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Factors Determining Exports' Product Quality: Empirical Evidence from Pakistan

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Abstract

Exports play a significant role in the growth and development process of an economy. However, the level and flow of exports depend on their quality. Among other external factors, export is one of the key sources of foreign exchange earnings in Pakistan. In this context, this study tends to explore the factors that affect exports' product quality in Pakistan. To analyze intensively, the factors are broadly divided into two exogenous (country-level), and endogenous (firm-level). The empirical insight covers all listed non-financial firms at Pakistan Stock Exchange over the period 1999-2018. Our findings reveal that among endogenous factors firm's total assets, TFP, advertising, and sale growth is the key determinants that pose a positive effect on exports' product quality. Whereas, trade flow, GDP, and R&D activities are the exogenous factors that improve the product quality of exports. The government and policy makers should focus on providing R&D funds and financial aid programs, reducing tariff rates, stabilizing the exchange rate policy, improving export performance, and agreements with trading countries on fewer terms and conditions.

Keywords: Trade flows; Economic Globalization; Product Quality; Heterogeneous Firms; Financial Liberalization; R&D Activities.

JEL codes: F1, F12, F60

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1. Introduction

The process of globalization has increased the economic interdependence of the world economies. The agreements under the framework of globalization are structured to integrate developed economies with less developed economies, hence improving the growth capacity of developing economies through export earning, FDI inflow, and R&D and technology diffusion. Among these, several empirical studies link the gains from international trade with the quality of exports (Copeland & Kotwal, 1996; Hallak, 2006; Gervais, 2015; Anderson et al., 2019). Studies on the subject argued that exports product quality plays a central role in the trade flows of an economy. For instance, the production of high-quality increases exports market outcomes and therefore economic growth (Amiti & Khandelwal, 2013; Fan et al., 2015)[2]. Existing studies also argued that product quality varies noticeably across both countries and industries, which poses larger differences in economic development and factor endowments across countries (Hummels & Klenow, 2005). Some recent studies (Schott, 2004; Hallak, 2006; Curzi et al., 2020) increasingly point to the importance of product quality in the gain from international trade.

Product quality shapes consumers' behavior about consumption which in turn affects a firm's output and profit performance. Existing studies highlighted several factors that affect product quality such as price (Bagwell & Riordan, 1991), demand for product and market share (Khandelwal, 2010), available resources (Ludema & Yu, 2016), new technologies (Khanna & Sharma, 2018) management skills and capital stock (Hung & Peng, 2020).

[2] The measure of product quality used by Khandelwal (2010) is more preferred as a proxy. Because the author used market share of the product along with prices to measure the product quality.

Some studies argue that the quality of the product is important not only to the producer but also for the consumer as well. For the producer, better quality can increase the sale of the firm by gaining the confidence of consumer. On the one hand, the consumer is willing to pay a high price of the product to receive a good quality product. On the other side, if they are not satisfied with the quality of the product, they will switch their interest and demand towards products of other firms. Product quality also plays an important role in international trade and transactions. A country can reap the potential gain of the international market and therefore economic growth and development, employment opportunities, and supply of high-quality products (Amiti & Khandelwal, 2013; Fan et al., 2015). The country can enjoy the benefit of comparative advantages and produce the product according to international standards. The trade flow of a country can be improved when the high-quality product is exported into international markets (Schott, 2004; Hummels & Klenow, 2005; Feenstra et al., 2014).

Keeping in view the significance of product quality in the exports earning, this study is devoted to analyzing how much product quality proves beneficial for a country's income as far as exports' earnings are concerned. The study contributes to the existing literature in two aspects. Firstly, the quality of Pakistan's products of non-financial firms is measured that are listed at the Pakistan Stock Exchange covers the period from 1999 to 2018, which no such exercise has been carried out in the case of Pakistan[3]. In addition, instead of primary data, we used secondary data while measuring the product quality of the firm. Secondly, the study intensively explored the determinants of exports' product quality. In this context, the study intends to explore both endogenous (firm-level), and exogenous (country-level) factors

[3]There are many studies on the measurement of product quality such as (Linder, 1961; Faruq, 2006; Alcalá, 2016; Piveteau & Smagghue, 2017; Henn et al., 2020).

that affect exports' product quality. There is no single study has been done to measure the product quality and explore its determinants for Pakistan's products. The following reasons may justify why the analysis was carried out in the case of Pakistan. The one fundamental issue in Pakistan's economy is the trade deficit that increases over the time. The trade deficit worsens day by day due to the quality of the product which is exported in international markets. The reason is that the quality of Pakistan's products is unable to meet international standards. Hence, to get rid of this problem issues should be addressed on the product quality front. In this regard, the current study should prove beneficial to overcome these issues. The rest of the study is organized as follows. Section 2 presents a review of the empirical insights on the subject. Section 3 discussed the theoretical framework, data sources, variables description, and estimation methodologies, of the study and Section 4 provides empirical findings and interpretation of the study in detail. Section 5 describes the conclusion of our analysis and gives policy recommendations

2. Insights from the Literature

As the study tends to explore the measurement and determinants of product quality, hence this section covers a review of the empirical insights on both measurement and determinants of product quality.

It is generally recognized that product quality cannot be measured by observing the data, as it has qualitative characteristics. Hence, in existing studies (Bagwell & Riordan, 1991; Thatcher, 2004; Bernard et al., 2007; Álvarez & Fuentes, 2011; Szczygielski & Grabowski, 2012; Tian, 2017) among others used two proxies to measure product quality namely prices and the unit value of the product. As far as price is concerned, Thatcher (2004); and Bernard,

Jensen, et al. (2007) arguing that price is the most relevant proxy as it provides relevant and accurate information about the quality of the product. In the recent literature, different approaches have been used to estimate product quality. The first approach is Constant Elasticity of Substitution (CES) which has been used in the studies carried out by Feenstra et al. (2014) and Harrigan et al. (2015) etc. However, the CES is a very simple approach. The second approach is developed by Khandelwal (2010), which is based on a Discrete Choice Framework. However, Anderson et al. (2019) argued that this framework is very similar to the CES approach. The third approach is established by Di Comite et al. (2014) by separating the taste effects of product quality. Most of the studies use the Khandelwal (2010) approach to estimate product quality due to its simple mathematical form. The basic concept of Khandelwal (2010) approach is that high-quality products lead to high market shares on conditional prices in a given destination. Based on this concept, Manova and Yu (2017) maximize consumer's utility function that depends on product variety, quantity, and product quality. Hence, this framework explains the relationship of quality, prices, revenue, and profit across firms (Anderson et al., 2019).

As far as the determinants of product quality are concerned, the existing studies highlighted both exogenous and endogenous factors that affect product quality. Some studies suggested different determinants of product quality based on qualitative characteristics such as Abowd et al. (1996) and Lee and Choi (2015) explored that health and safety conditions and worker motivation are the key determinants that affect product quality. Studies also specified the number of endogenous determinants that affect product quality. Murphy and Shleifer (1997) for example, argue that human capital is the main determinant that affects export product quality. According to (Bas & Strauss-Kahn, 2014; Bernini et al., 2015) firm's leverage poses a negative effect on export quality. The quality of a product can easily be improved and

better which is produced by good and competitive standards (Hu & Lin, 2016). When a firm tries to improve its product then ultimately it enhanced the productivity of the firm (Zailani et al., 2007). The imported inputs can enhance output growth by providing a wider set of products (Colantone & Crinò, 2014).

Studies on the subject highlighted several exogenous factors that affect product quality (Jones et al., 2005; Flach, 2016). Brambilla and Porto (2016) came up with the argument exports' product quality is strictly linked with the location and economic condition of the country that exports.

The presence of foreign investors contributes to a significant increase in export quality (Faruq, 2006; Anwar & Sun, 2018). Institutional management and governance reforms are the factors that determine the export product quality (Curkovic et al., 2000; Essaji & Fujiwara, 2012). Henn et al. (2020) found that research and development (R&D) activities play an important role in the improvement of product quality. But, Di Comite et al. (2014) suggested that taste heterogeneity leads to quality differentiation and enhances the trade flows. Anderton (1999) found that the temporary appreciation of currency has damaged both the trade and investment performance of the UK by giving a negative impact on product quality and R&D expenditures.

The above literature describes product quality and its determinants. There are many firm-specific determinants like size, age, productivity, imported inputs, and exporting status and, country-specific determinants are; location, foreign direct investment, institutional management, etc. The financial condition of a firm is also affecting the product quality. The price of a product is also a major measure of product quality. R&D expenditures and

innovative activities are also used to promote product quality. In the case of Pakistan, there is no yet study found which examines the determinants of product quality.

3. Methodology

The methodology section includes three subsections; the first section 3.1 presents the conceptual framework. Section 3.2 illustrates the empirical model, whereas subsection 3.3 describes the definition and construction of variables and data sources.

3.1 Conceptual Framework

The conceptual framework of this study is mainly based on Manova and Yu (2017) that link product quality and profit of the firm. The theoretical underpinning is illustrated as follows. Assume $J + 1$ countries with heterogeneous firms that produce different and multiple goods. In-country j, the consumer utility is the increasing function of both product quantity and product quality. Therefore, in-country j demand for i_{th} commodity (x_{ji}) positively related to product quality (q_{ji}), and negatively with price(p_{ji}), while positively with aggregate demand R_j.

The price index covers both output and input prices, the output prices indicate the effect of both objective and subjective aspects of product quality, whereas the input prices capture only the subjective dimension. The firms' marginal cost c_i is determined by two determinants: firms capacity of production $\varphi\lambda_i$ and the optimal input cost w_i, where $c_i = w_i/\varphi\lambda_i$.

On the entry, firms realize its full cost ($\varphi\lambda_i, i\epsilon\gamma_i$) and decide whether enter or exit. When they decide to enter, they have to decide which product i produce and to which country j this product sale. It is assumed that a single product is produced and no demand-supply

mechanism holds across the country. This allows us to explain how firms' profit maximization problems can be optimized. A producer has to maximize total profits by separating the global profits from each product. In particular, a firm's capacity $\varphi$and product specialization $\lambda_i$enables to select optimal cost w_i and thereby output quality q_i; the decision of entry $z_{ji} = 1$ or exit $z_{ji} = 0$ and the price p_{ji} and quantity demanded x_{ji} to offer in-country j. This maximization problem is under follows:

$$\max \pi_i(\varphi_i, \lambda_i) = \sum \pi_{ji}(\varphi_i, \lambda_i) = \sum Z_{ji}\left[p_{ji}(\varphi_i, \lambda_i, w_i)x_{ji}(\varphi_i, \lambda_i, w_i) - C_{ji}\left(c_i, x_{ji}, f_{pj}, \tau_j\right)\right]$$

$$\text{Subject to } x_{ji} = x_{ji}\left(p_{ji}, q_i, R_j, P_j\right)c_i = \frac{w_i}{\varphi\lambda_i} \;\; and \;\; q_i = q_i(\varphi_i, \lambda_i, w_i) \qquad (1)$$

The total cost of the good produce is $C_{ji}\left(c_i, x_{ji}, f_{pj}, \tau_j\right)$. Here c_i is a marginal cost, x_{ji} is the quantity demanded, $f_{pj}\ and\ \tau_j$ are variable productions and distributional cost respectively. Product quality is increasing with an increase in efficiency and input cost. The marginal cost decreases with efficiency in production and increases with input cost. The firm can face low marginal costs under the following conditions.

(i) Products are not differentiated vertically.

(ii) Products are differentiated vertically and firms used inputs of high quality, but marginal costs cannot increase quickly with an increase in quality.

(iii) Products are differentiated vertically and firms used inputs of higher quality, while marginal costs increase quickly with an increase in quality.

This framework establishes how quality affects the marginal cost and therefore firm's profit.

As for the measurement of product quality is a concern, we followed Manova and Yu (2017) using the following equation.

$$lnq_{it} = \sigma lnx_{it} + lnp_{it} \quad (2)$$

Here q_{it} stands for product quality, x_{it} is the export quantity, and p_{it} is the price of a product for a firm i at the time t, $\delta$is the elasticity of substitution[4]. We take $\delta = 5$, hence the equation takes the form $lnq_{it} = 5 * lnx_{it} + lnp_{it}$

3.2 Empirical Model and Data Description

After the detailed discussion on the theoretical models of the study, the next empirical models have been designed. These models are formed in light of the objectives of the study. Firstly, the measure of product quality is constructed by adopting the methodology of Manova and Yu, (2017). After the measurement of product quality, the determinants of product quality are explored in the next step.

$$PQ_{ft} = \alpha_0 + \alpha_n END_{it} + \varepsilon_t \quad (3)$$

$$END_{it} = (TA_{it}, LEV_{it}, TFP_{it}, AEX_{it}, SG_{it}, XPER_{it}, PUR_{it}, MS_{it}, CF_{it}, SIZE_{it}) \quad (4)$$

Where PQ is product quality, and END is the endogenous determinants like TA for total assets, TFP for the total factor of productivity, LEV for leverage, AEX for advertising expenditure, XPER for export performance, SG for sale growth, PUR for purchases, MS for market share, CF for cash flow, and SIZE for firm's size. Here, the final empirical model is as follows:

[4]The elasticity of substitution is set at the value$\delta = 5$. We have the robustness of results with choices $\delta$and our result is significant at this level.

$$PQ_{it} = \alpha_0 + \alpha_1 TA_{it} + \alpha_2 LEV_{it} + \alpha_3 TFP_{it} + \alpha_4 AEX_{it} + \alpha_5 SG_{it} + \alpha_6 XPER_{it} + \alpha_7 \mathrm{PUR_{it}} + \alpha_8 \mathrm{MS_{it}} + \alpha_9 \mathrm{CF_{it}} + \alpha_{10} \mathrm{SIZE_{it}} + \varepsilon_t \quad (5)$$

To explore the exogenous determinants of product quality, the following empirical model is presented as follows.

$$PQ_{ft} = \beta_0 + \beta_n EXG_t + \epsilon_t \quad (6)$$

Where$EXG_t$is for exogenous determinants of product quality and the exogenous determinants are;

$$EXG_t = (TF_t, LGDP_t, RD_t, WR_t, REER_t, RIR_t, \mathrm{POP_t}, TR_t, \mathrm{LF_t}) \quad (7)$$

Where PQ is product quality and EXGarethe endogenous determinants like ants are product quality. Here, TF is trade flow, LGDP stands for the log of GDP, RD is research and development activities, WR is wage rate, REER is Real Effective Exchange rate, RIR is taken as real interest rate, POP is population rate, TR is tariff rate, LF is for the labor force. Hence the final model is as follows;

$$PQ_{it} = \beta_0 + \beta_1 TF_t + \beta_2 LGDP_t + \beta_3 RD_t + \beta_4 WR_t + \beta_5 REER_t + \beta_6 RIR_t + \beta_7 \mathrm{POP_t} + \beta_8 TR_t + \beta_9 \mathrm{LF_t} + \epsilon_t \quad (8)$$

Estimation Technique

After collection and construction of variables, the Data of a few indicators is normalized as the unit of measurement is different. The min-max normalization method is chosen which is provided by OECD (2008). The methodology presented by Manova and Yu

(2017) is used to measure product quality. After measurement of product quality, the second objective of the study is to explore the determinants of product quality. The fixed effect model is applied to investigate the exogenous and endogenous determinants of product quality. For this purpose diagnostic test is applied, that is the Hausman test. Hence, the result of the Hausman test is suggested to check whether the fixed effect model is more suitable or a random effect model.

Data and Data Sources

The sample is selected from non-financial firms of Pakistan listed at the Pakistan Stock Exchange (PSX). The data is collected from the annual financial statements of non-financial firms for the period of 1999 to 2018. The other country-level variables are also used in this study. These variables are taken from the data sources such as the Pakistan Bureau of statistics, the Pakistan Economic Survey, World Development Indices, and International Financial Statistics.

Table 1: List of Variables and Sources

<table>
<tr><th colspan="4">Measurement of Product Quality (PSX)</th></tr>
<tr><td>Quantity of Export</td><td colspan="3" rowspan="2">Annual Financial Statements of Pakistan Stock Exchange (PSX)</td></tr>
<tr><td>Price of Export</td></tr>
<tr><th colspan="4">Determinants of Product Quality</th></tr>
<tr><th>Endogenous</th><td rowspan="11">Annual Financial Statements of Pakistan Stock Exchange (PSX)</td><th>Exogenous</th><td rowspan="11">World Development Indicators (WDI)</td></tr>
<tr><td>Total Assets</td><td>GDP</td></tr>
<tr><td>Total Factor of Productivity</td><td>Trade Flow</td></tr>
<tr><td>Advertising Expenditure</td><td>Research & Development Activities</td></tr>
<tr><td>Export performance</td><td>Population Rate</td></tr>
<tr><td>Sale Growth</td><td>Wage Rate</td></tr>
<tr><td>Purchases</td><td>Labor Force</td></tr>
<tr><td>Market Share</td><td>Real Effective Exchange rate</td></tr>
<tr><td>Size</td><td>Tariff Rate</td></tr>
<tr><td>Leverage</td><td>Real Interest Rate</td></tr>
<tr><td>Cash Flow</td><td></td></tr>
</table>

4. Results and Discussion

This section presents empirical findings of the study to address the objectives of the study accordingly. The first subsection section (4.1) describes the measurement of the product quality at the firm level of Pakistan. The second subsection (4.2) presents both the endogenous and exogenous determinants of product quality for the non-financial firms listed at the Pakistan Stock Exchange over the period 1999-2018.

4.1 Measurement of Product Quality

In this study, product quality is estimated by following the method of (Manova & Yu, 2017). They maximize consumers' utility function that depends on product variety, quantity, and product quality. Hence, this framework explains the relationship of quality, prices, revenue, and profit across firms. To measure product quality, we construct an indicator of unobserved product quality from observed data on export quantities and prices. We used the proxy for export prices as the cost of sale and net profit margin (Anderson et al., 2019). This quality proxy can also be relevant with the features of CES preferences used in Khandelwal (2010) and Fan et al. (2015). Table2 presents descriptive statistics of the estimated product quality of the non-financial firms.

Table 2: Measurement of Product Quality

No. of obs.		6879
No. of Firms		366
Mean		86.54
Percentile	25th	80.58
	50th (Median)	86.23
	75th	92.26
St Dev	Overall	10.15
	Between	8.66
	Within	5.65

Min	Overall	37.88
	Between	60.02
	Within	40.11
Max	Overall	118.36
	Between	113.19
	Within	126.78
Source: Author's Calculations		

Table 2 presents the summary statistics for the estimates of product quality. Such as the number of observations, number of groups, mean, median, 25th percentile, 50th percentile, 75th percentile, minimum value, maximum value, and standard deviation of product quality estimates. The mean value of 86.54 is higher than the median value of 86.23 which shows the distribution is rightward skewed. There is less variation and uncertainty is shown in the data. The data range is 37.88 to 118.36 value.

4.2 Determinants of Product Quality

The product quality can be determined by different endogenous (firm-specific) as well as exogenous (country-specific) factors. In this section, all exogenous and endogenous determinants are discussed separately which have a significant influence on product quality.

4.2.1. Endogenous (Firm-Level) Determinants of Product Quality

This study is taken various endogenous factors based on the existing literature. Following Table 3 presents the summary statistics of firm-level determinants of product quality. Here, the following endogenous (firm-level) determinants of product quality are taken: total assets, total factor productivity, leverage, advertising expenditure, performance, sale growth, purchases, and market share.

The fixed-effect model is used after applying the diagnostic test[5]. The result of the Hausman test suggested that the fixed effect model is a more suitable estimation technique for our analysis. Results for the final model exploring endogenous determinants are reported in Table 3.

Table 3: Summary Statistics of the Endogenous Determinants of Product Quality

Variables	No of obs.	Median	St Dev.	Min	Max	p25	p50 (Median)	p75
PQ_{it}	6877	60	12.59	0	100	53	60	68
TA_{it}	6783	0.08	0.04	0	1	0.08	0.08	0.09
TFP_{it}	6491	8.47	1.83	-1.61	15.19	7.35	8.47	9.64
LEV_{it}	4036	0.20	46.34	-13.12	139.00	0.06	0.20	0.59
AEX_{it}	5143	0.04	0.05	0	1	0.04	0.04	0.05
$XPER_{it}$	3244	5.70	1.00	-0.97	7.63	5.01	5.70	6.29
SG_{it}	7144	9.57	2.57	-100	2.17	-3.86	9.57	24.29
$\boldsymbol{PUR_{it}}$	2179	0.93	0.54	0	1	0.06	0.93	0.71
$\boldsymbol{MS_{it}}$	7126	0.02	0.59	0	1	0.00	0.02	0.10
$\boldsymbol{CF_{it}}$	3987	0.01	19.58	-683.85	116.51	-0.00	0.01	0.09
$\boldsymbol{SIZE_{it}}$	6880	0.18	0.40	0	1	0.66	0.18	0.54

[5]Hausman test statistics (15.54) with a p-value (0.000) decided the Fixed Effect Model is an appropriate technique.

Table 4: Estimated Results of Fixed Effect Model

Variables	General Model	Specific Model
TA_{fi}	38.73**	29.16**
	(0.011)	(0.018)
LEV_{it}	-3.50***	-4.37***
	(0.000)	(0.000)
TFP_{it}	5.58***	5.75***
	(0.000)	(0.000)
AEX_{it}	9.98**	13.22***
	(0.033)	(0.002)
SG_{it}	3.12**	3.58***
	(0.016)	(0.000)
$XPER_{it}$	0.88***	0.87***
	(0.000)	(0.000)
$\boldsymbol{PUR_{it}}$	-1.04	----
	(0.167)	
$\boldsymbol{MS_{it}}$	0.08	----
	(0.771)	
$\boldsymbol{CF_{it}}$	-0.11	----
	(0.866)	
$\boldsymbol{SIZE_{it}}$	1.39	----
	(0.237)	
Cons.	9.84**	5.65**
	(0.024)	(0.007)
Obs.	1345	1345
R-Squared	0.86	0.83
No. of firms	222	222
F.Stat.	56.90***	53.03***
	(0.000)	(0.000)

Note: TA for total assets, TFP for the total factor of productivity, LEV for leverage, AEX for advertising expenditure, XPER for export performance, SG for sale growth, PUR for purchases, MS for market share, CF for cash flow, and SIZE for firm's size. Significance at 1, 5, and 10 percent are denoted by ***, **, and *respectively. P-values of individual coefficients are presented in parenthesis. All models are estimated using Fixed Effect Model and employ robust standard error.

Column 2 of Table 4 presents the estimated values of our fixed effect general model that includes all endogenous (firm-level) determinants. After analysis, a few determinants such as market share, firm size, purchases, and cash flow of firm are economically and statistically insignificant, which leads to excluding them sequentially from the panel regression analysis. Hence, the specific model is estimated by excluding insignificant determinants.

Consequently, the firm-level determinants like Total Assets (TA_{it}), Total Factor of Productivity (TFP_{it}), Advertising Expenditure (AEX_{it}), Leverage (LEV_{it}), Export Performance ($XPER_{it}$), and the Sale Growth (SG_{it}) are highlighted in a specific model. The estimated results are presented in column 3.

The total assets (TA_{it}) of a firm enter the model positively that is statistically significant. Findings suggest that the firm can spend more expenditure on research and development activities to improve the quality of its product if firm have the more assets of firms. Our results are consistent with the results of Brooks (2006) and Anwar and Sun (2018) who argued that an increase in total assets motivates a firm to allocate more resources for producing high-quality products. In addition, the firm can adopt high-quality imported inputs in its production process.

Leverage (LEV_{it}) is the second endogenous determinant that can affect product quality. Our findings indicate a negative and significant effect of leverage on product quality. The high financial leverage discourages the production of high-quality products because they do have not enough finances to bear the high cost of producing a quality product. Our results are in line with the studies of Greenaway et al. (2007) and Sheikh and Wang (2010) which explain that high leverage firm try to cover its expenditures instead of the improvement of product quality.

The total factor of productivity (TFP_{it}) holds a positive and statistically significant effect on product quality. Our results are consistent with the study of Fan et al. (2018) and Demir and Hu (2020)that came with the findings that an increase in the productivity of a firm leads to high profitability, and hence, an increased likelihood of a firm to enter in the international market.

The Advertising Expenditure (AEX_{it}) has a positive and statistically significant impact on product quality. Firms that spend more on the advertising of their products can increase their sales revenue and profit. They have full information about the domestic and international markets, so they produced such items which meet the international standards. These firms can easily produce high-quality products. Our result is consistent with the study of Khanna and Sharma (2018) which explains more expenditure on advertising products can use in the promotion of product quality.

The Sale Growth (SG_{it}) poses positive and significant effects on the product quality of a firm. A large-sized firm can improve its product quality, as these firms have more resources to produce a high-quality product. Our results are consistent with the results of Brambilla and Porto (2016) which describes the increase in sales growth of firm indicates that firm can produce good quality product .on the other side, high-quality product also affects the sale's growth of the firm.

The Export Performance ($XPER_{it}$) a progressive and significant determinant of product quality for a firm. The one possible justification is if a firm involved more in exporting activities can affect the product quality. A firm with good export performance can increase its export sale. The survival rate of such firms is high as they are capable to meet international standards and produce high quality product. Our results are in favor of the studies of Lee and Choi (2015) and Manova and Yu (2017) that explain good export performance encourages the firm to improve the quality of the product.

In the general model, there are four determinants Purchases (PUR_{it}), Market Share (MS_{ft}), Cash Flow (CF_{it}), and Size of Firm (SIZ_{it}) which are excluded for a specific model. All these variables are economically significant but statistically insignificant. Economic significance means the expected sign of these variables according to economic theory. The

negative sign of purchases shows that abundant purchases increase the cost of production, so the firm reduces its expense on R&D activities. This process harms product quality. Similarly, in the case of Pakistan, cash flow is also negative effect as outflow and inflow of money is not efficiently handled by Pakistan's firms. Therefore, cash flow harms the quality of the product. The positive sign of market share and size of the firm suggests that as the size of the firm increases, the market share of that firm is also increased. The firm pays more attention to improving the product quality. All of these variables are excluded from the analysis due to the insignificant impact on the product quality.

The conclusions that can be extracted from the findings are that total asset, a total factor of productivity, advertising expenditure, export performance, sales growth positively and significantly affect the product quality but the leverage ratio of the firm has a negative and significant effect on product quality[6].

[6] A graphical analysis of endogenous determinants is given in the appendix.

4.2.2. Exogenous (Country-Level) Determinants of Product Quality

Product quality is not only subjected to firm characteristics but also country-level factors pose its impact. The exogenous (country-level) determinants of product quality are examined in this section. The preliminary analysis is based on two sub-sections: descriptive statistics and graphical analysis, and the regression analysis described afterward. Table 5explains the summary statistics of exogenous determinants of product quality.

Table 5: Summary Statistics of Exogenous Determinants of Firm's Product Quality

Variables	No of obs.	Median	St Dev.	Min	Max	p25	p50 (Median)	p75
PQ_{it}	6877	60.45	12.59	0	100	53	60	68
TF_t	7380	30.45	3.18	25.30	35.68	27.63	31.48	32.90
$LGDP_t$	7380	30.08	0.75	28.70	31.17	29.38	30.10	30.79
RD_t	7380	0.31	0.19	0.03	0.77	0.14	0.28	0.44
RIR_t	7380	1.26	4.14	-5.08	8.32	-2.51	1.54	4.44
$REER_t$	7380	10.65	7.00	6.48	21.47	9.41	10.38	27.67
POP_t	7380	2.26	0.19	2.05	2.77	2.09	2.24	2.32
WR_t	7380	38.32	1.87	35.25	42.96	36.99	38.42	39.77
TR_t	7380	15.69	4.34	12.12	26.41	13.04	13.44	17.23
LF_t	7380	52.07	1.53	50.01	54.68	50.63	52.04	53.45

Table 5 presents the summary statistics of exogenous determinants of product quality: Trade flows, GDP, R&D expenditure, Real interest rate, real exchange rate, Population growth, wage rate, tariff rate, and labor force. Table 6 explains the nature of the correlation between exogenous determinants of product quality. After descriptive analysis, we conduct a regression-based analysis for exogenous (country-level) determinants of product quality. The important exogenous determinants are exchange rate, real interest rate, GDP, wage rate, Tariff rate, trade balance, the labor force, R&D, and population growth. No study has been carried out in the case of Pakistan that investigated the determinants of product quality. After basic analysis, economically and statistically insignificant variables are excluded

sequentially from regression. We have taken the variables which are economically and statistically significant. In this section, we examine the exogenous determinants of product quality. The outcome of the Hausman test suggested that the fixed-effect model is a more appropriate technique[7]. Following table 6 presents the estimated result of our empirical model that explores exogenous determinants of product quality.

Table 6: Estimates of Exogenous Determinants of Firm's Product Quality

Variables	General Model	Specific Model
TF_t	0.18***	0.22***
	(0.000)	(0.000)
$LGDP_t$	7.32***	0.22***
	(0.000)	(0.000)
RD_t	0.46**	0.64**
	(0.017)	(0.008)
WR_t	-0.08**	-0.15***
	(0.099)	(0.000)
$REER_t$	-0.01	----
	(0.320)	
RIR_t	0.01	----
	(0.377)	
POP_t	3.22	----
	(0.229)	
TR_t	0.05	----
	(0.350)	
LF_t	-0.29	----
	(0.266)	
Cons.	-155.26***	-129.03***
	(0.000)	(0.000)
Obs.	6,877	6,877
R-Squared	0.4071	0.4071
No of firms	365	365
F.Stat.	62.94***	112.96***
	(0.000)	(0.000)

Note: the above table shows the exogenous determinants of export product quality. Here, LNGDP stands for the log of GDP, TF is trade flow, RD is research and development activities, POP is population rate, WR is wage rate, LF is for the labor force, REER is Real Effective Exchange rate, TR is tariff rate, RIR is taken as real interest rate, Significance at 1, 5, and 10 percent are denoted by ***,

[7]Hausman test statistics (15.54) with a p-value(0.000) decided the Fixed Effect Model is an applicable technique..

**, and * respectively. P-values of individual coefficients are presented in parenthesis. All models are estimated using Fixed Effect Model and employ robust standard error.

First, we estimated the general model by taking all factors at the country level. After analysis, a few determinants such as tariff rate, labor force, population rate, real exchange rate, and real interest rate are economically and statistically insignificant. Hence, the specific model is estimated by excluding insignificant determinants. Consequently, the country-level determinants that are GDP, trade flow, R&D, and wage rate are highlighted in our specific model.

The Gross Domestic Product (GDP_t) has positive and significant impact in improving product quality. The high GDP is the signal of economic growth and development that the economy grows in the right direction. The good economic condition encourages producers to produce high-quality products. Our results are consistent with the study of Sheikh and Wang (2010)andKneller and Yu (2016). Hence, high GDP indicates that the economy grows rapidly and producers are motivated to produce a high-quality product and to export to developed countries.

Next, the Trade Flow (TF_t) also plays positive and significant role in improving product quality. More trade flows mean more knowledge and technology is transmitted and easy access to good quality input for producing a good quality product. The trading activities of an economy can also affect product quality and can improve the product quality to meet the standards of international markets. Our results are in line with the findings of Calantone and Knight (2000), Johnson (2012), and Saudi et al. (2019), which argue for a positive effect of trade flow on product quality.

The R&D activities show the positive and statistically significant effect to enhance the product quality. The country spends more finances on research and development activities,

which can increase its trade flow. If a country is more contacts and connections, getting information regarding advanced and new technologies for production, improving their sale and product quality. The countries with more R&D activities can use good inputs, implement advanced and new technology of production, and engage skilled and trained workers. Our results are consistent with the study of Mendi (2007)and Eshraghi and Ismail (2013)which stated that R&D activities help improve the product quality.

The high Wage Rate (WR_t) means that payment of workers increases. As labor is a factor of production, the increase in wages leads to an increase in the cost of production. On the other side, improvement in product quality is also linked up with heavy expenses that can be the cause of high costs. Consequently, the firm is unable to face the burden of such high costs which restrict the firm to improve its product quality. The wage rate hurts product quality in the case of Pakistan's firm. Our results are in line with the study of Essaji and Fujiwara (2012) which investigated that there is negative relationship exists between wage rate and product quality.

In the general model, there are five determinants population, tariff rate, real interest rate, real exchange rate, labor force which is excluded for a specific model. All these variables are economically significant but statistically insignificant except labor force and interest rate which is economically and statistically significant. The economic significance means that the expected sign of these variables is in line with economic theory. The high Population Growth(POP_t) rate means that the demand as well as consumption increases. Consequently, firms keep their focus on increasing the quantity and quality of the product. The high Tariff Rate (TR_t) means the cost of importing items is high. High importing cost restricts the firm to import, ultimately export increases. The increased export flow indicates that the firm takes

some measures to improve product quality. A high Exchange Rate ($REER_t$) means appreciation of the currency, so the net export of the country goes downward. So, the producer is also discouraged to produce a high-quality product as international activities are not better economically. The above-discussed variables are statistically insignificant. The reason might be that the firms in Pakistan are not executing the effect on product quality properly[8].

5. Conclusion

Product quality plays a significant role in determining the export flow of a country. Firms that produce high-quality products should reap the potential gain of both domestic and international markets. In this context, our study is an attempt to analyze the effect of product quality in the case of Pakistan's non-financial firms listed at the Pakistan Stock Exchange for the period 1999-2018. To examine the first objective of the study, we measure the product quality by using the methodology adopted by Manova and Yu, (2017) and Khandelwal, (2010). Having constructed the product quality, the second objective of the study is to explore the macro and micro determinants of product quality. The findings of the study specified some endogenous and exogenous factors that signify its effect on product quality. Among the endogenous (firm-level) determinants of sale growth, total asset, TFP, leverage, advertising expenditure, and export performance are the key determinants that affect product quality. All these determinants are used to improve product quality except leverage which is negatively associated with the firm. As far as the exogenous (country-level) factors are concerned trade flow, GDP, and R&D activities play a positive and significant role in improving product quality whereas, the real exchange rate and real interest rate harm the

[8]A graphical analysis of exogenous determinants is given in the appendix.

firm's product quality. Based on the findings of this study, the following policy guidelines may be derived. In the recent period, quality is more important than quantity. The government and policymakers should focus on providing R&D funds for new investors, loan packages, and financial aid programs at the lowest rate, political situations, reduction in tariff, improve export performance, stable exchange rate policy, and agreements with trading countries on fewer terms and conditions. All these measures can be helpful to encourage international trading activities.

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Appendixes:

Appendix 1: Histogram of Product Quality

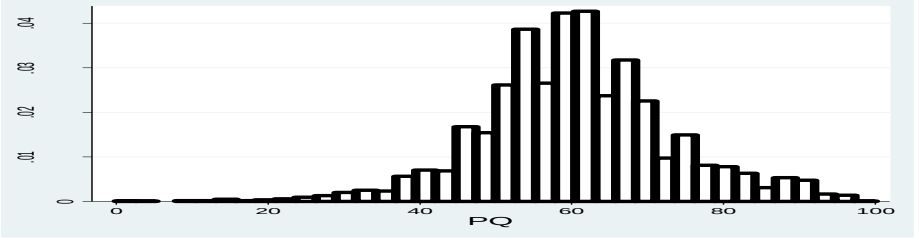
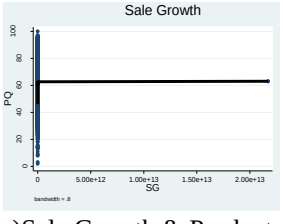


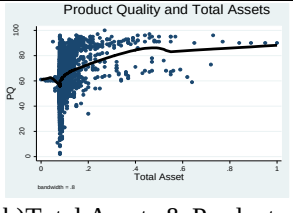
Table1 Hausman Test for Determinants of product quality

Hausman test	15.54 *** (0.000)

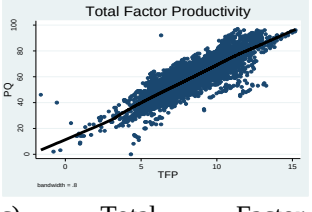
Appendix 2: Scatter Plots for Endogenous Determinants of Product Quality



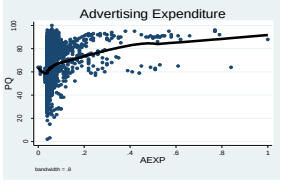
a)Sale Growth & Product Quality



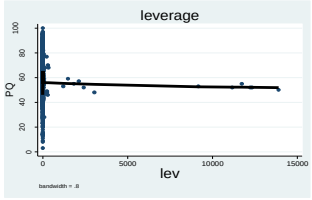
b)Total Assets & Product Quality



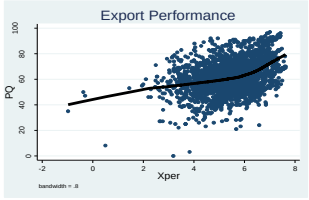
c) Total Factor Productivity& Product Quality



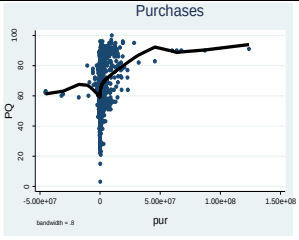
Advertising Expenditures &Product Quality



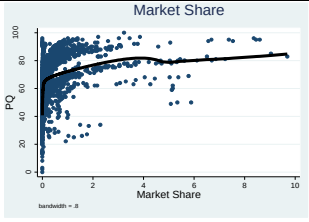
e) Leverage& Product Quality



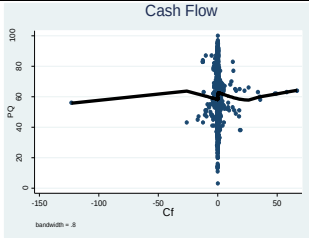
Export Performance & Product Quality



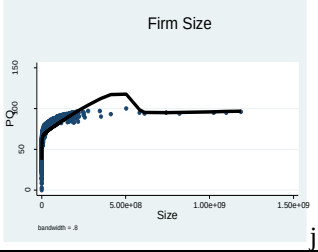
g) Purchases& Product Quality



h) Market Share& Product Quality



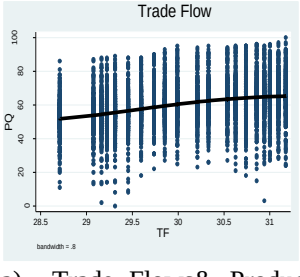
Cash Flow & Product Quality



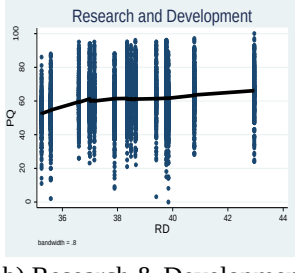
j) Size& Product Quality

Note: The above scatter plots show the relationship between product quality and its firm-specific determinants. Authors own depictions based on data set 1998-2018.

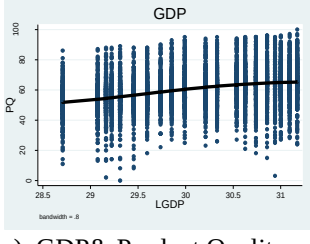
Appendix 3: Scatter Plots for Exogenous Determinants of Firm's Product Quality



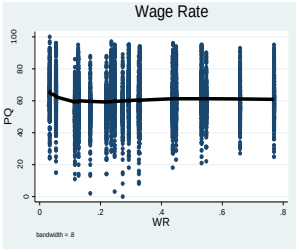
a) Trade Flows& Product Quality



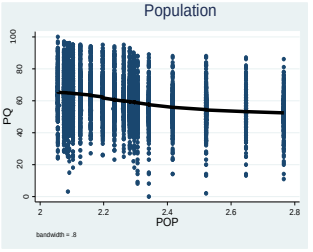
b) Research & Development & Product Quality



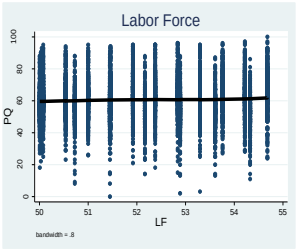
c) GDP& Product Quality



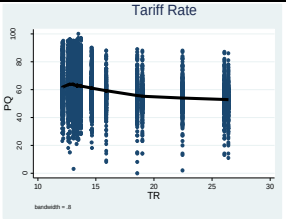
d)Wage Rate& Product Quality



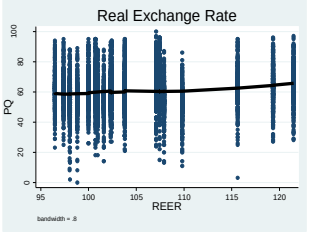
e) Population& Product Quality



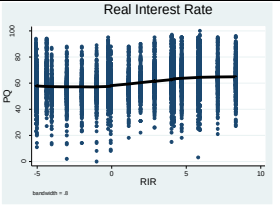
f) Labor Force& Product Quality



g) Tariff Rate & Product Quality



h) Exchange Rate & Product Quality



i) Real Interest Rate& Product Quality