_{it+1} - \ln S_{it}}}{\sum_i \left(\frac{S_{it+1} - S_{it}}{\ln S_{it+1} - \ln S_{it}} \right)}$, S_i represents the value share, $S_i = \frac{p_i q_i}{\sum_i p_i q_i}$

Finally, we can decompose the export ratio of the two time periods into three margins, as in Eq. (3):

$$R = \frac{\sum_{i \in \Omega_{t+1}} v_{it+1}}{\sum_{i \in \Omega_t} v_{it}} = EX \times P \times Q = \frac{\sum_{i \in \Omega_{t+1}} v_{it+1}}{\sum_{i \in \Omega_c} v_{it}} / \frac{\sum_{i \in \Omega_t} v_{it}}{\sum_{i \in \Omega_c} v_{it}} \times \prod_i \left(\frac{p_{it+1}}{p_{it}} \right)^{w_i} \times \prod_i \left(\frac{q_{it+1}}{q_{it}} \right)^{w_i} \quad 3$$

Taking the logarithm of Eq. (3) and dividing by the time intervals, we decompose the export growth rate into the extensive margin

$$Gr = GEX + GP + GQ \quad 4$$

It is pertinent to mention that the elasticity of the three margins' growth to overall export growth is equal to one in Eq. (4); therefore, the contribution ratio is simply the growth rate of each margin divided by the overall export growth rate, as stated in Eq (5).

$$REX = 100 \times GEX / GR ; RP = 100 \times GP / GR; RQ = 100 \times GQ / GR \dots 5$$

R represents the total exports in 2003 divided by the exports in 2020. Similarly, EX, P, and Q represent the ratios for extensive margin, price and quantity, respectively. GR, GEX, GP, GQ are the growth rates of total export, extensive margin, price and quantity and calculated as follows: $GR = 100 \ln(R) / (2003 - 2020)$. The calculation method is similar for GEX, GP, GQ. REX, RP, RQ are the contribution factor of each margin. Because the elasticity of each margin's growth to overall export growth is one, the contribution factor is calculated as follows: $REX = 100 \times GEX / GR$, as defined in Eq. (5).

The Data and Descriptive Analysis:

The International Trade Centre Data set Trade Map, which comprises data for 245 countries and 5,066 product categories categorised according to the Harmonized System at the 6-digit level, was used to break down Pakistan's export growth along the vast and intense margins. From 2003 through 2020, data is available in the Trade Map HS 1996 database. This database, which was built using the original UN Commodity Trade Statistics database (UN COMTRADE), provides detailed annual bilateral trade data for commodity exports in terms of value (in thousands of US Dollars at current prices) and quantities at the 6-digit level of the HS-6, allowing us to calculate unit values for each product or item.

IV. Estimations and Results

Table 1:

Pakistan's export growth to world and top ten export destinations

Partner	2003	2020	AGR	Partner	2003	2020	AGR
World	11,930	22,237	4.0%	Afghanistan	408	871	4.8%
USA	2,752	4,142	2.6%	Spain	268	794	7.0%
China	260	1,867	13.1%	Italy	402	719	3.7%
UK	842	1,726	4.6%	Bangladesh	166	583	8.2%
Germany	608	1,395	5.3%	Belgium	255	571	5.2%
UAE	1,122	1,097	-0.1%	Saudi Arabia	470	432	-0.5%
Netherlands	317	1,095	8.1%	France	315	397	1.5%

Author's calculation by using export data of Trade Map

Table 1 shows that Pakistan's exports to world has shown significant growth between 2003 and 2020. The exports increased from USD 11.9 billion in 2003 to USD 22.2 billion in 2020 registered an annual average growth rate of 4%. In the table1, we have reported average annual growth rate of top exporting partners of Pakistan. It is found that USA, China, UK, Germany, Netherlands, Afghanistan, Spain Italy, Bangladesh,

Belgium have shown increase in exports from Pakistan to said countries whereas, UAE, Saudi Arabia and France have shown negligible growth from Pakistan.

The above results show the first methodology used to calculate extensive margin. It is simple and easy to understand that Pakistan's exports growth is almost double in 18 years from 2003 to 2020. The comparison with its neighboring countries reveals the true picture of the export growth of Pakistan. We need to be more precise by analyzing quantity and Price margin in the second method. We analyze weighted count of tariff lines between two time periods which is more exploratory than number of exported values.

The below table shows Extensive Margin of Pakistan's export growth by applying second method of decomposing export growth. Number of Harmonized codes at 6-digit level is taken to calculate extensive margin of Pakistan's export growth. It is found that Pakistan exported 2,865 tariff lines to world in 2020 whereas the country exported 2,315 tariff lines in 2003 and registered cumulative average annual growth rate of 1.34% only. USA, China, UK, Germany, UAE, the Netherlands, Afghanistan, Spain Belgium, Saudi Arabia have shown positive growth however the diversification is limited. Pakistan's exports to Bangladesh are approximately same in terms of variety of goods. Italy has shown negative growth of 2.2 percent showing Pakistan's exports are declining over the years.

Table 2

Extensive Margin in Pakistan's export growth

Partner	2003	2020	AGR	Partner	2003	2020	AGR
World	2,315	2,865	1.34%	Afghanistan	510	687	1.88%
USA	834	1,076	1.61%	Spain	333	476	2.26%
China	246	611	5.85%	Italy	613	428	-2.22%
UK	744	997	1.85%	Bangladesh	407	410	0.05%
Germany	575	749	1.67%	Belgium	364	457	1.43%
UAE	1,061	1290	1.23%	Saudi Arabia	635	705	0.66%
Netherlands	390	545	2.11%	France	431	477	0.64%

Author's calculation

In table 2, we analyze country-product data at HS 6 by calculating country-product pairs. As per the definition of extensive margin, we compare number of tariff lines to the world and to the top export destination to highlight the growth in two time periods. It is found that extensive margin grows slowly in case of Pakistan as compared to the growth of exported values.

It is pertinent to mention that in the world, 5522 tariff lines at HS 6 digit were exported in 2020 and 5452 in 2003 and Pakistan exported 2,315 tariff lines in 2003 that is approximately half of the world trade varieties. The situation is not change after 18 years and Pakistan export 2,865 tariff lines to world in 2020. It is found that Pakistan's export growth is composed of intensive margin.

We further decompose Pakistan export growth into Price and Quantity margin by excluding extensive margin. We estimate growth rate of Price and Quantity margin by another data set consist of product values

and quantity. We aggregate country wise data of HS 6 digit and summing it into country level then estimate growth rates in two period. Price margin shows negative growth in all countries except Afghanistan between 2003 and 2020. Cumulative Average Annual Growth Rate is used to calculate Price and Quantity margin between 2003 and 2020. We observe Pakistan's exports are stagnant over last several years and main reason is that quantity increase but not Price showing low value-added exports.

Table 3

Price growth and Quantity Growth in Pakistan's export

Partner	Annual Price Growth Rate	Annual Quantity Growth Rate	Partner	Annual Price Growth Rate	Annual Quantity Growth Rate
World	-17%	24%	Afghanistan	2%	2%
USA	-8%	11%	Spain	-10%	19%
China	-14%	31%	Italy	-2%	6%
UK	-4%	9%	Bangladesh	-8%	17%
Germany	-1%	7%	Belgium	-3%	8%
UAE	-20%	25%	Saudi Arabia	-12%	13%
Netherlands	-18%	32%	France	-3%	5%

Author's calculation

It is found that the growth rates of exports of Pakistan are not same in the two methods. Quantity margin has shown more significant contribution in the export growth of Pakistan.

Table 4

The Extensive Margin, Price and Quantity Shares of Pakistan's export growth

WORLD	R	EX	P	Q	GR	GX	GP	GQ	REX	RP	RQ
World	1.9	1.2	0.0	41.4	3.5	1.2	17.2	20.7	34.2	-497.9	597.9
USA	1.5	1.3	0.3	5.3	2.3	1.4	-7.0	9.3	62.3	-309.4	409.4
China	7.2	2.5	0.1	74.0	11.0	5.1	12.9	23.9	46.1	-118.2	218.2
UK	2.0	1.3	0.5	3.9	4.0	1.6	-3.5	7.5	40.8	-88.6	188.6
Germany	2.3	1.3	0.8	2.9	4.6	1.5	-1.3	6.0	31.8	-29.1	129.1
UAE	1.0	1.2	0.0	36.8	-0.1	1.1	20.2	20.0	-874.7	16233.6	-16133
Netherlands	3.5	1.4	0.0	84.9	6.9	1.9	17.8	24.7	27.0	-258.2	358.2
Afghanistan	2.1	1.3	1.5	1.5	4.2	1.7	2.1	2.1	39.3	49.9	50.1
Spain	3.0	1.4	0.2	15.2	6.0	2.0	-9.1	15.1	32.9	-150.9	250.9

Italy	1.8	0.7	0.7	2.7	3.2	-2.0	-2.2	5.4	-61.8	-68.3	168.3
Bangladesh	3.5	1.0	0.3	12.4	7.0	0.0	-7.0	14.0	0.6	-100.6	200.6
Belgium	2.2	1.3	0.7	3.4	4.5	1.3	-2.4	6.9	28.3	-53.4	153.4
Saudi Arabia	0.9	1.1	0.1	7.2	-0.5	0.6	11.4	10.9	-126.4	2481.6	-2381
France	1.3	1.1	0.6	2.0	1.3	0.6	-2.7	3.9	44.0	-208.0	308.0

Author's calculation by using quantity data and values in both periods

The Anatomy of Export growth of Pakistan-Disaggregation

We decompose export growth of Pakistan into three margins extensive, Price and Quantity. Between 2003 and 2020. The above table shows results of all three margins and depict the picture of Pakistan's exports growth. The growth rate of Pakistan to world was positive between 2003 and 2007. With an extensive margin of -1.34%, -17%Price margin and 24% quantity margin. Price margin has shown negative contribution while quantity margin has shown significant contribution. In the export growth.

V. Conclusion

Pakistan has registered positive export growth since 2003. We estimate main causes of Pakistan's export growth in this study through decomposition methodology of extensive margin, Price margin and quantity margin between 2003 and 2020. We conclude that Pakistan's export growth is primarily led by quantity which accounts most important in Pakistan's export growth. This is approximately same for all major trading partners, and it implies that Pakistan is producing larger quantities of goods and labour abundant country. Quantity driven growth shows abundance of labour in the country. However, it shows that Pakistan is over-reliant on same type of goods and partners and external factors may impact Pakistan's exports due to the quantity margin. Pakistan should diversify export goods and export markets to improve price margin which is better for a country's export as well as economic growth.

Optimal Solution & Policy Implications:

Based on above research, we will be able to quantify the aspect of export diversification, namely extensive, Price and Quantity margins of international trade of Pakistan. If a country's trade growth is mostly quantitative, it indicates that it must expend a lot of capital, labour, and natural resources to create a big number of items, which is not ideal for long-term growth. If, on the other hand, trade growth is mostly driven by price growth, it indicates product quality, and this type of export growth may necessitate additional human capital and technical innovation, both of which are beneficial to long-term economic growth. The results are more understandable by identifying quantity margin as trade growth of Pakistan is to be useful for government policy makers to attain export growth of Pakistan.

Hence, this research determines the true nature of the Pakistan's export growth that helps policy makers to make rational policy decisions in increasing export growth of the country. In addition, establishing the fact that Pakistan's export growth is the result of same products and same markets to provide a new insight into the impact of export growth of Pakistan.

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