Export Product Quality and Trade Flows: An Empirical Analysis of Micro Data for Pakistan

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Declaration

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

IN THE NAME OF GOD,
THE MOST GRACIOUS, THE MOST MERCIFUL

Dedicated to

Ami G (Late),

My husband M. Yasir Ishfaq,

And my children Amna Yasir & Abdullah Yasir

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Abstract

One of the potential benefits of globalization is to enhance access to better-quality technologies and products that are central to accelerating the pace the economic growth in an open economy. Export product quality determines the extent of export flows in an economy. The exporting firms raise their sales of the high-quality product in the domestic as well as foreign markets. Such firms have adaptability in terms of acquiring advanced technologies that can enhance their productivity. Various other factors alter the relationship between export product quality and trade flows. This study broadly deals with the five broad directions. We measure product quality for non-financial firms listed on Pakistan Stock Exchange. We further explore determinants of export product quality both at firm-level panel data and country-level. Next, the nexus between export flows and product quality is examined at firm-level data. More importantly, we account for the role of moderators affecting the relationship between product quality and trade flows. We build three models by taking financial constraints, the firm's heterogeneity, and the research & development activities of a firm as moderators. Last, we consider two mediator channels, namely the firm's growth and the firm's total factor productivity growth in affecting the export flows-product quality relationship. We take data for non-financial firms listed on Pakistan Stock Exchange for the year 1999 to 2018. We choose those firms which meet the accounting criteria consistent with the objectives of the study. We apply three different panel data methods, namely the Fixed Effect, Random Effect Model, and Seemingly Unrelated Regression Model (SUR). The product quality for Pakistani firms is measured through the methodology adopted by Manova and Yu (2017). After he construction of product quality, we investigated the firm-level and country-level determinants of product quality. Product quality can be improved by total assets, the total factor of productivity, sales growth, advertising expenditure, and export performance at the firm level. The country-level determinants which affect quality are GDP, research and development activities, and trade flow. It is also found that improvement in the quality of products leads to an increase the export flows. Afterward, the significant and enhancing role of moderators is found in the relationship between product quality and export flows. The firm's heterogeneity and R&D activities are complimentary but financial constraints have a substitution effect on product quality. Moreover, it is concluded that there is a

partial mediation effect on product quality and export flows. The firm's growth and total factor of productivity growth have a partial effect as the direct and indirect effects are significant while determining the export through product quality.

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

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List of Abbreviations

PQ	Product Quality
EF	Export Flow
GDP	Gross Domestic Product
RD	Research & Development
FDI	Foreign Direct Investment
TFP	Total Factor of Productivity
FG	Firm's Growth
FH	Firm's Heterogeneity
FC	Financial Constraints
SUR	Seemingly Unrelated Regression
TO	Trade Openness
TA	Total Assets
REER	Real Effective Exchange Rate
RIR	Real Interest Rate
TF	Trade Flow
LEV	Leverage Ratio
AEXP	Advertising Expenditure
XPER	Export Performance
CES	Constant Elasticity of Substitution
KZ	Kaplan-Zingales
WW	Whited and Wu
FE	Fixed Effect
SG	Sale Growth
RE	Random Effect

Chapter 1

Introduction

1.1. Background of Study

The process of globalization has increased the economic interdependence of the world economies. This is a cause of a rapid increase in the cross-border movement of goods, services, technology, and capital flows. Among others, one potential benefit of globalization is the availability of better quality. Moreover, not only consumers, firms (production units) are getting benefits through access to advance and latest production processes (technologies). The main aspect of globalization is trade openness between countries. The concept of trade openness began in the late nineteenth century. The agreements under the framework of trade openness are used to integrate developed economies with less developed economies economically by giving better opportunities for foreign direct investment, the reduction of trade barriers, and many other projects.

Existing literature highlighted several challenges through which trade openness proves beneficial for trading partners. Trade openness is beneficial in many aspects. First, trade openness gives a greater variety of goods to consumers and a wider range of inputs are available to producers. Second, trade openness expands the size of markets for domestic producers. Third, inefficient domestic monopolies can be removed through foreign competition that inturns increase productivity through better allocation of resources (Pavcnik, 2002; Helpman et al., 2008). However, some empirical studies link the gains from international trade with the quality of exports (Copeland & Kotwal, 1996; J. C. Hallak, 2006; Gervais, 2015; Anderson et al., 2019). Studies on the subject argued

that export product quality plays a central role in the trade flows of an economy. For instance, the production of high-quality increases export market outcomes and thereafter economic growth (Amiti & Khandelwal, 2013; Fan & Li, 2015)[1]. 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 (Schott, 2004; Hummels & Klenow, 2005). Some recent studies (J. C. Hallak, 2006) increasingly point to the importance of product quality in international trade. However, the effect of product quality on the gain from trade flow is not investigated in its full length.

1.2. Product Quality and Its Determinants

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

Some studies argue that the quality of the product is important not only to the producer but also to the consumer as well. For the producer, better quality can increase the sale of the company by gaining the confidence of the consumer. The survival of the production unit can ultimately be linked to its sale and revenue. Moreover, the consumer willing to pay a high price for the product to receive a good quality product. On the other

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

hand, if they are satisfied with the quality of the product, they will switch their interest and demand toward 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 & Li, 2015). The factor of production is utilized differently so the product quality differs across the country. The country can enjoy the benefit of comparative advantages and produce the product accordingly. The trade flow of a country can be improved when a high-quality product is exported to international markets. (Schott, 2004; Hummels & Klenow, 2005; Feenstra et al., 2014).

1.3. Product Quality and Trade Flows

Linder (1961) was the first who has given the idea of product quality in international trade theory. According to theory, the country with high income per capita should put more focus on producing good quality products as they have financial space to spend in the production process. Hence, high-income countries can get a comparative advantage in the production of high-quality and highly demanded products in the domestic market. Hence, according to Linder's theory international trade can be more suitable for countries having similar income per capita. The Linder term measures the dissimilarity between the per capita income levels of two countries. Vertical product differentiation allows producing of products with different qualities due to comparative advantage qualities may be different as inputs of production are different (Hallak & Schott, 2008).

Foreign presence plays an important role in improving product quality (Calantone & Knight, 2000). In this context, the one strong argument put in literature (Saudi et al., 2019) is the availability and access to foreign R&D and technology. The transfer of technology can be possible if the country is more open to international trade and FDI. Existing studies (Johnson, 2012) hold some arguments and highlight several channels through which openness in an economy should affect a firm's competitiveness. First, the firm can produce a high-quality product if it has a high level of capital and engages itself in more research and development projects. Second, if a firm is engaged in FDI, it can participate more in international trade by producing high-quality products. Finally, high export prices of similar goods are decreased if the country specializes in agriculture and homogenous goods (Faruq, 2006; Aw & Lee, 2017). Some studies (Aghion et al., 2005; Crino & Epifani, 2012; Fernandes & Paunov, 2013) argued for the imports channel that a firm faces tough import competition, the product quality of that firm increases. The exposure of imports is more efficient in receiving the outcomes from innovative activities (Fan & Li, 2015). The mechanism of innovative outcome is followed as the firm tries to upgrade its product quality and differentiate the product when it faces the pressure of import competition (Brakman et al., 2020). The import competition also increases wage inequality within the firm as high-quality product requires more skilled workers to produce that good (Fernandes & Paunov, 2013). A few studies (Saeed & Sameer, 2015; Jinjarak & Wignaraja, 2016; Qi et al., 2018) pinpointed the role of export flows on the product quality and productivity of a firm. These studies presented some channels through which a firm can enhance exports by improving product quality and the productivity of its resources. First, quality is an essential aspect of exports. A low-quality

firm stays unable to get market access in the international market. Secondly, the developing countries produce low-quality products as their resource availability is limited. This lowers their exports flow[2] over time. On the other side, developed countries produced high-quality products and they have easy excess to the international market, which ultimately improves the export flows. (Fajgelbaum et al., 2011). Thirdly, high-quality product decreases the effect of high transport cost as the high quality product demanded more (Hummels & Klenow, 2005). It argued that only high-quality products are more probability to be exported.

Product quality plays an important role in international trade and much evidence indicates that the quality of products in international markets significantly varies across countries (Flam & Helpman, 1987; Fajgelbaum et al., 2011; Alcala, 2016)[3]. On one hand, higher quality brings a good reputation for producers. On the other hand, higher quality requires higher costs. According to the quality-and-trade literature, more productive firms tend to produce higher-quality products, which yield higher export prices. High-quality products can increase the sale of a product which ultimately earns more revenue. Firms can enter and then survive in foreign markets by upgrading their product quality (Silva & Carreira, 2012). For instance, the role of product quality in international trade is explained first time by Linder (1961). Krugman (1995) argued that higher-income countries produced a greater variety of goods. When rich and poor countries export goods in the same product category, the richer countries sell goods with higher unit values (Hummels & Klenow, 2005). Firms with high export product quality lead to larger

[2] There are few limitations regarding data on imports at firm level which is not available in context of Pakistan . so wehave just taken one sided flow of trade balance that is export flows.We have used word export flow alternatively in whole study.

[3] These studies used export data on goods produced in different countries and industries to determine the average quality of that product.

market shares and self-selection into the export market despite charging higher prices. Some recent studies by Ciani & Bartoli (2020), Alcala (2016), Piveteau & Smagghue (2017), and Crino (2017) have developed a theoretical framework for general equilibrium modeling based on Linder's theory. These frameworks have many implications which highlighted the impact of trade liberalization. Thus, Linder relates the domestic market to international markets. The author argued that international trade is an extended form of domestic business and also investigated that there are many risks involved in foreign trade. Hence, the producer does not fully rely on the international market, rather they export those items which have high domestic demand. High demand leads to the produce and export of high-quality products.

1.4. The Role of Moderators on Product Quality and Trade Flows

The role of moderators is used to check the correlation between product quality and trade flow. The moderators are very helpful in explaining the strength and significance of the relationship between the two variables. The nature and magnitude of the relationship can easily be understood. The moderating variables are used to check the significance and direction of the relationship between the two variables. There are three moderators as financial constraints, firm heterogeneity, and research and development activities.

1.4.1. Financial Constraints

Differences in technology and economies of scale across countries will increase the demand for external finance. Hence, financial development[4] affects not only the country's level of trade with the international market but also the export patterns.

[4] Financial developments are used to overcome costs which incurred in financial system. Such developments are used to fasten economic growth of a country.

Financially developed economies have a great volume of trade (Kletzer & Bardhan, 1987; Baldwin & Krugman, 1989) as countries with a well-developed financial system have a comparative advantage in sectors where the scale of economies is higher and which ultimately promote export activities (Beck, 2002). So, the financial development and trade hypothesis is also dependent on a country's economic, historic, cultural, or geographic condition (Apoteker & Crozet, 2003). However, external financing and funding are important factors in determining international trade.

Exporting firms are mainly dependent on finances to meet their needs. As financial constraints are the cost of international business activities. So well-established financial structures and a strong banking system are necessary to support the exporting firm. In this regard, credit constraint is an important determinant of international trade patterns. There is a high fixed cost is incurred when a firm enters a foreign market. This high cost is the main hurdle for exporting decisions of firms. These costs include the expense of collecting information about the foreign market, observing the needs and demands of foreign customers, producing different and new goods, marketing and packaging, and also providing transport services. The sunk entry cost is the main obstacle to the financial health of a firm with a high sunk cost, only the productive firm will easily export or the firm that has more finances to face business costs. Therefore, financially constrained firms have faced a significant effect on the decision of a firm to export or to produce for the local market (Greenaway et al., 2007).

Bardhan (1987) explains that countries that are more dependent on external financing can reap the potential gains of trading activities. Otherwise, the financial constraint harms the import and export of a country as the foreign suppliers faced the risk

in this situation. The role of the financial situation is also very important. More developed countries can show better export performance by covering these constraints than developing countries.

Related studies highlighted two channels through which financial constraint affects trade flows at the firm's level. First, as specified by Chaney (2016) that financial constraints[5] inversely affect trade flows by restricting the entry of firms into foreign markets. Second, financial development leads a firm to become an exporter by reducing trade costs (Helpman et al., 2004).

Similarly, a well-organized and developed financial market and strong banking system are very important for the new exporters to cover the entry cost. The production process for the international market requires more finance than production in the home country. As the exporter firm has to pay some fixed costs such as production to ensure quality, buy new techniques, conduct research, advertising costs, and investment in fixed capital. Thus, trade flow is more responsive to credit constraints than GDP (Chor & Manova, 2012).

Financial constraints can also affect trade flows by upgrading product quality. Financially developed countries export relatively more financial industries (Beck, 2002; Chan & Manova, 2015). Thus, more investments are needed for quality and technology up-gradation to promote export activities (Verhoogen, 2008; Bustos, 2011). Producers can increase their revenues from exporting and make more finance available to them by upgrading the export product quality (Brown et al., 2012; Martin & Mejean, 2014).

[5] Financial constraint is the shortage of money that cannot buy or do something.

Financial constraints respond to the average quality of export products of a country mainly in two margins. First, financial constraints raise the quality of goods sold by incumbent firms (intensive margin). Second, financial constraints induce new firms to enter the market. This reduces the average quality because the new entrants are less productive than the incumbents (extensive margin). Both margins are generally stronger in financially more vulnerable industries (Rajan & Zingales, 2003; Claessens & Laeven, 2003). Therefore, financial constraints may strongly affect international trade by slowing down quality upgrading at the firm level. Yet, there is limited empirical evidence on the impact of financial constraints on output quality (Crino & Ogliari, 2015).

1.4.2. Firm's Heterogeneity

Heterogeneity is defined as the firms' differences in productivity, size, capital, and skill intensity (Melitz & Redding, 2015). It plays an important role in firms' participation in global markets. The heterogeneity of the firms is helpful in the reallocation of resources efficiently under trade openness. For example, large-size firms have more potential to upgrade product quality which ultimately improves the trade flows (Satpathy et al., 2017). Hence, the productivity and size of a firm play a significant role in determining the revenue, domestic sales, and export sale of the firm. Moreover, exporters are often found to be more productive than non-exporters. Firms can also maximize high profits and minimize costs by producing high-quality products (Sutton, 2001).

Helpman et al. (2004) explain that a production firm can export because such firms are capable to bear the high entry cost. There are some important features that a firm has to consider when entering a foreign market. First, productivity is a necessary condition for a firm to export but it is not a sufficient condition, as some other

characteristics determine the probability of a firm's export: that are size, import status, and foreign ownership. However, the highly productive firm is not interested in exporting their product but few low productive firms can export. Second, firm location also matters, for instance, it is easy for a firm to get knowledge of the market in its surrounding. Third, the firm has sufficient knowledge about the location where they have to export or where not to export.

The firm's heterogeneity in terms of their productivity can only participate in international trade and such firms face specific market competition nationally and internationally (Sutton, 2001; Muuls, 2015). Market competition operates through two determinants: an increase in competition and an increase in the scope for quality differentiation (Abowd et al., 1996). The scope for quality products depends on various factors, such as country/ industry-specific factors, market size, the estimate of the quality of the product, and the degree of product differentiation. For example, firms can improve their performance (on the productivity and/or demand side) after entering export markets through the learning-by-exporting mechanism. Trade models of heterogeneous firms (Smith, 1937; Ricardo, 2017) predict that if product quality is high, a positive association could be observed between prices and productivity. However, in the absence of product quality, this relationship has been reversed. As average productivity increases and the remaining firms respond by lowering prices, quality and market shares shrink. The literature also reports that exporters produce higher quality goods and sell at higher prices than non-exporters (Hallak & Sivadasan, 2013). However, firm heterogeneity has a significant effect in determining the relationship between product quality and trade flows.

1.4.3. Research & Development Activities

Trade openness leads to a decrease in the trade barriers between integrated countries, access to more expanded markets, proficiency in output, use of capital and financial sources, use of technology spillovers, and access to foreign investment and international cooperation. The process of technology improvement through domestic research and development sectors is slower and more costly in developing countries as compared to developed countries. However, developing countries can improve their productivity by expanding trade with industrial countries which have knowledge base production[6].

The decade of the 1980s witnessed two related innovations in the theory of trade and growth. First, a new trade theory emerged at the beginning of the 1980s. It inherits concepts from the industrial organization into traditional trade theory; imperfect competition and economies of scale play a central role. Second, a new endogenous growth theory emerged in the mid-1980s and early 1990s. It provides an incentive for innovative activity commonly measured as R&D (research and development). Fajgelbaum et al. (2011) for example, argue that innovation and growth in the global economy are a combination of new trade theory and new growth theory. The basic argument about R&D concerns is the generation of new products which are transferred to overseas markets via trade. Technology transfers across borders are a powerful engine to increase productivity levels around the world. Technological knowledge is embodied in intermediate inputs traded across industries and countries (Frankel & Romer, 1999). There are different characteristics of R&D investment. Firstly, the main expenditures of R&D investments are payments and wages of trained and skilled workers. Secondly, the

[6] See Linder hypothesis of trade (1961)

uncertainty level is more at the beginning of the project based on R&D investment (Hall & Lerner, 2010). Thirdly, external R&D discourages domestic R&D investments. Foreign R&D stock can substitute domestic R&D investments (Siddharthan, 1992). There are mainly six determinants of R&D activities; financial leverage, size, profitability, intangible, human, and business resources (Marcelino Sadaba et al., 2016). Knowledge has positive effects on both domestic and foreign productivity levels. The domestic and foreign R&D capital stock affects domestic total factor productivity positively. The more open countries can get more benefits from R&D capital stock. Knowledge spillovers[7] take place when the ideas generated by one firm are utilized by other firms. The firms have full knowledge regarding new and advanced technologies which help produce a high-quality product (Bayoumi et al., 1999). Trade openness is a significant channel for the transmission of technological knowledge among countries and firms. Trade openness can facilitate knowledge spillovers from developed to developing countries through the interaction between trading partners (Helpman, 1981). Developing countries can enjoy the benefits of trade with industrial countries, as interaction with developed countries helps take ideas for improving their products (Schmitz & Knorringa, 2000). Investment in product innovation leads to improve product quality and which ultimately affects trading activities. Consequently, R&D also plays a supportive role in improving product quality and export flows.

1.5. The Role of Mediators on Product Quality and Export Flows

To examine the relationship between export flows and product quality, the role of some mediators needs to explain. These mediators can help in determining the

[7]Knowledge spillover is an exchange of ideas among individuals. these are non-rivalin nature

relationship between two variables in detail. The use of mediator variables aims to explain the direct and indirect effects on dependent variables separately. In this study, there is the role of two mediators is discussed to justify the connection of export flow with product quality.

1.5.1. Firm's Total Factor of Productivity Growth

Technology transfer is one of the main factors that enhancing as the productivity level, technological knowledge is used efficiently as an intermediate input into the production of goods. The use of both domestic and international inputs is necessary to increase in total factor of productivity (Miron & Romer, 1990; Aghion et al., 2005). Traditional trade theories were primarily focused on comparative advantages and aggregate trade patterns while new trade models explained mostly intra-industry trade. New trade theory associated with Baldwin & Krugman (1989) stated that all firms export by producing a unique variety for consumers. Once a firm entered export markets, efficiency in productivity grows. Firms usually react to positive productivity shocks by employing more inputs and increasing the output level.

In literature, several factors have been recognized which determine the TFP of the firm, such as human capital, and R&D. Recent literature included firm heterogeneity as an essential element in international trade. The presence of firm-level heterogeneity suggested that trade liberalization leads to more efficiency in the production process by reallocating resources at the firm level. The model developed by Helpman et al. (2004) shows how firm heterogeneity affects productivity growth by reducing trade costs. Consequently, high-productivity exporting firms survive and expand, while low-productivity non-exporting firms shrink or exit the industry. The literature (Jajri, 2007; Y.

Sheng & Song, 2013; Bhatia & Sharma, 2019) suggests that at least two mechanisms can explain a positive correlation between the export status of a firm and its productivity. The first is self-selection which stated that more productive firms can engage in export activities. The second mechanism is the 'learning-by-exporting' hypothesis: because firms enter into export markets they gain new knowledge and expertise which allows them to improve their efficiency level. In addition, firms with higher productivity, employment, skill, capital, advertising, and R&D intensity have higher average prices and quality. Hence, a firm's productivity growth is also playing a role in the relationship between product quality and trade flows.

The theoretical background developed by Bernard & Jensen (1999) emphasizes the export decision of a firm. A firm will maximize its profit when the expected revenue generated by foreign sales is more than the production cost. And the firms will sell their product in the foreign market when it gets additional net profit through exporting. However, the exporting decision of a firm depends on productivity, profitability, location, size of the firm, and technological progress. The firm size is a source of heterogeneity as larger firms are more productive than small firms (Geroski & Samiei, 1998). Consequently, TFP differences between large and small firms are explained by their characteristics and returns. Even the small firm can also enjoy more benefits than the larger firm if their characteristics are providing high returns. The technical progress through human capital has different returns on small and large firms. Larger firms have a probability to get high returns from innovations in the production process. The effect of human capital can also explain that skilled and trained workers can easily face and solve problems with better communication skills (Castany et al., 2005).

Productivity shocks are also an important element for firm performance and hence for economic growth. Firms are normally reacted to positive shocks by increasing their sales with increasing inputs which ultimately expand the output level. But the negative shocks lead to a decreased firm's sales and input-output level. The effects of productivity shocks on firms' growth are significant and consistent.

Four factors are important for the productivity and export entry of a firm (Van Biesebroeck, 2018). First, firms face the main hurdle in entry into the international market access to finance. Second, the only firm that can enter the foreign market has sales growth more than average growth. Third, the firm has to adopt a flexible production function that explains economies of scale properly to get more benefits. Fourth, the firm has productivity expansion while engaging itself in international business activities. It means that production function and economies of scale work in the business.

1.5.2. Firm's Growth

The growth can be defined in terms of expansion of business, generation of profit, and revenue. The firms enter into markets by starting the business and making efforts to survive and grow in domestic and foreign markets as well. Geroski & Samiei (1998) states, "entry is easy but survival is not". the firms can grow rapidly by adopting new knowledge and techniques which compatible with foreign markets' mechanisms. The firm size determines how the firm can survive and grow gradually.

Gibrat (1931) discussed the importance of firm size in determining the growth level of the firm. Gibrat's 'Law based on the law of the Proportionate Effect' implies that the firm growth level is independent of its initial size. According to the literature (Keller & Yeaple, 2009; Gupta et al., 2013), the concept of a firm's growth is based on a

multidimensional phenomenon. Many different variables are used to measure the firm's growth such as value-added, market value, number of workers, sales, and revenue. But the most preferable indicator is the sales of a firm (Barkham et al., 2012).

Two approaches explain the firm's growth theoretically: the deterministic and stochastic approaches (Oliveira & Fortunato, 2006). The deterministic approach suggests that the industry and firm-specific characteristics determined the firms' growth rate. In this approach, two-fold perspectives are highlighted while explaining the determinants of growth. Whereas the stochastic approach predicts that the growth rate of a firm is independent of firm size and history of growth (Santarelli et al., 2006)[8]. Several empirical studies analyze the firm's growth by following the stochastic arguments (Coad & Tamvada, 2012).

The significance of firms can be explained in many aspects. First, this growth rate is important for the survival of a firm in both domestic and foreign markets. There is a positive and significant relationship between a firm's growth and survival. Second, it creates more job opportunities in the economy. As a firm expands its business, demand increases, sales increase, and more workers are required to meet the sales targets. Consequently, a positive growth rate leads to job creation and a negative growth rate is the cause of job destruction. Third, the firm's growth develops the backward and forward linkages to other sectors which ultimately increase overall economic activities. Hence, high growth at the firm level causes them to grow economically as a whole. high. On the other side, the economy can face business crises in all sectors of a nation. Fourth, firms can introduce new inventions and new technologies when it comes to the phase of

[8] Gibrat's Law(1931)

growth. The new ideas and innovations can enhance the production process and enable the firm to meet the international standards of the market. Finally, the higher growth rate of firms will lead to an increase the market competitiveness. It helps policymakers to adopt growth policies which leads to an increase the economic activities (Carrizosa, 2007).

It is expected that new knowledge and innovations have a significant effect on the development and growth of a firm. In received literature on the subject, many studies suggested that R&D investment and firm growth have a positive relationship with each other. For example, there is a positive relationship between R & D and firm growth found positive for high-technology industries and negative for low-tech industries (Coad & Tamvada, 2012; Yu, 2013; Chen & Juvenal, 2016). Firms are investing their capital in innovation to enhance their sales, and growth and maintain their existence in the foreign market (Yasuda, 2005). However, R&D expenditures are necessary only for the growth and survival of a firm. The firm can fully capture the domestic and foreign markets by adopting innovations and inventions.

The tendency of a firm for innovation is dependent on the size of the firm. Existing literature highlighted the following innovative strategies (Imbriani et al., 2014):

1. Product Innovation: It boosts growth by increasing the quantity and improving the quality of goods that are supplied in the market.
2. Process Innovation: It increases the firm's growth by improving the techniques of production efficiency and reducing its prices.
3. Managerial Innovation: It tries to utilize the resources efficiently and implement the new production process.

4. Marketing Innovation: It enhances the developing process, searching for new ideas, improving sales, and promoting the product which meets the market demand.

By adopting these innovation strategies, the firm can grow and survive by increasing their sale. R&D investment and innovative activities are important factors to increase a firm growth.

1.6. Research Gap

There are many studies on the effect of product quality and international trade flows that suggested that there is a positive relationship between high export product quality and trade flows ((Faruq, 2006; Alcala, 2016; Piveteau & Smagghue, 2017). Few studies linked product quality with financial constraints which are faced by exporting firms (Antoniades, 2015; Ciani & Bartoli, 2015), but these researches ignore trade flows. However, no empirical study has been carried out so far to explore the relationship between product quality and trade flow through moderators and mediators. In this context, this study has been extended by introducing the role of different moderators and mediators on product quality and trade flow at Pakistan's firm level. Received literature on the subject highlighted some determinants through which export product quality shape trade flows such as foreign direct investment, trade liberalization, import tariff reduction, etc. Therefore, based on the above-cited research, no single study has yet been found to explore the determinants of export quality and trade flows of Pakistan's economy. There are few studies on Pakistani firms has been investigated the effect of financial constraints (Rashid, 2013; Rashid & Ashfaq, 2017; Ahmad & Hashmi, 2019), trade flow (Khan, 2006; Ahmed & Shabbir, 2016; Wadho & Chaudhry, 2018; Yeo & Deng, 2019; Rashid,

Muneeb, et al., 2021), TFP (Ahmad et al., 2008; Nadeem et al., 2012; J. Khan & Khattak, 2014; U. S. Khan et al., 2020; Adnan et al., 2020), firm's growth (Hamid & Ahmad, 2009; Qasim et al., 2021), firm heterogeneity (Whang, 2014; Rashid, Hassan, et al., 2021), and Research & Development activities (J. Khan & Khattak, 2014; Saleem et al., 2019) separately. In this study, we have constructed the estimates of product quality at the firm level for Pakistan as no single study has constructed the product quality for Pakistan. Consequently, there is no study on the relationship between product quality and export flow in Pakistan. However, no empirical study has been carried out to examine the role of moderators and mediators. All these indicators are used to check the relationship between export product quality and trade flow at the firm level. The relationship between product quality and trade flow can be explained more precisely when the direct and indirect role of mediators and moderators is investigated. The main purpose of this study is to investigate the determinant of product quality and afterward, the estimated value of product quality is used for further analysis. Furthermore, the role of moderators such as firm heterogeneity, financial constraints, and R&D activities on product quality and trade flows are also explored. Afterward, the role of mediators like firm's growth and total factor of productivity growth explains their direct and indirect effects on product quality and trade flows.

1.7. Significance of the Study

Among others, the one fundamental issue in Pakistan's economy is the trade deficit that increases over time. Historically import bills dominate export earnings. Among others, the one root cause is product quality that is not up to 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 this issue. Firstly, the study is devoted to measuring the export product quality which is very important for the international trading activities of firms engaged in international trade. The improvement of export product quality leads to an increase in the trade flow. Secondly, the determinants of product quality at both macro and micro levels which has a significant impact on the fluctuation of the Pakistan economy. Thirdly, the moderators play an important role to highlight the relationship between product quality and trade flows. In this study, the effect of financial constraints, firm heterogeneity, and research and development activities as moderators are examined on the link between product quality and trade flows. Finally, the study is examined the role of mediators such as a firm's growth and firm's total factor productivity growth on product quality through trade channels: both direct and indirect effect of the mediator is investigated.

1.8. Objectives of the Study

The study aims to examine the following objectives:

1. To explore the determinants of export product quality for Pakistani firms.
2. To empirically investigate the impact of export product quality on trade flows at the firm level.
3. To evaluate the role of financial constraints in the effect of product quality on trade flows.
4. To evaluate the role of a firm's heterogeneity in the effect of product quality on trade flows.
5. To evaluate the role of R&D in the effect of product quality on trade flows.

6. To examine the direct and indirect impacts of product quality on trade flows; a firm's growth is a channel variable.
7. To examine the direct and indirect impacts of product quality on trade flows; a firm's total factor productivity growth is a channel variable.

1.9. Research Questions

The research questions for this study are formulated as follows:

1. What are the main determinants of product quality?
2. Does export product quality affect the trade flows of Pakistani firms?
3. What could be the role of financial constraints in this relationship between product quality and trade flows?
4. Does a firm's heterogeneity play any significant role in the effect of product quality on trade flows?
5. Do R&D activities play an important role to enhance product quality and afterward improve the trade flows?
6. How product quality affects trade flow by a firm's growth taking as a channel variable?
7. What is the direct and indirect impact of trade flow taking a firm's total factor productivity growth as channel variables?

1.10 Organization of Study

The rest of the study is organized as follows. Chapter 2 presents the reviewed empirical and theoretical literature on the subject. Chapter 3 discussed the theoretical framework, data sources, variables description, and estimation methodologies, of the

study and Chapter 4 provides empirical findings and interpretation of the study in detail. Chapter 5 describes the conclusion of our analysis and gives policy recommendations.

Chapter 2

Literature Review

The literature explains the main four aspects of the study: first describes the concept of product quality and its determinants. Second, the connection between product quality and trade flow is reviewed properly. Third, the role of moderators which affect the link between product quality and trade flow was studied. The three moderators are financial constraints, firm heterogeneity, and R&D expenditures. Four defines the role of mediating effects on product quality and trade flow in detail. The two mediators are the firm's growth and the firm's total factor of productivity growth.

2.1. Product Quality and Its Measurement

Product quality is used to fulfill the consumer's needs (Garvin, 1984). It is a measure that determines the lifestyle of a customer. The product quality must have the following features the useful purpose of a product, its market value, on-time delivery, meeting high standards, customer satisfaction, etc.(H. Lee et al., 2000; Vandenbussche, 2014).

Product quality plays an important for both the firm as well as for the consumer. On the firm side, customer confidence can achieve by producing a high-quality product. In addition, a firm can improve the sale and therefore cover more market share. Many measures can be taken by a firm to improve product quality like suitable raw materials, advanced production technologies, engaging highly qualified and trained laborers, and utilizing the available resources which are used for production (Murphy & Shleifer, 1997; Essaji & Fujiwara, 2012; Fernandes & Paunov, 2013; Brambilla & Porto, 2016). On the

consumer side, the consumer can pay high prices for a high-quality product for his satisfaction. Product quality also plays important role in international markets. The high export product quality is helpful to improve a country's export flow by making high revenue from selling their product in the international market. The improvement in the export product quality is very necessary for the survival of exporting firms (Eshraghi & Ismail, 2013; Ferro et al., 2015; Chen & Juvenal, 2016). Product quality can be affected by interdepartmental interactions. More connections and interactions are used to provide new information regarding markets. this new information is useful to improve product quality (Menon, 1998).

Product quality cannot be measured by observing the data, as it has qualitative characteristics. Hence, the investigators used different proxies to examine product quality. In existing studies (Bagwell & Riordan, 1991; Thatcher, 2004; Bernard et al., 2007; Alvarez & Fuentes, 2011; Szczygielski & Grabowski, 2012; Tian, 2017), the two commonly used proxies are prices and the unit value of the product (Gabor & Granger, 1966). The reviewed studies (Thatcher 2004) have made some justification for the price of a product. For instance, it is argued that it provides relevant and accurate information about the quality. In addition, there is a direct and significant connection between prices and the quality of a 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) etc. However, Harrigan et al. (2015) highlighted that 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 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's (2010) approach is that high-quality products lead to high market shares on conditional prices in a given destination. Based on this concept, Khandelwal (2010) measured quality estimates by deriving a demand function that reflected both the vertical and the horizontal characteristics of the goods. this approach represents the quality of a product exported by one country to another country at a given time. However, the quality estimates can be varied by product, market, industry, country, and year.

Manova and Yu (2017) maximize the consumer's utility function that depends on product variety, quantity, and product quality. The consumer utility can be growing with increases in all aspects of product variety, quantity, and quality which implies that output prices can reflect all the aspects of product quality. Hence, this framework explains the relationship between quality, prices, revenue, and profit across firms (Anderson et al., 2019).

2.2. Product Quality and Its Determinants

Product quality is a scale to measure the satisfaction level of consumers. It can be determined by different macro and micro factors. So, exporters like the Japanese are successful in international markets due to producing goods of superior quality (Garvin, 1984). Product quality can be measured by the relationship between customer satisfaction and service quality (H. Lee et al., 2000). Some studies suggested different

determinants of product quality such as Falvey & Kierzkowski (1984) established a market structure with inter and intra-industry trade based on imperfect competition. But, Vandenbussche (2014) found that quality and market share is different concepts. And quality upgrading is not a big deal for a product that has a large market share. Abowd (1996) explored that health and safety conditions and worker motivation lead to improve product quality. Fernandes & Paunov (2013) examined product quality can improve as the level of competition increases in importing firms. So, the import push channel always squeezes domestic firms but export openness has an ambiguous effect. Faruq (2006) and Henn et al. (2020) found liberal trade policies and foreign direct investment as new estimates of product quality. They also found that research and development (R&D) activities play an important role in the improvement of product quality. But, Murphy & Andrei (1997) suggested that human capital is also the main determinant in improving the export product quality, as more skilled and trained workers can produce a good quality product. Comite et al. (2014) suggested that taste heterogeneity leads to quality differentiation and enhances the trade flows. Gervais (2015) explained that product quality is a more important determinant of selection for exporting than the productivity of a firm.

Few exogenous characteristics affect product quality (Schott, 2004). The income distribution and input liberalization also affect positively the quality of exported products (Jones et al., 2005). The location and economic condition of exporting countries also matter for the quality of a product. High-quality products are exported to high-income countries as good-quality products are expensive and they can purchase a high-priced product. Secondly, the production of good quality requires more skilled and professional

workers so the high-income countries generate a high wage equilibrium by producing high-quality products. So, there is a dual-link found between export destination, quality, and wages (Brambilla & Porto, 2016). Then, FDI can also affect the export quality of products, and, this quality directly determined the exporting prices. The presence of foreign investors contributes to a significant increase in export quality (Anwar & Sun, 2018). Institutional management is another factor that determines the export product quality. The country has bad governance with more corruption, inefficient bureaucracy, and bad institutional management; it creates uncertainty for producers and investors to produce good quality products. Good governance and institutional management give facilities and also encourage the producer to use efficient and innovative production methods for the improvement of product quality (Y. Lin et al., 2021). Countries with stronger institutions help promote trade flows and ultimately improve product quality (Essaji & Fujiwara, 2012). The productive firms export their product to the market where the demand for good quality is high and to the economies with high-income destinations (Flach, 2016). The adjustment in export product quality and prices of the product is determined by observing country characteristics.

There are endogenous factors that affect product quality. The firm's leverage and export quality are negatively related to each other. Leverage is used for debt financing. It affects the investment decision and productivity growth of a firm (Bernini et al., 2015). The exporting firms have less leverage and more liquid than non-exporters (Bellone et al., 2010; Minetti & Zhu, 2011). The quality of a product can easily be improved and better if it 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, 2007). The improvement in product quality is costly and does not always affect productivity (Audretsch & Elston, 2002). There are some quality action reforms to improve product quality that have direct and indirect effects on exports (Curkovic et al., 2000). But this issue can be resolved by reducing the cost of new techniques by using efficient production methods. The productivity of the firm and product quality have the same characteristic. There is high fixed and variable trade cost faced when a firm entering in export markets by improving product quality (Eum et al., 2021).

The price of a product is used as the main determinant of product quality. High-quality products charged a high price. With time, as consumers become fully aware of the market's mechanism and the market is matured then the introductory high prices decreases (Bagwell & Riordan, 1991). In the international market, the unit export value is a good measure to examine the quality of exports. But the literature is not so much support this hypothesis as export quality and export prices are not so much related to each other. This hypothesis is doubtful and rejected in most cases (Szczygielski & Grabowski, 2012). Product quality is directly related to the unit prices at the sector level and the per capita income of the economy (Tian, 2017). In the first stage of duopoly competitive markets, the firm chooses the quality of the product to produce, and then firmly sets the prices to maximize its profit after getting information regarding the customer's quality choice in the second stage (Thatcher, 2004). The unit value increase as distance and market size increase.

Recently, becoming 'Green' is a basic need and opportunity of the firm. A green product is designed to minimize the environmental impacts during its usage. Green products are produced to minimize waste and maximize the efficiency of resources like

Forest Stewardship Council, Energy star, etc. Few researchers focused on the quality of green products. The quality of Green products is higher than non-green products. So green product is more costly and ultimately expensive than non-green ones. The improved quality of the green product can increase consumer gain by reducing environmental impact (Shen et al., 2020). Similarly, the concept of remanufacturing is also important for the betterment of product quality. The impact of remanufacturing on product quality is mixed. The reason is that the manufacturing cost of improving product quality is different in every case. If the manufacturing cost is minimized then the remanufacturing firm can improve product quality in an efficient way (Li et al., 2018). So the concept of recycling and remanufacturing is also important for product quality. The concept of recycling is also used to improve product quality. The firm can reduce its cost of production and improve product quality by recycling and remanufacturing (Ullah & Sarkar, 2020).

Product creation and quality can be improved when the product is made with imported inputs. The imported inputs are meeting the international standard of the foreign market. If a firm uses good standard imported inputs in production, the quality of the exported product is ultimately high. The imported inputs can enhance output growth by providing a wider set of products (Colantone and Crino, 2014). There is a direct link between imported inputs and domestic products (Berry & Waldfogel, 2010). There is a dire need to develop a model that monitors the process of production to control product quality. For this purpose, a database model is developed and successfully applied by Kano & Nakagawa (2008) for the steel industry. Output growth can be sustained when a

firm produces new and updated products. This growth can boost when inputs are used in productions that are imported from abroad (Frankel & Romer, 1999).

Product quality can be affected by the financial constraints of firms. The main focus of a few studies is that reduction in trade cost leads to improving product quality as more financial resources are available to a firm. Such as, Helpman et al., (2011) examined the welfare consequences of trade for different income groups by making a discrete choice of quality of a differentiated product. Antoniades (2015) stated that competition not only lowers the cost of production of firms but it also raises the scope for quality differentiation. Fan et al, (2012, 2015) examined that import tariff reductions have increased the export quality and prices where the scope for quality differentiation is large. Antoniades (2015) explained how product quality can determine the entry-exit decision of a firm in a foreign market. He found that exporting cost of Ethiopian firms is high as these firms are more financially constrained than in other parts of the world. The classical Heckscher-Ohlin-Mundell model stated that trade and capital mobility are substitutes for each other. Antras & Caballero (2009) show that trade and capital mobility are complements in less financially developed economies. But Bougheas & Falvey (2011) believed that capital flows and international trade are complements when the degree of financial development differs in countries. The exports can compete at the international level by minimizing production costs. In the export market, firms in manufacturing sectors are selected based on food quality Kneller & Yu (2016). In the modern business environment, market competition is being increased. There is a dire need to improve product quality and produce new products to stay a firm in the market. This process can increase production costs. To overcome this cost, firms need to collaborate. The two

competing firms can take advantage of selling the product by adopting the combined policies. The concept of cost-sharing contracts is very helpful to improve product quality and increase the profit level (Chakraborty et al., 2019). Likewise, sharing economy is also important for improving product quality. As such economies can be cost-efficient and produce good quality products (Wen & Siqin, 2020).

Product quality has also been determined through R&D expenditures. As Hall & Mairesse (1995) focused that product quality is improved as the amount of expenditure on research and development rises. There is a significant and positive relationship between R&D and productivity. 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. Sharma et al. (2018) analyzed that firms used R&D expenditures to improve product quality and market shares.

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 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.

2.3. Product Quality and Trade flows

Economic development is directly related to export promotion activities. Different factors are useful for upgrading the export. The ratio of capital-labor is the most important factor, which promotes the export level. Natural and human resources, advanced technologies, institutional quality, and political instability also play a significant role in export promotion. The R&D activities are used to transfer knowledge, skills, and foreign investment. So the economy has to put more focus on R&D activities to expand its export level (Zhu & Fu, 2013). These factors are used to promote and upgrade the export level, which ultimately generates revenue for the economy, so the economy will grow rapidly (Poncet et al., 2010). The researchers have focused on the effect of trade volume on economic growth for developing countries. The empirical results reported that the volume of trade has significantly affected economic growth. A survey on the firms in international trade is investigated by Diez et al. (2018). He examined the behavior of a firm towards selection for exporting and entry of firms in international markets.

The role of Product quality is very important in the concept of international trade (Saudi et al., 2019). It's determining the performance of a firm at the international level. There is a mediation role of product quality which explains the international performance through the location of the international market, technical status, and general strategies adopted by a firm during international activities (Calantone & Knight, 2000). There is a significant and direct relationship between export product quality on trade flows. Several studies have analyzed the relationship between product quality and trade flows. Johnson (2008) developed a model of trade that incorporated product differences in firms.

Hummels & Klenow (2001) and Hallak & Schott (2008) found that larger countries have large trade shares and large trade surpluses by offering high export product quality. Can et al. (2022) also explained that newly industrialized countries can fast grow economically by improving product quality.

In recent studies, researchers focused on the impact of trade volume on product diversification (Gozgor & Can, 2017). the term product diversification is defined as a change in goods of the export basket available to the country (Ali et al., 1991). There is a positive and significant relationship between trade and the income level of a country. The income level rises if within-country trade exists (Frankel & Romer, 1999). Hummels & Klenow (2005) determined the huge quantities of a product as the intensive margin and the extensive margin as the broader set of goods. Such type of product diversification is beneficial for developing countries as more varieties of products in an export basket can help the countries grow speedily (Can & Gozgor, 2018; Dennis & Shepherd, 2011). Moreover, this variety of products reduces the risks of international markets. As it is difficult for a country to produce all kinds of goods, they get specialization in the production of the goods in which inputs are available in abundance. The firm's export participation can be explained by the product quality as well as the productivity of the firm. Both explain the decision of the firm about participation in international activities and product quantities to be exported. The firm producing a good quality product is successful in the international market. Higher product quality allows firms to be more successful in the export market even if their productivity is not similar to other firms (Aw & Lee, 2017).

The firm-specific factors which affect the decision of export activities of the firm are; the size of the firm, the status of import, the location of the firm, and foreign ownership. These factors are also even affected the high-productive firms and prevent them to stop exporting activities (Brakman et al., 2017). A firm with more experience can improve its export performance. The firm can get more access and opportunities in international markets easily if the firm is owned by foreign authorities (Demir & Hu, 2020). The export performance of the firm as entry and survival in the international market is determined by the quality of its product (Kugler & Verhoogen, 2012). Few studies have taken the unit value of a product as a proxy for product quality in the international market. The unit values of products are used as a proxy for the quality of trade (Alvarez & Fuentes, 2011). But unit values of exports are not the best proxy for quality overall.

There is a positive and direct relationship between export product quality and carbon dioxide emissions. So, international trade has also a positive impact on carbon dioxide emissions (Wang et al., 2021; Fatima et al., 2022). This impact on product quality is higher in high-income economies than in middle-income economies (Fang et al., 2019; Wang et al., 2021). So the overall extensive and intensive margin and product diversification have a positive and significant effect on CO2 emissions (Can, 2020). Song et al. (2021) and Zhang (2022)also found that low-polluted firms are more responsive to improving product quality by using environmental regulations. Although highly polluted firms are decreasing product quality due to financial constraints.

There are country-specific determinates that affect the decisions of a firm regarding the entry of the firm. Trade barriers and Institutional barriers affect the

exporting activities of a firm. Institutional barriers can also be faced by firms that increase the entry cost of a firm (Do & Levchenko, 2004; Sheng & Yang, 2016). Better institutions increase the entry of firms into foreign markets and the probability of survival for a firm. The development of the institution of a country can specialize in high-valued sectors, and improve product quality by reducing the problems of the production process. The trade barriers are examined by the tariff imposition on exports. The tariff reduction can also help to upgrade the export product quality. The firms who respond to the tariff reduction are utilized efficient inputs for production, improve product quality, and then redirect their exports to markets where high-quality products are more demanded. The product quality can be improved as good quality inputs are used for production. The tariff reduction facilitates the firm to import good quality inputs and enhance their productivity growth (Fan et al. 2018). A reduction in tariffs leads to improve quality of products (Curzi et al., 2015). These results are similar for developing countries in that reduction in barriers improves trade flows (Wagner, 2007; Melitz & Trefler, 2012).

Other macro factors affect the trade flow and export product quality. Likewise, economic conditions and per capita income have strengthened this connection. Copeland & Kotwal (1995) and Hallak (2006) confirmed that Rich countries have relatively more imports as they produce high-quality goods. Trade openness also affected the product quality of exporting goods. Gervais (2015) and Jakel (2013) examined that quality differentiation has a significant impact on trade flows and gains from trade in the response to trade liberalization. The reduction in trade cost is also promoting the trade flow and encourages the firm to improve the quality of a product. Ludema & Yu (2016) found a negative relationship between tariff elasticity and the productivity of firms that

produce high-quality goods. Yu (2013) and Chen & Juvenal (2014) explored that exchange rate absorption elasticity has a stronger impact on firm heterogeneity and product quality. Esharghi & Ismail (2012) investigated that export product quality plays an important role to choose trading partners, as china has considered Thailand as a high-product quality importer. Alcala (2016) found that the export quality of a country can increase if those countries have a comparative advantage in their trade. The environment of a country is also affected the export product quality, especially for developing countries. Export diversification is also affected by the environment of the countries (Can et al., 2022). Trade liberalization can lead to an increase in the welfare levels of the labor market. If the labor market is imperfect then welfare levels decrease (Hung & Peng, 2020).

Product quality has a significant role in the international trade of developed countries. The developed countries exchange high-quality products with developing countries and boost the growth rate of export (Cole et al., 2010; Alvarez & Fuentes, 2011). The tendency to export is varied with export product quality. The low intensity for an export country produced low quality and high-intensity export sold high quality (Brooks, 2006). Few studies have examined that countries following international standards during the production of goods can improve the quality of products and can be compatible with the rest of the world (Curzi & Olper, 2012; Fałkowski et al., 2016). High standards affect positively trade flow at the firm level (Fontagne et al., 2015; Chen & Juvenal, 2016). Developing countries have to put more attention to meeting high standards of exporting goods (Ferro et al., 2015). The firm maintains good Standards in production and increases the export volume by upgrading product quality. These

standards lead to focusing on the issues of firms like market failure by improving product quality. Good regional trade agreements are beneficial to improve product quality. The easy terms and conditions can cause to provide direct access to many markets. the firms are motivated to improve product quality (Sun, 2021).

The above literature has summarized the link between trade flow with product quality. Export promotion activities lead toward the economic development of a country. There is a positive and direct relationship exists between trading activities and trade flow. As high-quality products are more likely to export at the international level. There are country and firm-specific determinants which affect the connection between product quality and trade flow. The trade cost also affects the product quality and which ultimately decreases trading activities. There is no study found in the case of Pakistan which explains the relationship between export quality and trade flow.

2.4. The Moderator's Effect

The literature on the three sub-themes is reviewed in this section. The moderators are; financial constraints, firm heterogeneity, and R&D expenditures.

2.4.1. Financial Constraints

Financial constraints are the main limitation of any firm. Financially constrained firms countries cannot improve their product quality and afterward trade flows. Financial developments are used to overcome the effect of financial constraints. In this section, we will focus on the importance of financial development and financial constraints for a firm. The financial constraint hypothesis explained the relationship between the availability of finances and the capability of export of firms ((M. Akram & Rashid, 2018; M. W. Akram et al., 2022). Financial development has a strong impact on the trade

balance of a nation. Beck (2002) found that financial developments have a significant effect on the level of exports and the trade balance. Manova (2013) found that financial constraints restricted the multinational activities and trade patterns of a nation. (Do & Levchenko, 2004) found that financial development is faster in rich countries than in poor countries if the trade is open across the world. Chaney (2005) shows that financial development and exports are highly correlated in industries which more heavily dependent on external finance. Feal (2009) reviewed the theoretical and empirical literature on the impact of financial growth on the trade pattern of an economy. Bhatti et al. (2013) explored different directions of R&D expenditures and financial development. Choi (2015) examined that export sales are relatively more for industries that have a high level of financial development and more tangible assets. Bao & Qiu (2012) analyzed that international trade flows have a significant effect on financial development by reducing external and internal barriers. They have shown a bidirectional causality between financial development and liberalization in Middle-Income Countries.

Some studies indicated the best proxy of financial Constraints. Such as, Kaplan & Zingales (1997) found that investment cash flow sensitivities are higher for less constrained firms. Winker Winker (1999) found that the size of a firm affects has a significant effect on a firm level. Honda & Suzuki (2000) examined that cash flow is used as a proxy of financial constraints for Japanese firms. Ghosh (2006) examined that financial integration and openness are used to ease the financial constraints of Indian firms. Hadlock & Pierce (2010) found that firm size and age are used as a measure of financial constraints which is based on these firm characteristics. Kim and Parkc (2015) compared three standard indices of financial constraints (KZ (1997), WW (2006), and SA

(2010)) and found KZ index (1997) is a more relevant measure for financial distress. They explored a new indicator based on market risk measures of financial constraints. Shen et al. (2020) found that firm size, the current debt-to-asset ratio, and cash flow can be used as a proxy for financial constraint but the debt-to-asset ratio is not a significant measure of financial constraint. The better measures of financial constraints are cash flow, liquidity, and leverage ratios (Almeida & Campello, 2007; Bellone et al., 2010; Nagaraj, 2014).

There are a few firm-specific determinants of financial constraints like size, age, location, ownership, country status, and exporting involvement. The new exporters are efficient to improve their financial conditions (Silva & Carreira, 2012). Domestic firms that are financially unconstrained can easily become new exporters (Bellone et al., 2010). Sheikh and wang (2010) have explained the financing behavior of Pakistani textile firms they found that the leverage ratio is negatively correlated with profitability, tangibility, and liquidity but this ratio is positively correlated with firm size and growth opportunities. The same firm-specific factors of developed economies are used to explain the market structure in developing economies like Pakistan.

And financial constraints have a strong impact on a firm's decision on new investments and other business dealings. Such as, Almeida & Campello (2006) suggested that financing conditions affect investment decisions. Carreira & Silva (2010) highlighted some stylized effects of financial constraints that such constraints are the main hurdle for the growth and investment projects of firms. According to theory, an increase in sensitivities of the investment cash flows tends to increase the firm's assets. But Chaudhry (2009) examined this hypothesis for Pakistan and found investment has a

positive effect on firm size and a negative on a firm's age and dividend payout ratio. Mensa & Ljungqvist (2016) examined that both private and public firms below investment ratings are financially constrained. Iqbal (2017) found that when cash volatility is high, financially constrained firms increase their cash holdings more than unconstraint firms in Pakistan. Timoshenko (2015) examined that tight financial conditions affect investment decisions through product differentiation. Rashid & Ashfaq (2017) showed that cash holdings have a positive link with firm size, the payout ratio, and the market-to-book value but hurt cash flow volatility and leverage for financially unconstrained firms. The uncertainty of the exchange rate decreases the trade volume if the sector is facing credit constraints. The effect of the exchange rate is different across the sector as financing conditions are also different (Lin et al., 2018).

Some studies argued how financial constraints affect the trade flows of firms. As Vega et al. (2012) and Hericourt & Poncet (2015) examined that high exchange rate volatility leads to a reduction in the exports of a firm and this effect is stronger for financially constrained firms. Almeida et al. (2012) and Altomonte et al. (2013) found that financial constraints are used to improve innovative efficiency and export activities in firms. Goksel (2012) and Chan & Manova (2015) investigated that financial constraints have negative but trade flows have a positive effect on the innovation activities of firms. Wagner (2014) investigated that financial constraints are the main factor in exporting activities of firms. Exporting firms are less financially constrained and self-select into exporting activities. Financial development and economic growth have a causal relationship but the direction of causality is different. Askenazy Askenazy et al. (2015) investigated that financial constraint is the main determinant of export activities as

such constraints are decreasing the ability to export. Dinopoulos & Unel (2011) proposed that financial constraints affect exporter behavior through changes in product quality. Chaney (2016) proposed a model of trade and financial constraints that explains the effect of the exchange rate. Appreciation of the exchange rate leads to reduce export but, on the other side, more financial liquidity is available to domestic firms, and started to export more. Overall, exports are increasing. Akram and Rashid (2018) examined that financial dependency is the main element for a firm in the decision expert for UK firms. Exports are less in the sectors which highly depend on external finance. Goncalves et al. (2018) investigated that high market power firms alleviate financial constraints.

The financial constraint also determines the behavior of exporting firms. External finance can be generated when a share of exporting firms in total sales increases. But financial crisis becomes a challenge for a firm's export as the bank tightens its loan policy. There is a negative relationship between financial constraints and exporting performance. Only those firms can enter and survive an international market that has large sales, high productivity, minimum production cost, and the ability to compete for international standards (Jinjarak & Wignaraja, 2016; Qi et al.,2018). Availability of finance is the main factor for Pakistani firms to decide whether export their product to international markets (Saeed & Sameer, 2015),

So, the decision of a firm to export and entry into the international market depends on the available internal and external finances of the firm (Berman & Hericourt, 2010; Stiebale, 2011; Kumarasamy & Singh, 2018). There is a strong relationship between international trade, asset tangibility, and financial development. A firm that has high-level property rights can get more share in exports and improve the trade balance

(Hur et al., 2006). Large and productive firm can also decrease their export if they face financial constraints. Initial expenditures are one of the main issues faced by exporting firms. These costs are faced by a firm when searching for international markets for selling their product (Katayama et al., 2009). some studies found a direct relationship between financial constraints and export probability (Bond et al., 2005; Whited, 2006; Guariglia, 2008; Marcelino Sadaba et al., 2016). Some other studies found a negative relationship between financial constraints and export probability (Greenaway et al., 2007; Manova et al., 2015).

Whenever a firm has decided to enter a foreign market then the survival of the firm is an important issue. The survival of financially constrained firms in international markets is more difficult than financially unconstrained firms (Blalock & Gertler, 2004; Bellone et al., 2010). A firm that is efficient in production can bear the initial costs and survive in international markets (Helpman et al., 2008). And the financial constraints also affected the survival of firms in external markets. The exporting firm can only survive in the international market if they have enough finance to bear the cost of export (Askenazy et al., 2011). The more financially dependent firm is more sensitive to export to the less dependent sector (Chor & Manova, 2012). The firm can face more credit constraints when it adopts advanced technologies and innovations (Aristei & Franco, 2014). The growth of export is more important than the volume of trade. The exporting firms with financial constrained grow faster but the overall growth rate decreases with time. So, when the exporting firm maintains survival in international markets, the impact of financial constraints on the growth rate of exports reduces over time.

Financial constraints are an important factor in a firm decision about the level of production and quality of a product. Falvey & Kierzkowski (1984) found the presence of foreign capital is necessary for the alleviation of financial constraints faced by private Chinese firms. Chen & Guariglia (2011) analyzed that the productivity of firms depends more on external finance if firms are illiquid. Silva (2012) analyzed the impact of financial constraints on firm behavior. The degree of financial dependence and asset tangibility of an industry determined the ability of firms to obtain external finance and fund for international trading activities between Pakistan and its trading partners. Fernando et al. (2015) found that financial constraints hurt labor productivity. Muuls (2015) found that credit constraints are significantly associated with intensive and extensive margins of exports in terms of both products and destinations, but for imports, it is related to the extensive margin in terms of products only. Elsas and Klepsch (2016) derived a new measure of financial constraint suitable for private and publicly listed US firms. Prayagsing & Jankee (2018) found that both large firms and SMEs are financially constrained, but the degree of FC, however, varies on the corporate structure of firms. Financial constraints also play a role in the decision of a frim regarding financial activities. A multinational firm can raise and use funds in better ways. A firm with multinational activities can be more productive and efficiently participate in international trade (Foley & Manova, 2015).

Financing through foreign resources is costly for firms, so they try to utilize domestic financing resources like cash flows (Amiti & Khandelwal, 2013). Second, the business relationship of a firm with a bank is very helpful during a financial crisis when firms participate in innovative activities and need more finance to bear the cost of such

activities. If a firm and a bank have a strong business relationship then the bank can easily provide funding to the firm. Otherwise, the firm is unable to indulge in international activities and increase productivity due to these financial issues. Firms that have a deep business relationship with banks cannot participate in innovation activities as the financial burden is high (Giebel & Kraft, 2017). Future exporters are needed to improve their financial conditions when entering the international markets (Qasim et al. 2019).

Financial constraint is an important moderator that affects the trade flow and product quality. There are macro and micro factors that determined the financial condition of a firm. There are different methods are used to measure the financial constraints of the firm like KZ, WW, and SA indices. The level of productivity and exporting behavior is also affected by the financial constraints of the firm. The financial constraints affect the decision of the firm to invest in business activities, to enter a foreign market, and, the survival of the firm is big deal. The banks are helping to solve the issue of financial constraints of the firm.

2.4.2. Firm's Heterogeneity

The heterogeneity of firms is explained as every firm has a different economic performance. As, each firm is different from others in respect of the sale, age, productivity, location ownership, financial conditions, and status of international business activities. Firms' heterogeneity is the main determinant of product quality and trade flows. Helpman et al. (2004) developed a dynamic industry model of trade which shows that firms with different production levels can survive in an industry. Different factors determine the heterogeneity of a firm. Cole et al. (2010) examined that a firm having

higher profit than its sunk cost can export its product. But Hiep & Ohta (2007) investigated various factors of heterogeneous firms deciding to export such as sunk cost, firm size, and foreign ownership. They also showed that firms having more skilled laborers are more likely to export. Gopinath et al. (2007) found the existence of firm heterogeneity in the Chilean economy and positively related to the export-production decision in agriculture. Haruyama & Zhao (2008) explored that trade openness leads to an increase in the technical progress in heterogeneous firms. Bernard et al. (2007) estimated a trade model of heterogeneous firms and found that variation in firm characteristics and product quality leads to variation in firm sales. Rashid & Waqar (2017) explored that exchange rate volatility has a stronger effect on firm size. Small-Medium exporting Pakistani firms can get more benefits from exchange rate variations. Yeaple (2005) revealed that US multinational activities explain the effect of firm heterogeneity on trade.

Therefore, Firms' financial decisions have an influencing role in determining their investment activities. Antras & Caballero (2009) provided evidence that financial constraints are relatively more important for intensive margin than the extensive margin of a firm. Qureshi & Yousaf (2014) analyzed the main determinants of profit for heterogeneous firms in the case of Pakistan. Firm Size, liquidity, market share, and age have a positive and significant impact on the profitability of firms. Fan (2012) examined the mechanism of quality adjustment in which firms optimally choose to produce lower-quality products when facing tighter credit constraints. The firm facing financial constraints is more sensitive to changes in the exchange rate. These firms are transferring the effect of the exchange rate into the prices, so their exporting activities are more

sensitive to exchange rate variations (Strasser, 2013). Manova (2013) explored three mechanisms through which credit constraints affect trade and found that financially developed economies export more to financially vulnerable sectors. Xu et al. (2013) analyzed that government connections play an important role in explaining Chinese firms' financing conditions. Gervais (2015) explained that product quality is a more important determinant of selection for exporting than the productivity of a firm. There is a significant role of dominant exporters in foreign sales. The aggregate export sale can be driven by the sale of other exporters. The dominant exporters are capable to compete for the needs of international markets (Carballo et al., 2018).

The investments in new technologies lead to an increase in profit level and productivity of the firm by reducing the fixed cost of the firm but these new investments have not any impact on product quality and decisions of the price level. When such investments reduce the variable cost of manufacturing, they can improve the quality of products and implement high prices. There is a mixed effect of such investments exists. The direction of the impact of technological investments on the productivity of a firm that determined by the relationship between market size and the fixed cost of a firm (Thatcher & Oliver, 2015). There are welfare gains that a firm can get through engagement in international trading activities. Firstly the firm can earn more profit by increasing the variety of goods. Secondly, the productivity of firms can increase by reallocating their resource from low to high-productivity firms. The firm can produce new intentions and innovation techniques and get productivity gain from trade (Melitz & Trefler, 2012). if the market negative demand shocks arise, then the highly productive firm can earn from

other markets and can reduce their markup rates (Das et al., 2007; Berman et al., 2012; Chatterjee et al., 2013).

Few studies investigated the firm size and its productivity are affected by financial constraints. Yeaple (2005) and Helpman et al., (2009) explored that firm heterogeneity raises large variations between developed and less developed countries when intensive and extensive margins are examined. Bonfiglioli (2008) found a positive direct effect of financial integration on productivity and an indirect effect on capital accumulation. Bernard et al. (2011) and Hottman et al. (2014) developed a multi-product model which allows a firm to enter a foreign market with a heterogeneous variety of products. Feenstra (2011) examined the sizable impact of the financial crisis on reducing exports of Chinese firms. Yuan et al. (2016) investigated the negative and insignificant non-linear effect of financial constraints on firm size distribution in Eastern China. Salim (2006) examined that the productivity of heterogeneous firms can be measured more efficiently. Bai et al. (2017) provided evidence that a learning-by-exporting effect has realized that scale economies and small firms have expanded their sales. Rashid & Ahmad (2018) examined that financial constraints are present in the manufacturing sector of Pakistan. Qureshi & Yousaf (2018) suggested that the firm size, market power, and market knowledge significantly and positively affect its profitability but the leverage of firms hurts the profitability of firms in Pakistan. the relationship between productivity growth and efficiency is measured at the firm level and outsourced in manufacturing and services at the micro-level (Loof & Heshmati, 2003). A firm with better financial conditions can easily carry out its international business activities. These firms are more productive and profitable than financially constrained firms (Muuls, 2015).

Many important determinants affect the export price. The export prices are determined by observing the firm's characteristics. An efficient, productive, and skill-oriented firm charges high prices than capital intensive firm. There are country-specific characteristics that also affect the prices charged by exporting firms. The distance of the market is also affecting the price of export, as traveling cost is also included in charged prices (Harrigan et al., 2015). The firms have to be efficient in production for survival in the (domestic) market and only the more productive firms can bear the high entry cost in the international markets and become exporters (Pavcnik, 2002; Bernard et al., 2012; Melitz & Redding, 2015). The selection of exporting firms is very important. The productivity of a firm is based on the decision of the firm to enter the export market. A firm having high productivity can only enter and survive in international markets.

There are some determinants such as price level, productivity; firm size, export status, and foreign ownership that are used to forecast the future international activities of firms (Brakman et al., 2017). The firm size plays an important role to determine the export level of a firm. A large-sized firm can easily excess to international markets by exporting directly. The gain from trade is important for productivity if a firm is heterogeneous (Chung, 2019). Multinationals and exporting firms are properly managed and more efficient in production than domestic firms (Serrano & Myro, 2019). The cost of export is more difficult to bear for small firms (Jakel, 2013). The firm's involvement in the international market is different as firms are heterogeneous. The sale of a firm has a positive impact on the share of exports. A firm with a large export share has more sales volatility at a domestic level than at the international level. They try to maintain their share of the export sale (Vannoorenberghe, 2012). The firm is increased product verities

as trade cos decreases. So heterogeneity of firms is important for international trade (Lopresti, 2016). And some factors affect the exporting behavior of a firm at the macro level. There is a positive and direct relationship between firm size, real exchange rate, and firm exports even for the Pakistani firm (Vega et al., 2012).

Other factors are also important such as productivity, the number of products, skill intensity, employment, value-added, capital intensity, and many other firm characteristics (Bernard et al. 2007). The effect of export price and tariff reduction is firm-specific. When the tariff reduces, the firm imports input and is used in the production process. Afterward, the firm exports its high-quality product to high-income countries, making excess to more markets and generating more revenue (Bas & Strauss, 2014). Environmental management has a significant role in firms. It is examined that product quality can explain much better through comparative advantage when the environment is managed properly (Dunk, 2007). The amount of export is also determined by the manager's commitment to export, managerial capabilities, and available resources. If the manager is not sufficiently capable to get international knowledge and experience, the firm cannot enter the international market (Bianchi & Wickramasekera, 2016). The internal performance of a firm is also affecting its export performance. The organizational setting like the number of layers is also directly related to the export performance (Spanos, 2016). The export-oriented market has a positive impact on the export performance of a firm. The firm has more knowledge about the needs of the international market and can perform exporting activities internationally (Olabode et al., 2018).

The new exporters are more capable to learn at different stages. They are facing more uncertainty at the beginning of their business. In the beginning, they can easily exit from the international market. as they are unable to perceive the signals from market demand. Afterward, they get experience from learning through their own exporting as well as from their neighbors. So the new exporters can also survive in a foreign market by learning from their neighbor's exporting experience (Loecker, 2007). The firm which participates in both exporting and importing activities is more productive than the firm which is only an exporter or importer (Andersson et al., 2008).

The location of exporting firm also matters. The firm is exporting to countries located at distance by charging high prices. As firm included transportation costs in the price of export (Martin & Mejean, 2014). Fixed entry cost increases as the distance of the trading partner have been increases. So firms are firstly exported to neighboring countries and then extend their markets far away. Foreign direct investment is also considered the entry cost of the firm in international markets (Helpman et al., 2004; Helpman 2018). The firms are facing different entry costs (Eaton et al., 2004). The effects of trade liberalization on unemployment are examined under firm heterogeneity. Trade openness leads to an increase in the unemployment rate of large countries (Hung & Peng, 2019). There are welfare effects of trade openness for heterogeneous firms are increasing saving rates and improving the efficiency of the economy. But this welfare cannot be the same for different countries as characteristics are changing (Ourens, 2020).

The concept of learning by exporting is more important for new exporters. The learning process plays a significant role in examining the entry patterns. They can enter international markets that have similar characteristics to their home market. They can

also learn about trade costs by observing trade history (Schmeiser, 2012). After learning by exporting, the firm can efficiently respond to changes in a market situation. The trade cost decreases, and exporters and non-exporters are switched their production strategies. New exporters have more tendency to change the baskets of exporting goods than old exporters. The new exporting firm can learn from the demand shock by changing the products repeatedly as they are less aware of the customer's choice. As the trade cost decreases, the new exporting firm introduces the new product to export, and the new firm enters the international market. The impact of trade costs on an existing firm is stronger than on new firms (Timoshenko, 2015).

There is a significant and direct relationship between exporting activities and the profitability ratio of the firm (Qian & Li, 2003; Wagner, 2007; Dosi et al., 2016). In contrast, there is no relationship (Dosi et al., 2016) and even a negative correlation between profitability and exports of a firm is observed (Esmeray & Esmeray, 2016). There is a significant relationship between tariff reduction and exporting firms. The export planning activities are important elements to determine the export behavior of a firm. The amount of export sales is determined by the planning activities but the profitability of exports is not related to such activities (Samiee & Walters, 1990). As the tariff rate declines, more firms want to export their product (Baggs & Brander, 2006). The expansion in productivity is helpful to generate the profit level of a firm. The firm-specific variables like size and productivity have a positive and strong impact on a firm's profitability (Stierwald, 2009).

The researchers have more focus on financing and funding trading activities at the international level. They examine that financing fixed costs for both imports and export

positive and significant effect on export performance. As the firm size increases, get more business experience and improve export performance (Majocchi et al., 2005). There is a positive relationship between the export product quality and the distance between partner countries (Curzi and Olper, 2012). The more productive firms are larger in their sales and more expected to export to foreign markets (Carballo et al., 2018). More productive firms are having more potential to export than less productive firms. Such firms can easily enter and survive in the international market by selling their products (Bernard & Jensen, 1999; Aw et al., 2011). Many internal factors affect the export activities like resource availability, firm size, managerial skills, and knowledge of international markets (Navarro, 2016).

Firm heterogeneity is another important moderator of trade flow and product quality. There are a few determinants of firm heterogeneity at the firm and country levels that are reviewed. A firm's heterogeneity can be measured by the size and scale of the firm. The productivity, profit, and investment rate of the firm are based on firm heterogeneity. The concept of learning by exporting is explained by the firm's heterogeneity as the firm can get experience by exporting and exporting. The financing of international activities can also be examined by the firm's heterogeneity.

2.4.3. Research & Development Activities

R&D activities are more focused nowadays. This concept is based on the Solow growth model. Solow (1956) attributed economic growth to technological innovation. He claims that new technologies convert economic growth into "technical change". And then Romer (1994) considered that endogenous growth is made by adopting advanced technology. He found a direct link between human capital and technological growth.

Technical advancement and innovations boost economic growth (Schumpeter, 1942). These changes are just affecting certain sectors and surroundings and these innovations are unevenly distributed. Different types of financial development are important determinants of R&D intensity. But only FDI is a significant measure of financial development. The high foreign direct investment leads to improving the R&D sector.

Many determinants affect the R&D expenditures at the firm level. Few studies highlighted the determinants of R&D expenditures. Such as, Kane et al. (2007) and Aroray et al. (2010) investigated that the financial and organizational structure of a firm has a significant effect on R&D expenditures. Hall (2009) surveyed that small and new innovative firms experience high costs of capital but the evidence for high costs of R&D capital is mixed for large firms. Few studies, Yang et al. (2012), da Costa Soares (2014) and Dechezleprêtre et al. (2016) suggested that tax incentives have a significant effect on a firm's sales through R&D expenditures. Bento (2016) and M. W. Akram et al. (2022) found that knowledge, machinery, equipment, training, and marketing are the main determinants of investment decisions in the Research and Development (R&D) sector. Baumann & Kritikos (2016) related R&D expenditures, innovation, and productivity of SME firms but Rehman (2016) examined that internal and external R&D expenditures have a significant direct impact on the performance of small and medium-sized enterprises (SMEs) in India and Pakistan. Samudhram and Sivalingam (2009) found that cash flow and firm sales are the main factors affecting the R&D expenditures of Malaysian firms. Bond et al. (2005), Altomonte et al. (2013), and Hall (2015) examined financial constraints as an important determinant of R&D expenditures. The adoption of new ideas and technologies is also the main determinant of R&D expenditures. As

Acemoglu & Linn (2004), Aghion et al. (2005) and Chiu et al. (2017) focused on the adoption of innovations and ideas for production.

Investment in the R&D sector also plays a crucial role in determining trade flows. The R&D investment activities are determined by the financial independence, size, and sale, resources of a firm (Bento, 2016). The size of a firm is found to be the determinant of R&D investment decisions. Sales, government facilities, foreign ownership, the incentive for competition, and domestic and foreign trading activities are important factors for investment in R&D (Aghion et al., 2005; Costa-Scottini, 2018). A small firm in size has more difficulties in research activities as they do have not enough financial resources (Muscettolaa, 2015). Charos & Simos (1988) examined the role of human capital and R&D on the trade flows of a country. Mendi (2007) investigated how R&D expenditures can improve export product quality. Tayebi and Eshargi (2010) and Epifani (2012) explained how R&D expenditures affect trade flows by reducing trade barriers and promoting export policies. Carboni & Medda (2018) and Parameswaran (2010) developed the channels through which R&D expenditure decisions affect positively and significantly the export flows. And Nishioka (2013) investigated that R & D is the main factor in getting the comparative advantage in advanced countries. Cameron et al. (2005), Bratti & Felice (2009), Impullitti & Licandro (2018), Bustos (2011), and Fracasso & Marzetti (2015) analyzed that firms can use advanced technology to improve their product quality by exporting more and more. J. Khan & Khattak (2014) and Demmel et al. (2017) found that improvement in the quality of the educational sector enhances R&D expenditures by promoting exports. The firm's decision to invest in innovative activities has a positive and significant effect on the productivity and exports of the firm. So the

export and innovation promotion policies are used to enhance the productivity of a firm (Cassiman et al., 2010). Investments in new technologies can lead to reducing the firm's cost, so the productivity of the firm is improved and increases the profit (Thatcher and Oliver, 2015).

R&D expenditures play an important role to determine the relationship with the factor productivity of a firm. Bayoumi et al. (1999), Coe and Helpman (1995), Brown et al. (2012), and Chiu et al.(2017) found both domestic and foreign R&D expenditures are an important determinant of factors productivity as the rate of returns on such investment are high. The exporting firm that engages in R&D activities can survive in international markets. So, the future productivity of firms can be determined by workers' training and investment in sectors (Aw et al. 2005). Bayoumi et al. (1999) examined that more investment in R&D leads to improving product performance in the foreign market. Castillejo (2006), Lai et al. (2006), and Limanlı (2015) found that investment in R&D is positively affected by market share, firm size, labor productivity, and technological spillover at the firm level. Khan (2006) and Nishioka (2013) found that the speed of economic growth is high for economies having more R&D expenditures. There is a strong relationship between productivity growth and R&D investment levels. If the share of R&D expenditures is explained by GDP then productivity growth can be enhanced (Coccia, 2009).

The role of R& D expenditures in a firm's growth is more important. There is a positive relationship between the firm's R&D expenditure and Productivity growth. There is a significant relationship shown between R& D expenditure and a firm's productivity growth (Griliches, 1979; Scherer, 1982). The rate of return on R & D

expenditure is more for exporting firms than for non-exporting (Wakelin, 2001). Better finance and easy excess to finance are directly related to innovative firms. The financial improvements develop the shape of trade and also decide the firm's selection for exporting (Fauceglia, 2015). R&D investment and innovation are used as the main determinants of firm growth (Klette & Griliches, 2000). R&D activities also promote the employment level and growth rate but pure export is not affected the employment rate. The labor productivity of a firm can be increased by investing in R&D activities and information technology investments (Khanna & Sharma, 2018).

The role of R&D activities of the firm as moderators is also a very important moderator that explains the relationship between trade flow and product quality. The above literature describes the determinants of R&D expenditures. The investment activities in the innovative business are also helpful to measure the R&D activities. The R&D activities explain the relationship between a firm's growth and factor productivity growth.

2.5. The Mediators Effect

In this section, literature is reviewed to explain the importance of mediators that define the relationship between product quality and trade flow; Firm's Growth, Firm's Total Factor of Productivity Growth.

2.5.1. Firm's Growth

The firm's growth is the main characteristic of a firm. Firms have different resources to grow. Several studies have explored the relationship between firm growth and firm size. Gibrat (1931) found that a firm's growth is independent of the firm's size and Kumarasamy & Singh (2018), and Wagner (2007), supported Gibrat's law. But, Hall

& Mairesse (1995), have found a negative relationship between a firm's growth and size. Only one study by Baldwin & Krugman (1989) also rejected Gibrat's law. Gibrat's law stated that the growth of a firm is based on three effects: (i) the industrial growth rate (ii) the firm's initial size, and (iii) the random growth term. According to Gibrat's law expected increase in firm size is related to the initial size of the firm. This law is not supported by Danish firms (Audretsch & Elston, 2002; Bentzen et al., 2012). Whereas Gibrat's Law holds for medium-sized, large, and old firms (Geroski & Samiei, 1998).

Trade openness leads to an increase in the growth rate of a firm. The firm expands its sale when exporting at the international level. There is a rich literature on how trade affects the growth rate (Ramjerdi, 2012). For example, the old Trade theories first explained by Smith (1776) extend the domestic market at the international level to increase productivity. Moreover, Ricardo Ricardo (2017) develops a dynamic model for economic growth that increases productivity with a high rate of savings. Young (1928) extends the Smith model with the division of labor. In the post-Keynesian, firstly, Kalecki (1935) develop a model likewise Keynesian with the addition of consumption function. Harrod (1953) and Domar (1957)developed a closed economy model taking growth as endogenous. The rate of growth of an economy is determined by the rate of growth of investment as well as the export of that economy. For Endogenous Growth Models and International Trade, Schumpeter (1942) explained the fluctuation that arises in economic activities by distinguishing between innovation and invention. Romer (1990) develops a model with four inputs: labor, capital, human capital, and the level of technology. The role of R&D is also very important to explain the relationship between trade and growth rate. As both domestic and foreign R&D have a positive effect on the

total productivity factor (Keller & Yeaple, 2009). In the new trade theory, the percentage of trade explains within the intra-industry rather than inter-industry (Grubel & Lloyd, 1975) and the cost of adjustment includes Intra industry trade (Balassa, 1967). Baldwin & Krugman (1989) change the assumption of perfect competition with monopolistic. This assumption of a monopolistic market structure is supported (Hummels & Levinsohn, 1995; Keller & Yeaple, 2009).

Some studies investigated the determinants of a firm's growth. Ansoff (1991) and Marris & Wood (1971) explained that the expansion of new products is also the main determinant of a firm's growth. M. Chen & Guariglia (2013) used the profitability of the firm as a proxy for the firm's growth. Kaplan & Zingales (1997) found that the availability of external finance is the main factor in a firm's growth. Davidsson & Wiklund (2006) explained the firm's location plays an important role in determining growth. Schumpeter (1942) highlighted that the qualifications and skills of entrepreneurs are also the main elements of a firm's growth.

The process of firm growth has been discussed in many studies. The firm invests in different productive activities to improve and strengthen product quality. The firm can achieve competitiveness by adopting efficient product strategies (Kvam et al., 2014). The new firms have more capacity to gain positive growth. The growth rate is directly related to size, technical reforms, advanced production methods, and institutional change in firms (Morone and Testa, 2012). Foreign direct investment is also playing a positive and significant role in the growing accumulation of domestic firms (Keller and Yeaple, 2003).

In the beginning, a firm started its business activities afterward expands and grows, and finally developed its business (Gupta et al., 2013). There are many

determinants for increasing firm growth as the qualifications and technical skills of entrepreneurs that they can use more advanced technologies and creative ideas (Schumpeter, 1942). He can discover new opportunities for his business and grow by using advanced techniques. The average growth rate of a firm declines with the size and age of the firm (Farinas & Moreno, 2000).

The firm growth can also be measured to generate revenue, value addition, and increment in the volume of business. Such growth can also determine by qualitative aspects like product quality, market position, and customer satisfaction. The important source of eco growth is the reallocation of the labor force across the firm. The productive labor force can help a firm grow rapidly by producing efficiently (Lentz & Mortensen, 2005). The younger and smaller firm can grow more rapidly than older firms as new firms have more potential to grow and generate more opportunities (Hart, 2000). There is a positive relationship exists between firm size and growth level. As a firm's size increases, the growth rate increases more rapidly. The positive relationship between size and the growth rate of a firm is mainly determined by the sustainability of the growth rate of a firm over time (Singh & Whittington, 1975). The firm productivity and firm size plays important role in determining the firm's sale rather than the leverage of a firm. As the firm size expands, reducing the financial constraints and exporting more (Greenaway & Kneller, 2007; Manova et al., 2015; M. Akram & Rashid, 2018).

The firm's growth rate can also be determined by its productivity level of a firm. The concept of productivity is important for both exporting and importing as well. If importing firm is more productive then it will import good quality inputs to the market. And the exporting firm used these inputs in the production of good quality and increases

productivity. So trade can be beneficial if both importing and exporting firms are productive. The price determined by the firm also affects the level of productivity of exporting and importing firms. As, Price heterogeneity is used to measure productivity (Smeets & Warzynski, 2013). High-productivity firms are less sensitive to institutions as they are more experienced in reducing entry barriers and entry costs (Helpman et al., 2004; Albornoz et al., 2016; Satpathy et al., 2017). The more productive firms are in line with more partners and produce more variety and quality of goods (Eaton et al., 2014). The more productive firms in each sector grow more quickly than the productive firms (Melitz & Motensen, 2007).

The study by Coad & Tamvada (2012) examined different stylized facts that affect a firm's growth. A firm owned by a female is expected to low growth rate. Proprietary especially young firms also face a low growth rate. The main reason for the low growth rate is related to raw materials and market problems. But the growth rate can be increased when firms have become exporters.

R&D activities are the main key factor that determines the productivity of a firm. Manjon (Manjon & Merino, 2012) pointed out that participation in R&D activities is one of the major factors which boost the firm's growth. They supported the positive and significant role of R&D investment in the growth of a firm's sales, especially in advanced technology sectors. Substantial Growth is a basic need for a firm to survive in the market. Furthermore, firm growth is opening the door for innovations and advanced technologies to set a strong position in business (Pagano & Schivardi, 2003). There are different indicators used to measure the firm's growth like employment, sales, revenue, and value-added but firm sale is one of the most appropriate scales (Cranston & Flamholtz, 1986;

Ardishvili et al., 1998; Barkham et al., 2012). R&D activities have a direct and significant effect on firms' growth (Mills et al., 2005), while others find no significant results between the two variables (Bottazzi et al., 2001; Doukas & Lang, 2003). The relationship between R&D and growth in high-tech industries is positive (Chan et al., 1990; Yasuda, 2005; Geroski and Machin, 2006) and become negative for low-technology sectors (Yu et al., 2010).

A firm's growth is an important factor that plays the role of mediating effect. Trade liberalization leads to promotes the growth of the firm. The above literature gives a review of old and new trade theories related to a firm's growth. There are different determinants of a firm's growth that describes the relationship between export product and trade flow. The process of a firm's growth is explained step by step. There are some measures are given to examine the growth of a firm.

2.5.2. Firm's Total Factor of Productivity Growth

The total factor productivity (TFP) of a firm is the level that explains how efficiently inputs are used in the production process. The growth of TFP is the indicator of the good performance of a firm. There are many determinants of the growth of the total factor productivity of a firm (Jajri, 2007). The productivity of the firm is mainly affected by the usage of efficient inputs. Efficient inputs can produce a high level of output which ultimately reduces the cost of production. The other factors which affect the TFP are the development of human resources, rebuilding of institutions, place, and condition of work, and changes in social, economic, and political conditions (Bhatia & Sharma, 2019). The total factor productivity of firms is determined by size, ownership type, and the area where a firm is located. The market share positively affected the

productivity level as large firms are unable to capture the changes in the share of the market. The privately-owned firms have more chances to get productivity benefits by entering international markets. So the performance of firms in TFP can be better examined by increasing the firm size (Y. Sheng & Song, 2013). The availability of finances to a firm is also affecting the productivity of growth (Levine & Warusawitharana, 2019).

The growth of TFP is more important as well as the growth of physical and human capital. The growth of total factor productivity is increased every year but its effect is varied within sectors. The foreign-owned firms have larger TFP than local firms as foreign investors can receive more benefits from technological changes. The productivity growth at the sectoral level can be determined by the size of the market, level of education, technical opportunities, skills, and trade openness (Castellacci, 2007). The registration of the industry, imported inputs, share of export sales, wages, and training of workers are also relevant factors that explain productivity (Saleem et al., 2019). And the size of a firm, investment, worker, and the book-to-market ratio are also related to the TFP of a firm (Imrohoroglu & Tuzel, 2014). There is a positive relationship that exists between TFP and its determinants such as firm size, ownership, financial condition, advanced technologies, and exporting activities (Seker & Saliola, 2018). The most appropriate variable which measures the TFP is output per worker (Jones et al., 2005). The qualification of workers and managers is also affecting the TFP of a firm (Bloom et al., 2016). Due to economies of scale, a larger firm can perform efficiently in promoting production techniques (Kim et al., 2016). The relationship between trade and the firm's productivity is important for an economy (Kasahara & Lapham, 2013). In the

case of Pakistan, the macroeconomic determinants play important role in TFP growth (Khan, 2006; Ahmed & Shabbir, 2016). Effective protection and regulatory policies, investment level, and excise taxes are considered trade barriers for a firm's TFP (Saleem et al., 2019).

The social factors are important as other factors in determining the TFP. Social interactions help promote knowledge-wise interactions. These social interactions give awareness regarding consumers' choices and new production techniques. Based on accurate information about the economy, firms can easily improve their TFP by getting benefits from social interactions (Antonelli & Scellato, 2013). The availability of finances to a firm is also affecting the productivity of growth (Levine & Warusawitharana, 2019).

The TFP growth is measured by using different techniques and methods at an aggregate level (Biesebroeck, 2007; Katayama et al., 2009). To measure the TFP, the production function is estimated by using the investment function and including intermediate inputs afterward (Olley & Pakes, 1992). There are five major approaches are used to measure TFP in literature Index Number, Semi-parametric estimation using simulated data, GMM estimator, Stochastic Frontier, and Data Envelopment Analysis. But it is found that the GMM estimator is the most suitable technique (Biesebroeck, 2018). Likewise, in some cases, the semi-parametric approach is a more effective measure of TFP (Del Gatto et al., 2011).

The Firm's total factor productivity growth is affected by the level of productivity of a firm. Some studies relate trade flow and the productivity of firms. Haider et al. (2021) and Jin & Yu (1996) reported bidirectional causality between exports and

productivity. Bernard and Jensen (1999) also found that firms with high productivity usually export their products. (Bernard & Jensen, 1999; Bernard et al., 2007) examined the impact of globalization on the productivity and entry of firms into the international market. Biesebroeck (2005) and Loecker (2007) found that firms become more productive by starting exports. These firms get an advantage in productivity when entre to export market. But Smeets & Warzynski (2013) suggested that both exporting and importing firms improved their productivity not only exporting firms. Greenaway et al. (2007) explained that the productivity of exporting firms is higher than non-exporting firms and multinational firms are more productive as they have fewer financial constraints. Manova and Yu (2014) examined that the global value chain has more emphasis on the production and trade of final goods. Bernard et al. (2016) analyzed that firms with high and efficient productivity growth lead to a decline in trade costs as exports increase. Johannes (2016) analyzed that firms can improve their performance more efficiently when they sell their products internationally. Bloom et al. (2011) suggested that trade flow leads to an increase in total factor productivity in firms. Pavthrecnik (2002) investigated that trade liberalization improved the aggregate productivity of firms efficiently when they faced competition in the foreign market. Bai et al. (2017) provided evidence that a learning-by-exporting effect has realized that scale economies and small firms have expanded their sales.

Trade openness can negatively impact on TFP of a firm. Trade openness leads to fiscal imbalances by reducing government revenue. For recovering fiscal imbalances, the government imposes corporate taxes (Chaudhry, 2009). Corporate taxes affect the TFP growth negatively by reducing the profit of the firm because the company profit is the

main factor determining the investment and growth rate of the firm. So many corporate taxes demotivates the innovation activities, and decrease the TFP which affects the performance of the firm Likewise, Vega et al. (2012) found that exporting firms have higher costs as compared to non-exporting firms due to new markets and transportation networks, hence such firms require extra financial resources The high taxes hurt TFP of Pakistan firms as it discourages the R&D activities of the market. However, trade openness leads to promoting the TFP as the firm is engaged in international activities and interactions (Khan et al., 2020). In the case of Pakistan, the impact of trade openness in terms of removing trade barriers is negative. In such a case, trade openness cut off the government revenue which ultimately leads to fiscal imbalance.

Many factors are helping in the growth of TFP. High-quality management plays a significant role in the production process of a firm. To improve the productivity of a firm, a certain quality management score is required (Brkić et al., 2016). Most of the distribution of TFP goes to larger firms. But the return of a firm's characteristics can explain the differences between the TFP of a large and small firm. The small can also enjoy the benefit of TFP If the return of the firm's characteristics is high (Castany et al., 2005). Trade liberalization and reforming of the different sectors are the main factors affecting the TFP (Jajri, 2007). In the case of India, There is a positive relationship exists between trade openness and a firm's productivity. The one-way causality occurs from trade liberalization to TFP (Haider et al., 2019). The liquid assets and easy access to finance are used to improve the financial condition of the firm. A better financial position encourages the firm's total factor productivity and the firm expands its production by adopting advanced technologies (Thangavelu & Chongvilaivan, 2013). Few factors affect

TFP growth. For example, FDI, imports with a percentage of GDP, government infrastructure, and investment in information technology (Gamage & Kankanamge, 2013). Entrepreneurship is used as an important driver of the productivity of the firm. Entrepreneurship can be determining directly the economic growth (Erken et al., 2009). The financial condition, education, skills of workers, and firm size are important factors of TFP growth (Jovanovic, 2018).

The internal and regional factors of firms are also affecting the level of TFP. The firm located at a distance is not more efficient than the nearest firm. As resources can easily be accessible to the firm located at the near and it can grow by increasing production (Aiello et al., 2014). The reduction in tariff rate leads to an increase the productivity as it decreases the trade cost. It allows the imports of foreign products which ultimately increases the TFP of the firm. It also explains the significance of the heterogeneity of firms as each firm responds to this reduction differently (Dovis & Milgram, 2009).

The firm's productivity growth is related to productivity growth at the industry level. The growth of productivity is also enhanced and improved as the firm is privatized. The TFP is measured by constructing indices of the production function and evaluating the cost function (Uguccioni, 2016). As the firm developed in terms of innovation, the production of the firm grows quickly. The level of development plays an important role as a mediator for TFP for developed countries. High levels of per capita income and high-technology countries are more likely to engage in innovative activities and more rapidly increase production growth (Demmel et al.,2017). The production efficiency of the firm is also determined by the inefficient allocation of resources utilized in the production

process. Misallocation is increased day by day that ultimately decreasing the TFP. The resources are fully and efficiently utilized for the high technological firm, small a young firms, and nearly located firms (Calligaris, 2015).

In the agriculture sector, the same determinants are used to determine the TFP growth. The firm size, age, ownership, exporting status, use of the internet, and accessibility to finance are firm-specific determinants of TFP in the agriculture sector. The reforms in the agriculture sector are used to improve productivity (Giang et al., 2019). Within the same industry, exporting firms are more productive than non-exporting firms. No indication exporting leads to an increase in productivity growth rate. The benefits of exporting are more when resources are reallocated to more efficient from the less efficient sector (Bernard et al., 2007). Now, there is a strong connection between exporting behavior and a firm's productivity. The more productive firm easily enters foreign markets. The productivity of a firm has a significant effect on the decision of the firm to enter the market but at some times exporting behavior is not play role in improving productivity (Arnold & Hussinger, 2004).

Other factors affect a firm's productivity growth. The firm with foreign ownership has more TFP. So foreign firm increases their sale and generate more profit as the return on foreign capital is higher for the foreign-owned firm (Fukao & Murakami, 2005). Trade openness encourages exporters as well as importers to transfer new technologies, accelerate R&D activities and increase productivity. The firms face strong competition when entering foreign markets. So they have to increase the quantity and quality of their products to meet up international standards (Haider et al., 2020). The impact of trade openness on a firm's productivity is more beneficial for middle-income countries than for

high and low-income countries. The economies can achieve a higher productivity growth rate as it open trade to other economies (Naz et al., 2015). A high degree of openness can increase the TFP as foreign direct investment plays an important role in developing countries. FDI and trade openness have a significant and positive effect on the growth of TFP (Maryam & Jehan, 2018). The facilities provided by Government play a significant role in improving productivity. Government support in terms of tax cuts and subsidies for the firm is very important. These facilities encourage the firm to increase its productivity (Harris & Li, 2019). The efficiency in technical change is boosting the TFP for an Indian firm. Technical changes have a positive and strong impact on the growth of production (Joshi & Singh, 2010). There is a two-way causality channel working between the productivity and export performance of a firm when they invest in the R&D sector. As R&D activities have a positive and direct effect on both the productivity and export of a firm (Yang & Chen, 2012).

The total factor productivity growth is also affected by input growth for both foreign and domestic firms (Menon, 1998). Only the presence in the export market is not enough to measure productivity growth but the intensity of the export market is showing the level of productivity growth. The firm having high export intensity leads to an increase in its productivity growth (Castellani, 2002). The FDI and trade openness have a significant and positive impact on TFP growth in Sri Lanka (Gamage & Kankanamge, 2013). The volatility and uncertainty of the exchange rate hurt the productivity of the firm. Such uncertainties in exchange rate damage the gains from trade (Caglayan & Demir, 2014). The adoption of new technology plays a significant role in determining productivity. The size of firms and imported raw materials are also important factors for

the measurement of productivity (Satpathy et al., 2017). The firm size and R&D expenditure are the main factors for TFP. The firm size has a positive effect on the firm's productivity. There is a heterogeneity of productivity that exists between and within the sector of markets (Kreuser & Newman, 2018). There is a casual relationship between Innovation, productivity, and economic growth in the case of Pakistan. The country has the potential to engage in innovation activities that can achieve sustained economic growth (Saleem et al., 2019).

Some studies investigated the relationship between product quality and the production of the firm. The main focus of these studies is that the characteristics of a firm are also determinants of product quality. For instance, Nakao (1982) analyzed the speed of improvement in average product quality declines as several oligopolists increased in market structures. Bernard et al. (2007) examined that the trade costs of firms have declined as the productivity of firms grow. Verhoogen (2008) investigated that more productive firms produce high-quality products by raising their share in export sales and by increasing wages. Khandelwal (2010) examined that higher-quality products are exported more as market shares are higher in price. After analyzing consumer quantity/quality choices, Alcala (2010) investigated that as a country develops, product quality becomes also an important component of GDP growth. Newman et al. (2014) analyzed that domestic firms can improve their product quality rather than foreign-owned firms. Whang (2014) found that a country having more productive industries can specialize in its production more rapidly. Martin and Mejean (2014) found aggregate quality changes driven by a reallocation of sales from low- to high-quality exporters, within industries. Sepavand et al. (2015) showed that the size of the company, foreign

buyers, export channels, advertising, technology, quality, and the brand has positive effects on export performance. Fałkowski et al. (2015) examined that a firm can specialize in the production of a product that has the potential to improve its quality by using more and more advanced technologies. Pivteau & Smagghue (2017) analyzed that product quality is improved if firms add their products to export portfolios as export prices are used as a proxy for product quality. Anderson et al. (2017) examined the positive relationship between the quality of imports and exports in the case of India. They also analyzed that export prices can increase with the firm's capabilities.

Firm's total factor productivity is the mediator which affects the trade flow and export product. Many internal, regional, and social factors are used to determine the TFP growth of a firm. Trade openness can also negatively affect TFP growth. Productivity growth is related to the productivity of the firm, financial conditions, input growth, ownership, and product quality.

Overall, the above literature suggests that high product quality is used to enhance trade flows. Further, there is a positive and direct relationship between export quality and trade flows. However, the above studies ignore the moderating and mediating variables which may affect the relationship between product quality and trade flows. Therefore, this study will consider three moderating variables; financial constraints, firm heterogeneity, and R&D expenditures as well as two mediating variables; the firm's growth and the firm's total factor of productivity growth. These variables may affect the relationship between product quality and trade flows at their different levels.

Chapter 3

Pakistan's Exporting Activities

Exports play an important role in making a country become a developing country. The economic development of Pakistan is mainly dependent on export flows. Access to foreign markets becomes easier through such exporting activities. These activities lead to providing finances for import bills, payment of its debts, stabilizing currency rate, and resolving the issue of trade deficit. The export competitiveness challenges are the main cause of the large trade deficit for Pakistan. Exports have been growing slowly since the beginning of the century. As a result, economic growth has become slow in Pakistan, because the share of exports in GDP declined from 16 percent in 1999 to 10 percent in 2020.

3.1. History of Pakistan's Trade Trend

Foreign trade is important to the economy because of the country's need to involve in international business activities. In Pakistan, imports have exceeded exports almost every year since 1950 and had a deficit in its balance of trade each year from FY 1973 through FY 2020. In the early 1980s and 1990s, important exports were ready-made garments, synthetic textiles, cotton, and rice. In the early 1980s, incentives were again provided to industrialists to increase manufactured exports. And in the early 1990s, the major imports of Pakistan were nonelectrical machinery, chemicals, transportation equipment, edible oils, and crude oil and refined products. Although import-substitution industrialization policies favored domestic manufacturing of substitutes for imports, officials also encouraged manufactured exports in the 1950s and 1960s. Pakistan's balance of trade remained particularly vulnerable to changes in the world economy and

bad weather. Sharp increases in crude oil prices, such as those of 1979-81 and 1990, raised the nation's import bill significantly. Sources for imports and markets for exports are widely scattered, and they fluctuate from year to year.

During the first four decades after independence, controls on imports were used to ensure the priority use of foreign exchange and to assist industrialization. In the 1980s, the government maintained lists of permissible imports and also used quantitative restrictions and regulations on foreign exchange to control imports. The most extensive list covers consumer goods as well as raw materials and capital goods that can be imported by commercial users. In 1991 and 1992, the government announced various measures to liberalize trade. Import licensing was ended for most goods, many products were removed from the lists of restricted imports, and import duties were cut. The government also promised to convert the remaining nontariff barriers into tariffs, and incorporate customs duties. Pakistan is an agricultural nation and its exports include most agricultural products e.g. cotton and rice and so on. In the early years of its formation i.e. 1948-49, 99% of Pakistan's exports were just five basic wares; crude jute, crude cotton, crude fleece, covers up, and tea. The structure of exports changed rapidly in the 1990s and moved from primary and semi-manufactured to manufactured goods.

3.1.1. Major Exports Goods and Countries of Pakistan

Pakistan is an exporter of a wide variety of commodities. The major exports of Pakistan are textiles, leather and sports goods, chemicals, carpets, and rugs. Meanwhile, Pakistan also exports significant quantities of rice, sugar, cotton, fish, fruits, and vegetables. The country ranks among Asia's largest camel market, second-

largest apricot and ghee (oil), and third-largest cotton, onion, and milk market. The major exports of Pakistan along with revenue share are mentioned below:

Table 3.1: Export of Pakistan in Term of Revenue

Commodity	Share in Revenue
Textile Articles	$4,058,657,509
Cotton	$3,242,493,094
Apparel: Knit	$3,019,862,818
Apparel: Non-Knit	$2,806,215,766
Cereals	$2,368,645,352
Leather Products	$632,411,816
Seafood	$474,092,757
Precision Instruments	$452,839,228
Natural Minerals & Stone	$433,194,281
Fruit & Nuts	$397,596,830

Source: World Trade Integrated Solution, 2021

Table 3.1. shows that the textile sector of Pakistan has the largest share in revenue generation. There are top ten export countries of Pakistan are mentioned below:

Table 3.2. Export Countries of Pakistan

Country	Share in Revenue
United States	$4,030,369,559
China	$2,036,877,333
United Kingdom	$1,677,364,493
Germany	$1,340,865,589
Afghanistan	$1,180,107,082
United Arab Emirates	$1,175,587,350
Netherlands	$1,055,224,959
Spain	$946,205,740
Italy	$808,014,372
Bangladesh	$790,699,312

Source: World Trade Integrated Solution, 2021

The major exports of Pakistan are demanded by the USA. And China is the second largest export country. The main exporting items to these countries are Textile and Clothing and Agro products.

3.1.2. Trade Agreements with Partners' Countries

In the 1980s and early 1990s, the government of Pakistan highlighted the importance of trade with neighboring countries due to fears of protectionism and the importance of regional blocs in international trade. In the early 1990s, new trading initiatives were being pursued through membership in two regional organizations, the Economic Co-operation Organization (ECO) (1985) and the South Asian Association for Regional Cooperation (SAARC) (mid-1980s). Pakistan is one of the founding members of the WTO and had been a member of the General Agreements on Tariffs and Trade (GATT) since 30 July 1948. Pakistan is a party to the following trade agreements:

- Agreement on South Asian Free Trade Area (SAFTA).
- Pakistan-Malaysia Trade Agreements.
- Pakistan-China FTA on Goods and Investment.
- Pakistan-China FTA on Trade in Services.
- Pakistan-Sri Lanka FTA.
- Pakistan-Iran PTA.
- Pakistan-Mauritius PTA.
- Pakistan-Indonesia PTA.

For more information, negotiations are underway for bilateral FTAs with Iran, South Korea, Thailand, Turkey, and Uzbekistan, and with Afghanistan for a PTA.

3.4. Current Pakistan External Sector Performance

Pakistan's economy rebounded in FY2021 and FY2022 after a slight contraction of real GDP in FY2020. Many policy measures were initiated to support export-oriented industries and facilitate these firms to increase export earnings. Over the last two years,

imports have decreased due to regulatory measures, currency devaluation, and higher interest rates to suppress domestic demand. With the relaxing of lockdown measures, economic indicators are showing positive results bringing Pakistan's economy on the path of recovery. The earlier trend of falling imports has been reversed. This is because the government reduced import tariffs on raw materials in line with the National Tariff Policy (2019-2024). During FY2022, exports of goods and services grew but the country's imports have also risen. The reasons for high imports are an increase in worldwide commodity prices, imports of COVID-19 vaccine, and demand-side pressures. Resultantly, the trade deficit reaches a historically high level. The rising level of Remittances is not always sufficient to offset the trade deficit which is always supported to cover up the the pressure of trade deficit. The structure of the export value is shown below.

Table 3.3. Structure of Export Values in US$ million

	Particulars	2020-21	2021-22	% Change
1.	Food Group	3331.3	3961.5	18.9
2.	Textile Manufactures	11355.5	14242.6	25.4
3.	Petroleum Group	116.1	236.0	103.3
4.	Other Manufactures	2566.1	2982.6	16.2
5.	All Other items	1318.3	1932.2	46.6

Source: Pakistan Economic Survey, 2021-2022

During FY2021-22, the Textile and Petroleum group has shown remarkable performance and has earned more export revenue.

Table 3.4. Pakistan's Major Exports Percentage Share

Commodity	2016	2017	2018	2019	2020	2021	2022
Cotton Manufactures	55.0	56.5	61.7	56.4	56.6	59.0	59.2
Leather**	4.9	4.1	4.2	3.7	3.6	3.3	3.0
Rice	8.8	8.8	7.7	9.0	10.2	8.1	7.7
Other items	31.3	30.6	26.4	30.9	29.6	29.6	30.1

Source: Pakistan Economic Survey, 2021-2022

During FY2021-22, the export share of cotton manufacturers an d other items has increased relative to the share of leather and rice in exports of Pakistan. In so far as the top export destinations are concerned, the USA remains the largest export market for Pakistan during FY2022. Detail of major export markets has shown below.

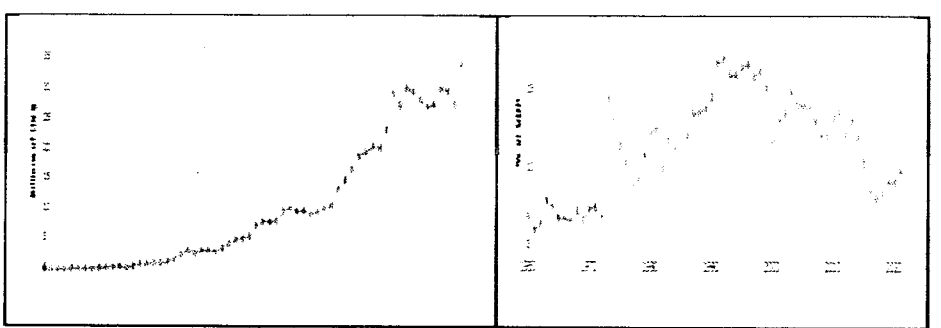
Table 3.5. Major Exports Markets *(Rs billion & Percentage share)*

	2020-2021		2021-2022	
Country	Rs (billion)	%age Share	Rs (billion)	%age Share
USA	593.6	20	854.3	21
China	292.9	10	428.4	11
Afghanistan	126.9	4	90.2	2
United Kingdom	245.3	8	277.1	7
Germany	187.7	6	220.0	5
U.A.E	118.9	4	174.6	4
Bangladesh	78.3	3	125.1	3
Italy	92.6	3	138.6	3
Spain	108.1	4	159.3	4
France	49.8	2	60.5	2
All Other	1,126.1	37	1,490.6	37
Total	3,020.2	100	4,018.8	100

Source: Pakistan Economic Survey, 2021-2022

All major export destinations have registered significant growth during FY 2022. For April 2022, exports of goods and services are expected to continue their upward trend due to export-oriented policies.

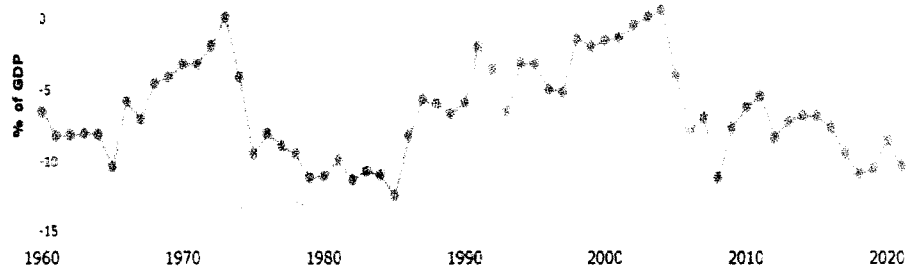
Figure 3.1. Exports of Pakistan (1960-2020)



Source: Pakistan Economic Survey, 2020-2021

The above graph 3.1. show the increasing trend at a slow rate in exports of Pakistan in terms of billions of US$ and percentage of GDP for the year 1960-2020.

Figure 3.2.Trade Balance



Source: Pakistan Economic Survey, 2020-2021

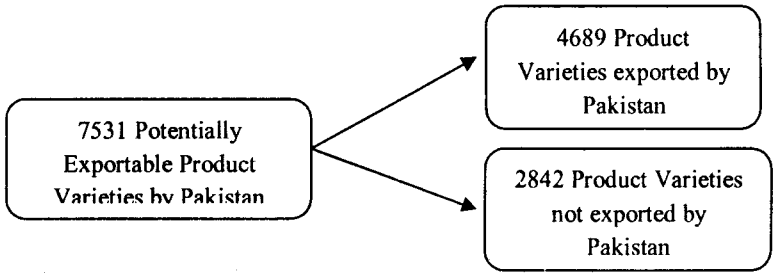
The export flow of Pakistan increased in 2020 but imports are also raised for the same period. As result, there is a negative trade balance exists in the country.

3.5. Quality of Pakistan's Export Products

The quality of Pakistan's export products is another indicator of export competitiveness. If exports are of high quality, they create better-paid jobs. However, the prices offered by Pakistan's exporters are lower than that of competitors. This suggests that Pakistan's exporters specialize in more standard, low-quality items. Where Pakistan sells well-established products like basmati rice, Pakistani exporters charge better prices. Export quality upgrading is notable in the services sector. During the past decade, services exports have been stagnant in the vicinity of USD6 billion. However, knowledge-intensive sectors such as computer and professional business services have grown relatively fast. The global trend of internationalization of business services facilitated this transformation, as Pakistani freelancers and SMEs embraced it. Industry experts believe that approximately USD 1.5 billion in exports is not reported. This is

because some of the exporters are small freelancers who register their receipts as remittances for taxation reasons.

Figure 3.4. Exportable Varieties of Product (Pakistan)



Source: Pakistan Development Update, The World Bank (2021)

3.6. Performance and Challenges of Exports

Pakistan's exports have been affected due to the low level of export competitiveness faced by Pakistani enterprises due to the higher cost of doing business and low product sophistication. The situation is caused by expensive energy compared to competitors, lower enterprise productivity, cumbersome taxation system, higher tariffs on intermediate and capital goods, lack of quality and standard ensuring ecosystem, and unattractive regime for investment in the export-oriented sector. The goals stipulated in the previous policies were not achieved because of the following challenges:

- Lack of unity and ineffective coordination within the government to successfully implement trade policy.
- Absence of effective Monitoring and Evaluation mechanism.
- Unrealistic exchange rate was also a reason for the continuous decline of Pakistan's exports.
- High tariffs on inputs also made Pakistan's exports non-competitive.
- Inadequate disbursement of funds often led to non-implementation of policy initiatives.

• Policy is focused on protection seeking rather than improving competitiveness and efficiencies.

• There was high dependence of the country's exports on textiles rather than automotive manufactured products. The primary and intermediate goods are exported rather than value-added finished products.

3.7. Measures to Boost Export in 2021

The economy had stabilized after the lifting of lockdowns at the start of FY2021, various policy measures were taken to support industrial activity and resume the growth momentum. The policy incentives are taken to increase exports included:

1. Supply of energy to export-oriented sectors including textiles at regionally competitive rates.
2. Release extra budget for Duty Drawback of Taxes and Levies.
3. Continuation of duty-free import of textile machinery.
4. Long Term Financing Facility (LTFF) for all sectors by SBP.
5. Implementation of export regulations to simplify export procedures by SBP.

3.8. Strategic Trade Policy Framework (STPF 2020-25)

Pakistan's exports have remained stagnant for the last ten years and thereby reducing Pakistan's share in the global export market. While Pakistan's exports have stagnated, imports have kept rising to result in a huge trade deficit. To address lower export growth in Pakistan, the Ministry of Commerce (MOC) has prepared the Strategic Trade Policy Framework (STPF) 2020-25 that aims to enhance the export competitiveness of Pakistan through a framework of interventions having an impact across the value chains. The STPF intends to make the policy implementation

unidirectional by correcting the chronic policy fragmentation-related issues that have undermined the effective implementation of previous Trade Policy Frameworks. Overall, it aims to enhance the ability of Pakistani enterprises' capacity to produce, distribute and sell products and services as or more efficiently than is done by the competitors. To achieve sustainable rapid export growth a comprehensive strategy has been devised to (a) optimize the growth of existing sectors in the short term, (b) diversify into the new sectors to be identified through stakeholders' engagement in the medium term, and (c) identify the innovation-driven export sectors for support interventions in the long term. The Ministry of Commerce has identified the following action areas and policy measures to enhance competitiveness:

1. Reduction in Cost of Doing Business
2. Tariff Rationalizations
3. Productivity Enhancements
4. Enhancement of Quality of Products
5. Trade-Related Investments

The above-mentioned measures should be taken and implemented by the government to achieve export competitiveness. So the export performance of Pakistan can be improved and ultimately trade deficit can be reduced. And Pakistan can easily develop and grow economically very fast.

Chapter 4

Methodology

4.1. Introduction

This chapter of the study is devoted to developing theoretical modeling to explore product quality and export flow. In the first section (4.2), a theoretical and conceptual framework for product quality is discussed. In the second section (4.3), a theoretical foundation is provided for product quality and trade flows. In the third section (4.4) the theoretical models of three moderators through which product quality affects trade flows are discussed. The last section (4.5) comprises a theoretical and conceptual model of two mediators examined in the study.

4.2. Theoretical Framework of Product Quality

The theoretical model developed by Manova and Yu (2017) explains how product quality can affect the profit of a firm.

4.2.1. Production Efficiency and Product Quality

This theoretical framework is based on CES consumers' preferences. Firstly they considered J + 1 countries in the world with heterogeneous firms which can produce different and multiple goods. By assuming that the utility of consumers is increasing in product quantity and product quality in country j like that demand x_{ji} positively related to quality q_{ji}, negatively with the price p_{ji}, and positively with aggregate demand R_j and an adjusted price index x_{ji}..

It is defined that quality is based on taste preference that helps in increasing the consumer's demand. This suggests that output prices show the influence of objective and

subjective aspects of product quality, but 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 marginal cost w_i, where $c_i = w_i/\varphi\lambda_i$.

4.2.2. Firm Behavior regarding Price Setting and Quality

On the entry, firms realize their 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 produces and to which country j this product sells. 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 φ 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 as follows:

$$\max \pi_i(\varphi_i, \lambda_i)$$

$$= \sum \pi_{ji}(\varphi_i, \lambda_i)$$

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

Subject to $x_{ji} = x_{ji}(p_{ji}, q_i, R_j, P_j)c_i = \frac{w_i}{\varphi\lambda_i}$ and $q_i = q_i(\varphi_i, \lambda_i, w_i)$

The total cost of the good is $C_{ji}(c_i, x_{ji}, f_{pj}, \tau_j)$. Here $c_i$is a marginal cost that is increasing, x_{ji} is the quantity demanded that is increasing, and f_{pj} and τ_j are variable production and distributional cost. Consequently, quality is increasing as efficiency in production and input cost increase. On the other side, marginal cost decreases with efficiency in production and increases with input cost.

It is also assumed that firms produce the same category of items. The firm can face low marginal costs if

(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.

The first two propositions describe an efficient category and the last is categorized as quality efficient.

This framework establishes how quality affects the link between prices, profits, and revenues across firms. Since consumer demand declines with prices, quantities are attached to higher production efficiency. This can generate higher profits and sales revenues (Bernard et al., 2010; Melitz et al., 2014).

4.3. Theoretical Framework for Product Quality and Trade Flows

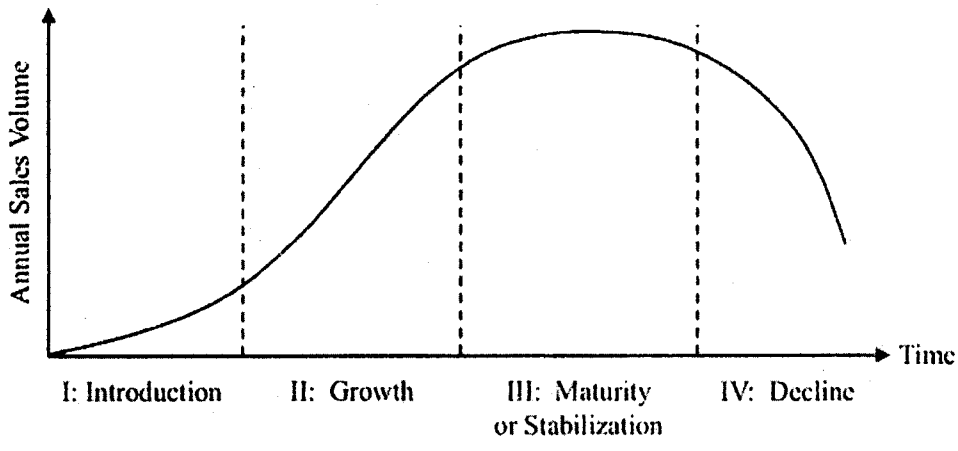
The theoretical framework for international trade and product quality is based on two trade theories that explain patterns of international trade: Product life cycle trade theory and Country similarity theory.

4.3.1. Product Life Cycle Trade Theory

This theory was developed by Raymond Vernon (1960's) after the failure of Hecksher Ohlin's Theory. the main assumption is that there are different production stages and output will transfer to a region in a good and final condition. The focus of the theory is technological advancement in the company and country to get more

specialization and efficient production technologies. There are four stages involved in the production process: Introduction, Growth, Maturity, and Decline stage.

Figure 4.1: Stages of Product Life Cycle



The first stage of the product cycle is the Introduction. At this stage, the new product entre into a local market where competition is minimal. There are limited international business activities because of no large-scale production. The second stage is Growth. In this stage, the demand for a product at a foreign level grows. There is little competition that exists at the domestic as well as foreign level. So the volume of production increased. Maturity is the Third stage of a product cycle. based on technology and innovation, the production process and product become standardized. Developing countries start to export and developed countries are introducing new products. The decline is the last stage, where no demand for the product in the market. This stage comes when the life cycle of the product is completed.

4.3.2. Country Similarity Theory

This is a demand-based theory of trade presented by Steffan Linder (1961) who explain the concept of industry trade. He suggested that at first firms produce for

domestic consumption. Afterward, firms are looking for a market similar to the domestic market when they decide to export. Linder's similarity theory states that trade exists between countries with similar income and trade patterns. Similar-income countries will demand products of similar quality. This theory is useful where brand names and product reputations are important for buyers' decision-making. So the countries will get expertise in the production of high-quality goods and will trade these goods. both export prices and demand for the same quality product are correlated with income. In this manner, the high-quality product can consume by high incomes countries.

4.4. Theoretical Framework for Moderators

This section provides the theoretical foundations for moderators. That comprises two sub-sections. The first sub-section presents a theoretical framework for the role of moderators such as Financial Constraints, Firm heterogeneity, and R& D activities.

4.4.1. Product Quality and Trade Flows: Role of Financial Constraints

Based on a theoretical model developed by Crino & Ogliari (2017) that enables us to investigate empirically how financial imperfection affects the average quality of good produce and hence creates trade imbalances. Our interest is to analyze how financial imperfections affect the average quality of goods sold by countries in different destinations and industries. Accordingly, we will consider a setup with multiple countries and sectors, which are heterogeneous in terms of financial frictions and financial vulnerability respectively.

4.4.1.1. Set-up

Consider a static model of a world economy composed of i and countries, indexed by $i, j = 1, \ldots, J$, with i and j denoting importing and exporting countries, respectively. In

each country, there are S industries, indexed by s= 1, . . . , S, each of which consists of a continuum of differentiated products, labeled by l.

4.4.1.2. Consumers

The representative consumer in-country has the following utility function and cost function,

$$u_i = \prod_s c_{is}^{\vartheta s} \; \vartheta s \epsilon \; (0,1) \sum \vartheta s = 1, \tag{4.1}$$

$$c_{is} = \left[\int_{l \in B_{is}} \left(q_{is}(l) x_{is}(l)\right)^{\alpha} dl\right]^{\frac{1}{\alpha}} \quad \alpha \epsilon \; (0,1) \tag{4.2}$$

Where q_{is} is the set of industry-S products available for consumption in country i, q_{is}(l) is the consumption of product l, $q_{is} \geq 1$ is its quality, and $\varepsilon = (1-\alpha)^{-1} > 1$ is the elasticity of substitution between any two products. As conventional, product quality is interpreted as an attribute of the good that increases its valuation by the consumer and that is chosen by firms. These features include physical characteristics such as product constituents, functions, and method of operation; the appearance of the good (color, styling, size, etc.); the packaging; complementary services such as insurance, repair, and maintenance; marketing and advertising activities.

Consumer utility maximization yields the following demand for good l in country i:

$$x_{is}(l) = \frac{q_{is}(l)^{\varepsilon-1} p_{is}(l)^{-\varepsilon} y_{is}}{p_{is}^{1-\varepsilon}} \tag{4.3}$$

Where $p_{is}(l)$ is the price of the good,

$y_{is} = \vartheta s R_i$

y_{is} is the share of total spending where R_i devotes industry "s" products, and

$$p_{is} = \left[\int_{l \in B_{is}} \left(\frac{p_{is}(l)}{q_{is}(l)}\right)^{1-\varepsilon} dl\right]^{\frac{1}{1-\varepsilon}}$$

is the ideal, quality-adjusted, price index associated with Eq. (4.2). Note that demand is decreasing in the price and increasing in the quality of the goods.

4.4.1.3. Firms

In any country j and industry S, there are N_{js} active firms, which produce differentiated products under monopolistic competition. To enter the industry, each firm bears a fixed entry cost $c_{js}f_{ej}$, where f_{ej} is the number of bundles of country j_s inputs and c_{js} is the cost of each bundle. An entrant then draws an input-per-unit-output coefficient a, whose inverse $1/a$represents productivity. The distribution of $a's$ across active firms is described by a cumulative distribution function $G(a)$, with probability density function $g(a)$ and support $[a_L, a_H]$, where $0 < a_L < a_H$. This distribution function is the same across countries and industries.[9]

Following Feenstra et al. (2014), we assumed that firms choose the quality of their products for each destination market. This assumption generates quality variation across destination markets for the same firm and product, consistent with a growing number of micro-econometric studies on the behavior of export unit values across markets (Silva & Carreira, 2012). These studies have claimed that the observed pattern of prices across destinations is in line with heterogeneous-firms trade models in which firms differentiate product quality across destinations.

Accordingly, we posit that, to produce a good quality Q_{ijs} for the destination i, a country-j firm active in industry-s bears a fixed cost equal to:

$$FQ_{ijs} = C_{js}q_{ijs}^{\gamma} \qquad (4.4)$$

[9]The a's capture productivity differences across active firms in the same country and industry. Aggregate differences across the countries and industries capture by c_{js}(see, Crino and Ogliari, 2017).

Where $\gamma>0$ is the quality-elasticity of the fixed cost. By comparing, Eqs. (3) and (4), note that quality upgrading involves a trade-off between higher demand (hence revenue) and higher fixed costs. The marginal cost of production is instead equal to

$MC_{ijs}(a) = \omega_{ijs}(a)q_{ijs}^{\sigma}$

$\omega_{ijs}(a) = \tau_{ij}c_{js}a$ (4.5)

where $\tau_{ij}>1$ is a trade cost that needs to be paid for shipping goods from country j to country *i*, $\delta\varepsilon(0, 1)$ is the quality elasticity of marginal cost, and $\omega_{ijs}(a)$ can be interpreted as a measure of the marginal cost per unit of quality[10]. Finally, it assumed that selling in destination *i* involves a fixed export cost as in (Helpman et al., 2004) equal to:

$Ex_{ijs} = c_{js}f_{xij}$ (4.6)

The baseline assumptions about firms' quality decisions may be restrictive in some cases for analytical convenience, as they imply that the quality choice for one destination is independent of those for other destinations, thereby ruling out complementarities in quality decisions across markets.

4.4.1.4. Financial Imperfections

The model for financial friction and financial vulnerability is mainly based on Manova (2013). We assumed that, in a representative industry, a fraction $d_s\epsilon(0, 1)$ of the fixed costs must be borne up-front, before revenue is realized.[11] Hence, a country-*j* firm producing in industry s needs to borrow $(d_{ijs} + EX_{ijs})$ from external investors to service destinations *i*. To be able to borrow, the firm must pledge collateral. It has assumed that a fraction $t_s \epsilon (0, 1)$ of the entry cost is invested intangible assets, which can be

[10] Marginal cost can be increased if quality of a product is required better inputs.(see, Verhoogen, 2008)
[11] The most of external finance used by firm to produce high quality product covers the fixed cost rather than
variable cost

collateralized. Hence, the collateral is equal to:

$$CO_{js} = t_s c_{js} f_{Ej} \quad (4.7)$$

The parameters d_s and t_s describe the financial vulnerability of industry s: the higher d_s and the lower t_s, the industry will be more vulnerable financially. As customary, it assumes that d_s and t_s vary across industries due to innate technological differences (Rajan and Zingales, 1998).

Countries differ in their level of financial development, and thus in the strength of financial frictions facing domestic firms. It also assumed that each country has a different degree of financial contractibility. This means that an investor in country j can expect to be repaid with probability $\lambda_j \epsilon (0, 1)$. Instead, with probability $1 - \lambda_j$ the contract is not enforced, and the investor seizes the collateral.

4.4.1.5. Firms' Decisions

A country-j firm active in industry s chooses a price p_{ijs}, quality q_{ijs}, and payment $F_{ijs}$to maximizes profits in destination market i, subject to two constraints that a liquidity constraint, which states that in case of repayment the firm can promise the investor at most the cash flow and the participation constraint of the investor. These constraints state that the value of the loan cannot exceed the expected return from the investment. The decisions of firms regarding entry into destination i and the quality of goods sold therein are illustrated graphically. Absent financial frictions, all firms with $a \epsilon [a_L, a_H]$ would enter market i with the optimal quality, denoted by $q^0_{ijs}(a)$ and equal to:

$$q^0_{ijs}(a) = \left[\left(\frac{\tau_{ij} c_{js} a}{\alpha p_{is}}\right)^{1-\varepsilon} \frac{(\gamma - \bar{\gamma}) y_{is}}{\varepsilon \gamma c_{js}}\right]^{\frac{1}{\bar{\gamma}}} \quad (4.8)$$

where $\ddot{Y} \equiv \gamma - (\varepsilon - 1)(1 - \sigma) > 0$ by the second-order condition for profit maximization and quality is increasing in firm productivity because more productive firms have higher revenue and can thus afford to pay higher fixed costs of quality upgrading. Hence, only a fraction $G(a_{ijs})$ of the Njs active firms would sell in country i. it should be pointed out that this fraction is zero when no firm finds it profitable to enter destination i. This is the case when $a_{ijs} < a_L$, i.e. when the least productive firm that can profitably sell in i has a coefficient a below the support of $G(a)$.

When credit markets are imperfect, there can still be firms that are liquidity unconstrained and enter the market i with the optimal quality. These are firms that generate enough revenue and cash flow to incentivize the creditor at financing the investment associated with $q^0_{ijs}(a)$. In this respect, revenue and cash flow are increasing in productivity, both because more productive firms are more efficient and because they produce higher-quality products. On the other hand, more productive firms bear higher fixed costs of quality upgrading and thus need to borrow more from external investors.

As for the remaining firms, those with $a \in (a^*_{ijs}, a_{ijs})$ would enter market i with the optimal quality of financial frictions absent. But with imperfect credit markets, these firms are liquidity constrained and cannot achieve $q^0_{ijs}(a)$. Intuitively, they do not make enough revenue to incentivize the creditor at financing the investment associated with the optimal quality. It is shown that some of those firms, i.e., those with $a \epsilon (\bar{a}_{ijs}, \underline{a}_{ijs})$, enter destination i with a quality below the optimum. Intuitively, by lowering quality, these firms reduce the value of the investment to be financed externally, and thus the payment F_{ijs}which is required by the investor. By doing so, they can meet their liquidity constraint and enter. Because revenue is increasing in productivity, less productive firms need to

deviate more from the optimum. Accordingly, firms in this productivity range choose a quality level equal to a fraction $\beta_{ijs}(a) \in (0, 1)$ of their optimum, with $\beta_{ijs}(a)$ smaller for less productive firms (i.e., $\partial \beta_{ijs}(a)/\partial a < 0$). Finally, firms with $a \epsilon (\tilde{a}_{ijs}, \bar{a}_H)$ cannot profitably sell in destination i, as they are so unproductive that their revenue would always be too low for an investor to break even.

4.4.1.6. Average Quality

An expression can derive from the average quality of goods exported by a country j to country i in industry s.

$$q_{ijs} = \int_{\bar{a}_l}^{\bar{a}_{ijs}} q_{ijs}^0(a) \frac{g(a)}{G(\tilde{a}_{ijs})} da + \int_{\bar{a}_{ijs}}^{\tilde{a}_{ijs}} \beta_{ijs}(a) q_{ijs}^0 \frac{g(a)}{G(\tilde{a}_{ijs})} da$$

$$= \left[\left(\frac{\tau_{ij} c_{js} a}{\alpha p_{is}}\right)^{1-\varepsilon} \frac{(\gamma - \tilde{\gamma}) y_{is}}{\varepsilon \gamma c_{js}}\right]^{\frac{1}{\tilde{\gamma}}} * \left(\int_{\bar{a}_l}^{\bar{a}_{ijs}} a^{\frac{(1-\varepsilon)}{\tilde{\gamma}}} \frac{g(a)}{G(\tilde{a}_{ijs})} da + \int_{\bar{a}_{ijs}}^{\tilde{a}_{ijs}} \beta_{ijs}(a) a^{\frac{(1-\varepsilon)}{\tilde{\gamma}}} \frac{g(a)}{G(\tilde{a}_{ijs})} da\right) \quad (4.9)$$

Eq. (3.9) shows that q_{ijs} varies along two margins. The first is an 'extensive margin', which reflects the selection of firms into the market i and is governed by the exporting cut-off. The second is an 'intensive margin', which reflects the average quality of incumbent exporters' products and is governed by the share of liquidity-unconstrained firms and by the quality level of liquidity-constrained firms.

4.4.2. Product Quality and Trade Flows: *Firm's Heterogeneity*

Bernard et al. (2003) and Helpman et al. (2004) have developed firm-level models of intra-industry trade to stylize facts about exporting firms.

4.4.2.1 A Model of Credit Constraints in Trade

Helpman et al. (2004) incorporated credit constraints and firm heterogeneity into a static equilibrium model. Accordingly, large numbers of firms produce differentiated

goods in each J country and S sector. Individual Consumer exhibits a Cobb-Douglas utility aggregate of a country $u_i = \prod_s c_{is}^{\vartheta s}$ is over sector-specific with CES from the available products and $\varepsilon = \frac{1}{1-\alpha} > 1$ is the elasticity of substitution. The share of each sector in total expenditure Y_i is $\vartheta s \in (0,1)$ and $\sum \vartheta s = 1$

If $p_{is} = \left[\int_{l \in B_{is}}^{s} \left(\frac{p_{is}(l)}{q_{is}(l)}\right)^{1-\varepsilon} dl\right]^{\frac{1}{1-\varepsilon}}$

is the ideal price index, $i.s$. Demand for a variety with price p_{is} is thus

$$q_{is} = p_{is}(l)^{-\varepsilon}\theta_s Y_i / P_{is}^{1-\varepsilon}$$

4.4.2.2. Domestic Producers

Firms in country j pay a sunk entry cost $c_{js}f_{ij}$ before drawing a productivity level $1/a$ from a cumulative distribution function $G(a)$ with support $[a_L; a_H]$, $a_H > a_L > 0$. Manufacturing 1 unit of output costs $c_{js}a$, where c_{js} is the cost of a cost-minimizing bundle of inputs specific to each country and sector. Since c_{js} captures differences in aggregate productivity, factor prices, and factor intensities across countries and sectors, $G(a)$ does not depend on j and s.

4.4.2.3. Credit-Constrained Exporters

Firms in-country j can export i by paying a fixed cost $c_{js}f_{jj}$ each period, where $f_{jj} > 0$ for $i \neq j$and $f_{jj} = 0$. Exporters also incurred trade costs so that $\tau_{ij} > 1$ units of a product need to be shipped for 1 unit to arrive. Firms faced liquidity constraints in financing their foreign sales. While variable costs can be funded internally, a fraction $d_s \in (0; 1)$ of the fixed trade cost is borne up-front and has to be covered with outside capital.

Producers in the country j and sector s thus have to borrow $d_s c_{js} f_{jj}$ to service country i. A fraction $t_s \in (0; 1)$ of the sunken entry cost goes toward tangible assets.

Countries differ in their level of financial contractibility. An investor can expect to be repaid with probability $\lambda_j \in (0,1)$, which is exogenous to the model and determined by the strength of financial institutions. With probability$(1 - \lambda_j)$, the financial contract is not enforced, the firm defaults and the creditor seizes the collateral $t_s c_{js} f_{ej}$[12]. Firms from countries j choose their export price and quantity in the market i to maximize profits

$$\max_{p,q,f} \pi_{ijs}(a) = p_{ijs}(a)q_{ijs}(a) - q_{ijs}(a)\tau_{ij}c_{js}a - (1 - d_s)c_{js}f_{ij} - \lambda_j F(a) - (1 - \lambda_j)t_s c_{js} f_{ej}$$

Subject to $$(1)\ q_{is}(a) = \frac{p_{is}(a)^{-\varepsilon}\theta_s Y_i}{P_{is}^{1-\varepsilon}}$$

$$(2) A_{ijs}(a) \equiv p_{ijs}(a)q_{ijs}(a) - q_{ijs}(a)\tau_{ij}c_{js}a - (1-d_s)c_{js}f_{ij} \geq F(a)$$

$$(3) B_{ijs} \equiv -d_s c_{js} f_{ij} + \lambda_j F(a) + (1-\lambda_j)t_s c_{js} f_{ej} \geq 0$$

The expression for-profits reflect the fact that the firm finances all its variable costs and a fraction $(1 - d_s)$ of its fixed costs internally, pays the investor F(a) when the contract is enforced (with probability λ_j), and replaces the collateral in case of default (with probability $(1 - \lambda_j)$). In the absence of credit constraints, exporters maximized profits subject to demand (1). With external financing, two additional conditions bind a firm's decisions. In case of repayment, entrepreneurs can offer most of their net revenues $A_{ijs}(a)$ to the creditor. Also, investors only fund the firm if their net return $B_{ijs}(a)$ exceeds their outside option. With competitive credit markets, investors always break-even in expectation. This implies that producers adjust their payment *F(a)* to bring the

[12] See, Manova, 2013.

financier to his participation constraint, i.e. $B_{ijs}(a) = 0$. If the liquidity constraint (2) does not bind, firms become exporters with the same optimal export quantities, prices, revenues, and profits as specified by Melitz (2003):

$$p_{ijs}(a) = \frac{\tau_{ij}c_{js}a}{\alpha},$$

$$q_{ijs}(a) = \left(\frac{\tau_{ij}c_{js}a}{\alpha}\right)^{-\varepsilon}\frac{\theta_s Y_i}{P_{is}^{1-\varepsilon}},$$

$$r_{ijs}(a) = \left(\frac{\tau_{ij}c_{js}a}{\alpha P_{is}}\right)^{1-\varepsilon}\theta_s Y_i,$$

$$\pi_{ijs}(a) = (1-\alpha)\left(\frac{\tau_{ij}c_{js}a}{\alpha P_{is}}\right)^{1-\varepsilon}\theta_s Y_i - c_{js}f_{ij}, \quad (4.10)$$

4.4.2.4. Selection into Exporting

Since net revenues $A_{ijs}(a)$ increase with productivity, the liquidity constraint (2) is binding for firms with productivity below a certain cut-off $\frac{1}{a_{ijs}}$. Plugging $B_{ijs}(a) =$ 0and the optimal price and quantity from (3.10) into constraints (2), this threshold is given by the condition

$$r_{ijs}(a) = \left(\frac{\tau_{ij}c_{js}a}{\alpha P_{is}}\right)^{1-\varepsilon}\theta_s Y_i = \varepsilon\left\{\left(1-d_s+\frac{d_s}{\lambda_j}\right)c_{js}f_{ij} - \frac{1-\lambda_j}{\lambda_j}t_s c_{js}f_{ej}\right\} \quad (4.11)$$

With perfect financial contractibility ($\lambda_j = 1$), the cut-off for exporting $\frac{1}{a_{ijs}}$ satisfies as in Melitz (2003). Condition (3) implies that the export cut-off varies systematically across countries and sectors.

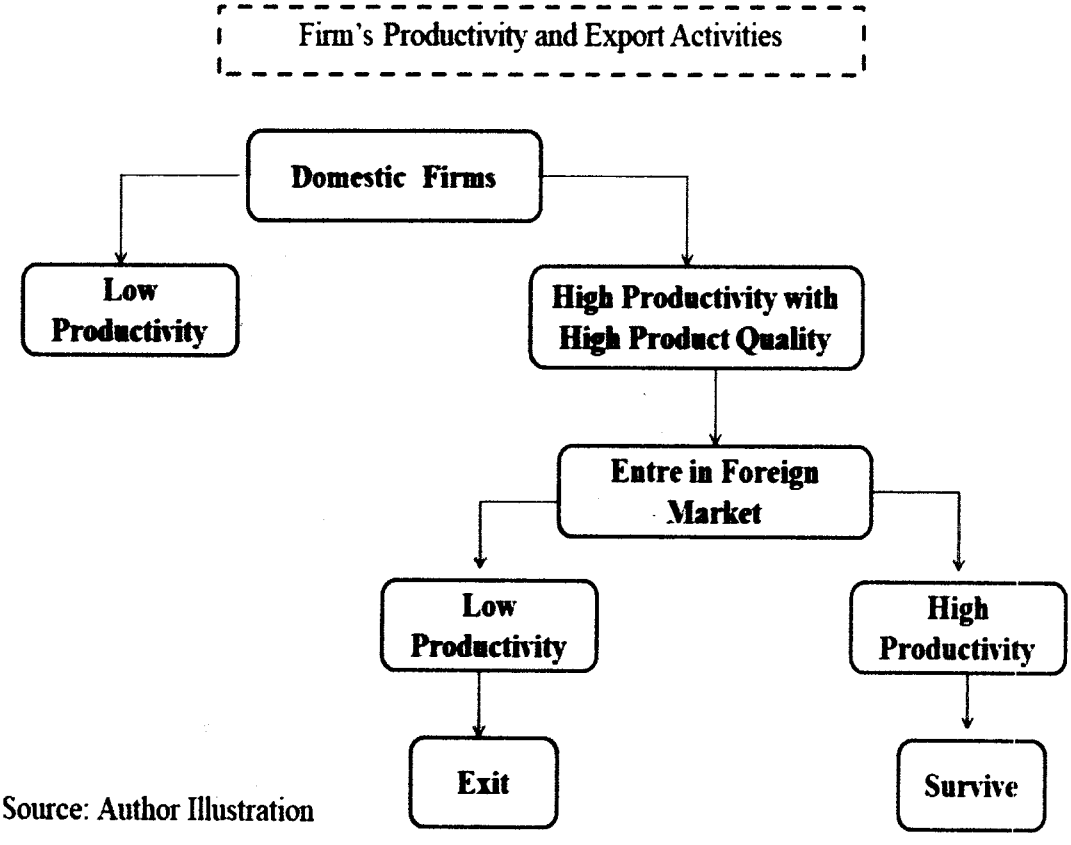
4.4.2.5. Aggregate exports

Aggregating exports across firms (m_{ijs}), total exports from country j to country i in sector s are

$$m_{ijs}=\left(\frac{\tau_{ij}c_{js}a}{\alpha P_{is}}\right)^{1-\varepsilon}\theta_s Y_i N_{js}\left[\int_{a_L}^{a_{ijs}^H} a^{1-\varepsilon}dG(a)+\int_{a_{ijs}^H}^{a_{ijs}^L}\beta_{ijs}(a)a^{1-\varepsilon}dG(a)\right] \quad (4.12)$$

Where N_{js} is the exogenous measure of active producers. The first term in the brackets corresponds to firms trading at first-best levels, while the second captures the reduced revenues of constrained exporters.

Figure 4.2. Analytical Framework for firms Export Flow



Source: Author Illustration

4.4.3. Product Quality and Trade Flows: Research & Development Activities

In the Cobb-Douglas construction, the benefits of increased 'A' are distributed proportionately across all factors in the economy[13]. Griliches (1979) modified the Solow model, rewriting equation (3.13) as:

$$y_{it} = A_t {X_{it}}^{1-\beta} R_{it}^{\beta} S_{it}^{\lambda} \qquad (4.13)$$

In equation (4.18) for the i^{th} firm in an industry, the variable X represents all conventional inputs (capital and labor, properly measured and quality-adjusted); R represents the stock of R&D knowledge produced by the firm; and S represents the stock of 'outside' knowledge that the firm can draw upon, specifically, the R&D produced by other firms in the industry. Griliches (1979) imposed constant returns to scale on the firm's inputs (X and R).

Levin & Reiss (1989) have built on Griliches'(1979) formulation (4.18) and help to clarify the chain of empirical challenges in measuring R&D and R&D spillovers.[14] The impact of R&D in a production function is determined by the firm's R&D (R), the R&D of all other firms (S), and the degree of non-excludability of all others' R&D (β):

$$R^{\alpha}(\beta S)^{\lambda} \qquad 0 \leq \beta \leq 1 \qquad (4.14)$$

Further, there are other factors explained by Levin and Reiss (1988) that reduce the effective stock of S to a given firm:

$$R^{\alpha}(\beta_1\beta_2\beta_3\beta_4 S)^{\lambda} \qquad o \leq \beta_i \leq 1 \qquad (4.15)$$

These factors are formalized in [4.20] as a series of effective information is available to the firm for the production of good quality products.

[13] See, Haq et al., 2015.
[14] See, S.khan, 2006.

4.5. Theoretical Framework for Mediators

This section explains the theoretical foundations for two mediators which explain the direct and indirect relationship between product quality and export flows. The two mediators are Total Factor of productivity growth and Firms growth.

4.5.1. Product Quality and Trade Flows: Total Factor Productivity (TFP)

Total factor productivity (TFP) plays a central place in economic growth theory. According to the exogenous growth theories initiated with the seminal work of Solow (1956), TFP is an exogenous and time-driven phenomenon. This model states how an economy can respond to changes in investment, technological investment, and labor growth. This model still gives the leading framework to explain productivity and economic growth. There is a technological component that is unexplained when labor and capital are accounting. This growth component is called Solow Residual and is also known as a total factor of productivity (TFP) For instance, their aggregate production function is given as:

$$Y = A_t F(K_t, L_t) \tag{4.16}$$

Or it can also be re-write in such a format

$$Y = TFP.K^{\alpha}.L^{\beta} \tag{4.17}$$

Here Y is the gross domestic product of the firm. K and L are capital and labor inputs. This equation can be expressed in form of growth rate by assuming $\alpha+\beta=1$

$$\dot{Y} = T\dot{F}P + \alpha\dot{K} + \beta\dot{L} \tag{4.18}$$

However, with the blossom of endogenous growth theories, the concept of time-driven TFP has faded away. Instead, the endogenous growth models proclaim that TFP is a function of human capital and a change in it or technical change occurs as a result of the

profit-maximizing motives of economic agents ((Lucas, 1988). In their framework, the aggregate production function is given as:

$$Y = A_t(h)F(K_t, L_t) \quad (4.19)$$

Where h is the stock of human capital. Similarly, the second generation of endogenous growth models (Romer, 1990; Grossman & Helpman, 1991; and Aghion & Howitt, 1992) emphasized that besides the stock of human capital "h", TFP is the function of R&D expenditure. Hence, the production function is given as:

$$Y = A_t(h, r)F(K_t, L_t) \quad (4.20)$$

Where r is domestic R&D capital stock. Further, Grossman and Helpman (1994) and Coe and Hepman (1995) incorporate trade openness into the endogenous economic growth framework. According to these authors, the knowledge or technology that diffuses through international trade has a positive impact on TFP:

$$Y = A_t(h, r, o)F(K_t, L_t) \quad (4.21)$$

Where 'O'is the country's level of openness. Given the assumption that the TFP at any time takes the following Cobb–Douglas specification:

$$TFP_t = h_t^{\alpha}.r_t^{\beta}.o_t^{\gamma} \quad (4.22)$$

The TFP growth in each country is measured as

$$ln\left(\frac{A_{i,j,t}}{A_{i,j,t-1}}\right) = ln\left(\frac{Y_{i,j,t}}{Y_{i,j,t-1}}\right) - \alpha ln\left(\frac{L_{i,j,t}}{L_{i,j,t-1}}\right) - \beta ln\left(\frac{K_{i,j,t}}{K_{i,j,t-1}}\right) \quad (4.23)$$

Whereas, the term A is used for TFP

4.5.2. Product Quality and Trade flows: Firm's Growth

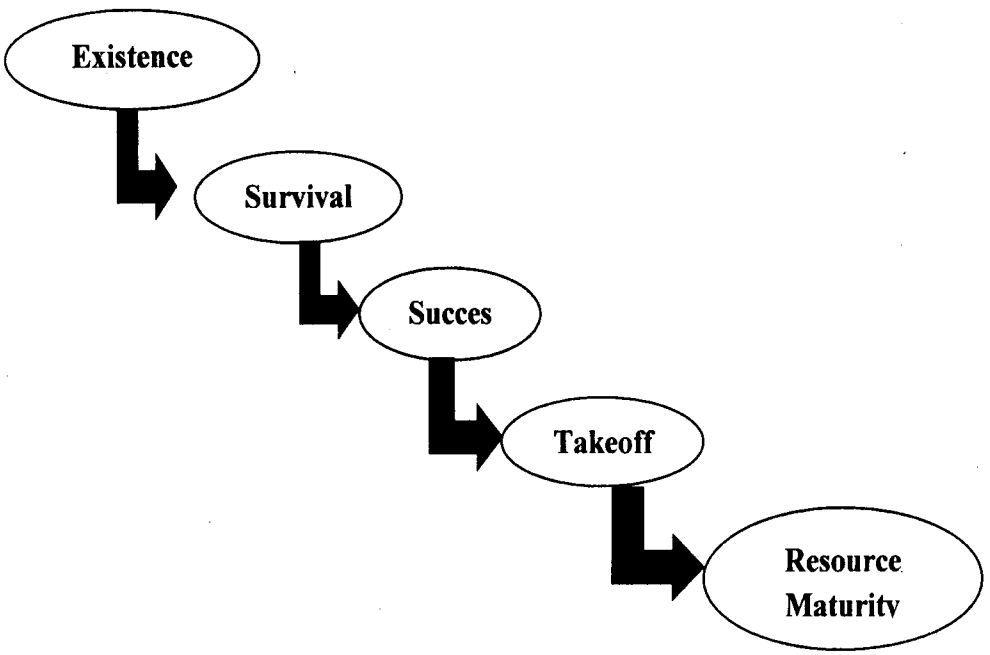
A firm's growth is the major aspect of study in economics. This growth has a significant effect on the survival of the firm, employment opportunities, and

business activities of a firm at both domestic and foreign levels. A model is developed by Churchill and Lewis (1983) who explain the five stages of a firm's growth.

- Existence: At this level, the firm first tries to set up its business by supervising all the business activities.
- Survival: At the second level, the firm requires more capital to increase its sale. The business of the firm grows and expands.
- Success: the firm earns more and more profit in the third stage. Now they have enough financial resources to invest in new projects. The enterprise begins to earn profits. They have enough capital to either invest in further business opportunities or continue with the same pace of growth.
- Take off: In the fourth stage, the firm tries to increase its human capital by conducting different training programs. The entrepreneur becomes more efficient and skilled. The firm is focused on expansion and searching for new business opportunities.
- Resource Maturity: at the final stage, now firmly put more attention towards improving quality and financial condition. As the firm remains no more a small enterprise.

Broadly two theoretical frameworks explain the firm's growth: One framework states that the growth path can be sequential, linear, invariant, and deterministic (Lewis & Churchill, 1983). The competitiveness of a firm is increasing at all the stages of growth and this competency decreases if the firm is not upgrading its business. So the firm tries to put more focus on improving its capabilities (Lewis & Churchill, 1983). The second school of thought states that small enterprises can face sudden changes in their growth.

Figure 4.3: Five Stages of Firms' Growth



Note: Resource (Churchill and Lewis (1983))

The sequence of stages in the growth path of a small firm remains the same if some factors are intervening suddenly (Levie & Hay, 1998; Phelps et al., 2007).

Gibrat (1931) is the first who gives a model for explaining firm growth. This model is based on 'The Law of Proportionate Effect'. There is a dynamic approach to testing Gibrat's Law with a random walk specification:

$$z_{t,i} = \beta\, z_{t-1,i} + \varepsilon_{i,t} \qquad (4.24)$$

Where $z_{t,i}$ denotes the logarithm of the size of the firm. Hence, the firm growth is determined by the error term $\varepsilon_{i,t}$, and the validity of restriction $\beta = 1$ is suggested that the law holds. Whenever subtracting $z_{t-1,i}$ on both sides in Eq. 1 and defining $\gamma = \beta - 1$, the following equation gets.

$$\Delta z_{t,i} = \gamma\, z_{t-1,i} + \varepsilon_{i,t} \quad (4.25)$$

This model is estimated for cross-sectional data, and Gibrat's Law holds if the restriction $\gamma = 0$ and $\beta = 1$ is valid which implies that the growth rate is sustained over time. Audretsch et al. (2004) argued that the autoregressive process at first order is not sufficient to fix the problem of autocorrelation. So second-order process is also considered:

$$\varepsilon_{t,i} = \rho\varepsilon_{t-1,i} + \omega\varepsilon_{t,i} + v_{t,i} \quad (4.26)$$

Adding this to the error term in Eq. 2, the following results are estimated:

$$\Delta z_{t,i} = (\beta - 1 + \rho)z_{t-1,i} + (\omega - \beta\rho)z_{t-2,i} - (\beta\omega)z_{t-3,i} + v_{t,i} \quad (4.27)$$

When (β, ρ, ω) is equal to (1, 0, 0), Gibrat's Law is considered to be fulfilled (Bentzen 2012).

4.6. Econometric Modeling

After a detailed discussion of the theoretical models of the study, the next we designed empirical models. These models are formed in light of the objectives of the study.

4.6.1. Determinants of Product Quality

Firstly, we have constructed the measure of product quality 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.

$$PQ = f(x_1, x_2, x_3 \ldots\ldots\ldots x_n)$$

$$PQ = f(y_1, y_2, y_3 \ldots\ldots\ldots y_n) \quad (4.28)$$

Where PQ is product quality and x's are the firm-level determinants of Product quality and y's are the country-level determinants of product quality.

4.6.2. Product Quality and Export Flows

Secondly, the baseline model is estimated to check the link between export quality on trade flows.

$$EF_{ft} = \alpha_0 + \alpha_1 PQ_{ft} + \alpha_2 'z_{1t} + \mu_i + \lambda_t + e_{i,t} \quad (4.29)$$

where, EF_{ft} is export flows of the firm, PQ_{ft} is export product quality of a firm and z_{1t} is the vector of firm specific control variables. And coefficient of $\frac{\partial EF_{ft}}{\partial PQ_{ft}} = \alpha_1$ shown the direct impact of product quality on trade flows of an economy. Where μ_i and λ_t are firm specific and time specific non stochastic effects.

4.6.3. The Role of Moderators

In this study, there are three moderators: financial constraints, firm heterogeneity, and research & development activities are used to check the relationship between export quality and trade flows.

4.6.3.1. Role of Financial Constraints in Product Quality and Trade Flows Nexus

Equation 4.29 is extended to check the impact of financial constraints on product quality and trade flows as follows.

$$EF_{ft} = \beta_0 + \beta_1 PQ_{ft} + \beta_2 FC_{ft} + \beta_3 \sum(PQ_{ft} * FC_{ft}) + \acute{\beta}_4 z_{2t} + \mu_i + \lambda_t + e_{i,t} \quad (4.30)$$

Where, FC_{ft} is a financial constraint for firms, and β_3 represent its interconnection term with product quality. The term of $\frac{\partial EF_{ft}}{\partial PQ_{ft}} = \beta_1 + \beta_3 FC_{ft}$ shows change in trade flow due to a change in product quality.

4.6.3.2. Role of Firm Heterogeneity in Product Quality and Trade Flows Nexus

To analyze the impact of firm heterogeneity on product quality on trade flows, the

basic model (Equation 4.29) is extended which takes the following form.

$$EF_{ft} = \gamma_0 + \gamma_1 PQ_{ft} + \gamma_2 FH_{ft} + \gamma_3 \sum(PQ_{ft} * FH_{ft}) + \acute{\gamma_4} z_{3t} + \mu_i + \lambda_t + e_{i,t} \quad (4.31)$$

Where, FH_{ft} is firm heterogeneity and γ_3 represent its interconnection term with product quality. The term of $\frac{\partial EF_{ft}}{\partial PQ_{ft}} = \gamma_1 + \gamma_3 FH_{ft}$ explain the effect of firm heterogeneity on product quality.

4.6.3.3. Role of Research and Development Activities in Product Quality and Trade Flows Nexus

The impact of R & D activities on product quality and trade flows is examined by an extended basic model (Equation 4.29).

$$EF_{ft} = \varphi_0 + \varphi_1 PQ_{ft} + \varphi_2 RD_{ft} + \varphi_3 \sum(PQ_{ft} * RD_{ft}) + \acute{\varphi_4} z_{4t} + \mu_i + \lambda_t + e_{i,t} \quad (4.32)$$

Where, $rd_{i,t}$ are research and development activities and $\varphi_3$represent its interconnection term with product quality. This term $\frac{\partial EF_{ft}}{\partial PQ_{ft}} = \varphi_1 + \varphi_3 RD_{ft}$ describes the magnitude and direction of relationship of R&D with export flow and product quality.

4.6.4. The Role of Mediators

Mediation analysis is used to examine the process in which an independent variable influences the dependent variable with the help of a mediating variable (Hayes & Preacher, 2014). The mediators explain both direct and indirect effects on dependent and independent variables. In this study, there are two mediators namely firm's growth and TFP growth which explain the relationship between product quality and trade flow.

4.6.4.1. Role of Firm's Growth in Product Quality and Trade Flows Nexus

The direct and indirect impact of product quality on firms' growth through channel of trade flows is examined by estimating two Equations (3.33 and 3.34). Which take the following form.

$$FG_{ft} = \theta_0 + \theta_1 PQ_{ft} + \acute{\theta_2} z_{5t} + \mu_{1i} + \lambda_t + e_{i,t} \quad (4.33)$$

$$EF_{ft} = \delta_0 + \delta_1 PQ_{ft} + \delta_2 FG_{ft} + \acute{\delta_3} z_{6t} + \mu_{2i} + \lambda_t + e_{i,t} \quad (4.34)$$

where, $\frac{\partial EF_{ft}}{\partial PQ_{ft}} = \delta_1$ shows the direct effect of export flow and quality product and multiplicative term of $\frac{\partial EF_{ft}}{\partial PQ_{ft}} = \frac{\partial FG_{ft}}{\partial PQ_{ft}} \frac{\partial EF_{ft}}{\partial FG_{ft}} = \theta_1 \delta_2$ shown indirect effect through the channel of firm growth.

4.6.4.2. Role of Firm's TFP Growth

The effect of one more mediator is used to examine the relationship between product quality and trade flow. The two Equations 4.35 and 4.36 are estimated to check the effect of TFPG.

$$TFPG_{ft} = \rho_0 + \rho_1 PQ_{ft} + \acute{\rho_2} z_{7t} + \mu_{1i} + \lambda_t + e_{i,t} \quad (4.35)$$

$$EF_{ft} = \tau_0 + \tau_1 PQ_{ft} + \tau_2 TFPG_{ft} + \acute{\tau_4} z_{8t} + \mu_{2i} + \lambda_t + e_{i,t} \quad (4.36)$$

hence, $\frac{\partial EF_{ft}}{\partial PQ_{ft}} = \tau_1$ shows the direct effect of export flow and the quality of a product. while the multiplicative term of $\frac{\partial EF_{ft}}{\partial PQ_{ft}} = \frac{\partial TFPG_{ft}}{\partial PQ_{ft}} \frac{\partial EF_{ft}}{\partial TFPG_{ft}} = \rho_1 \tau_2$ highlights the indirect effect of the TFP growth channel.

Firstly the quality estimates are computed. And by using this estimate, the effect of financial constraints and financial vulnerability is checked. The long panel regression analysis is used for estimating the effect of firm heterogeneity and R&D activities by getting different proxies and variables which helps investigate our research objectives.

The robustness of the results is also checked by using alternative measures of all variables.

4.7. Descriptions of Variables and Data Source

This section of the chapter presents the definition and construction of the variables under consideration:

4.7.1. Product Quality Estimates:

In this study, we have adopted the methodology by Manova and yu (2017) to estimate product quality. It was considered that the utility of consumers' can be maximized through product quantity and product quality. The demand for a good is increasing in quality, increases in aggregate demand, and decreases in the price level and aggregate price index. It suggested that prices of output can reveal all features of product quality. This framework describes the relationship between prices, quality, and profit across both firms and industries level. The firms earn high profits and revenue by producing high-quality products. Firstly, we have constructed an indicator of product quality from data on quantities and prices of export. The following equation is estimated:

$$lnq_{ft} = \sigma lnx_{ft} + lnp_{ft} \quad (4.37)$$

Here q_{ft} stands for product quality, x_{ft} is the export quantity and p_{ft} is the price of a product for a firm f at the time t, where the elasticity of substitution (σ) is set at value $\sigma = 1$ We also take $\sigma = 1$[15].

$$lnq_{ft} = 1 * lnx_{ft} + lnp_{ft} \quad (4.38)$$

[15]This measure of the product quality is constructed for the country China.

This quality proxy is also consistent with the features of CES preferences used in Fan et al. (2015).

4.7.2. Financial Constraints

Financial constraints play an important role in affecting the export product quality (Poncet et al., 2010; Foley & Manova, 2015) and ultimately the trade flow of a country (Bhatti et al., 2013; Choi,2015; Bao et al., 2012)[16]. In literature, many indices are used to measure financial constraints. Such as (KZ (1997), WW(2006), and SA (2010)[17]. The KZ index is from Kaplan and Zingales (1997). In literature, This index is used to check the reliability of externally available finance. The formula of the KZ index is

$$KZ = -1.001909 * \left(\frac{\text{Cash flow}}{\text{capital}}\right) + 0.2826389 * Q + 3.139193 * \left(\frac{\text{debt}}{\text{capital}}\right) - 39.3678 * \left(\frac{\text{dividend}}{\text{capital}}\right) - 1.3147549 * \left(\frac{\text{Cash}}{\text{capital}}\right) \quad (4.39)$$

The second index, the SA index (Hadlock and Pierce 2010) is a combination of the size and age of the firm. The formula of SA index is:

$$SA = -0.737 * \text{size} + 0.043 * \text{size}^2 - 0.040 * \text{age} \quad (4.40)$$

The third index for financial constraints is WW index (Whited and Wu 2006) which is computed as

$$WW = -0.091 * \left(\frac{\text{cashflow}}{\text{Total assets}}\right) - 0.062 * \text{dividend} + 0.021 \left(\frac{\text{long term debt}}{\text{total assets}}\right) - 0.044 * \text{Total assets} + 0.102 * \text{Industry sale growth} - 0.035 * \text{sale growth} \quad (4.41)$$

[16] This study is focused on firm level analysis. So the choice of modertors and mediators is based on their relevancy with firm characteristics.

[17] KZ index based on cash flows, Q, leverage, dividends and cash .WW index based on cash flow, dividend, debt ratio, total assets, industry and firms growth. While SA index based on age and sales of firm.

All of these indices are estimated for the financial constraints. It is investigated that WW index is the most suitable index for the financial constraints of Pakistani firms.

4.7.3 Firm Heterogeneity

Firm heterogeneity is very important to examine the product quality of a firm. The firm heterogeneity is positively related to product quality and trade flow. The firm can expand its sale and exports by improving its product quality and the survival rate of the firm is also increased through learning by exporting. For this purpose, the proxies of firm heterogeneity are taken which are mostly used in literature as size, age, productivity, and leverage of the firm.[18] The most commonly used proxy of firm heterogeneity is size and leverage. In this study, the size of the firm is used to check the heterogeneity of the firm (Helpman et al., 2004; Cole et al., 2010; Qureshi & Yousaf, 2014; Rashid & Waqar, 2017).

4.7.4. Research & Development Activities

Innovation is a main and important factor in economic growth (Yang et al., 2012). R& D expenditure is getting more attention nowadays. The knowledge and adoption of new technologies and techniques are very important elements for the success of a business. A firm that has more R&D investment can improve product quality and export flow. The innovation process is the main factor and it makes a firm more compatible in both domestic and foreign markets. R&D is used for innovation and the transfer of knowledge spills across firms and even countries (Brown et al., 2012; Bento, 2016; Chiu et al., 2017). For this purpose, we have used the proxy R&D expenditures which are intangible assets and patents at the firm level. Intangible assets are defined as assets

[18] It will construct through sales of firm per worker.

which unable to be seen and measured physically. The possible items are Trademarks, Copyrights, Knowledge accounts, Patents, Exploration accounts, Goodwill, and Computer software.

4.7.5. Firm's Growth

A firm with a high growth rate gives more contributions to the development of an economy. The firm growth stated that a company faces more continuous growth than its other competitors. The growth of a firm refers to terms of financial resources, revenue, asset, and market share. If a firm increases its financial resources both domestic and foreign, generates continuous net positive revenue, gets more assets, and widens its share of the market. The growth has both direct and indirect effects but is positively related to product quality and export flow (Gibrat, 1931; Keller and Yeaple, 2003; Greenaway et al., 2007; Bentzen et al., 2012; Zhang,2012; Gupta et al., 2013). This growth rate is calculated as:

$$FG = \frac{\text{Revenue(new)} - \text{Revenue(old)}}{\text{Revenue(old)}} \tag{4.42}$$

4.7.6. Firm's Total Factor Productivity

Total factor productivity is used to measure the efficiency in production by explaining how many levels of output can be produced by a certain amount of inputs. Productivity shows the relationship between inputs and outputs. It is equally divided in the share of inputs. There are two measures of productivity labor and capital.TFP is calculated by dividing output by the weighted average of labor and capital input, taking Cobb Douglas production function where k is capital and l is labor input and y is total product (Khan et al., 2020; Haider et al., 2020).

$$y = A * k^{\alpha} * l^{\beta}$$

$$TFP = \frac{\text{total product}}{\text{a weighted average of inputs}(k, l)}$$

And

$$A = \frac{y}{k^{\alpha} * l^{\beta}}$$

TFP represents an increase in output with the increase in inputs of production. This shows the increase in productivity as inputs labor and capital increase. And the total factor of productivity growth explains the relationship between growth in output, growth in labor, and capital growth.

$$\frac{\Delta y}{y} = \frac{\Delta A}{A} + \alpha\frac{\Delta k}{k} + \beta\frac{\Delta l}{l} \quad (4.43)$$

The TFPG is a good indicator that explains the growth and development at both the country and firm levels (Y. Sheng & Song, 2013; Bhatia & Sharma, 2019; Levine & Warusawitharana, 2019). The TFP can also be affected by the financial condition, firm size, qualification of workers, advanced technologies, ownership, and exporting activities (Bloom et al., 2016; Seker & Saliola, 2018). A firm can be an exporter as the level of growth in TFP increases, as the sale and production level of the firm increases. So TFP has a direct and significant effect on the trading activities of a firm by increasing their sale.

4.7.7.Control Variables

The control variables are similar to the independent variables and are used in regression at the same time. These variables are related to the dependent variable and have some effect on the result of the model. There can arise estimation problems if these variables did not include in the model. Both firm and country-specific variables are there.

i) Trade Flow

Trade flow is the purchases and sales of goods and services between two countries. It measures through the trade balance that is exports – imports of a country. It is the main indicator to check the economic growth and development of an economy. It can also be a more important variable to explain the effect of product quality.

ii) Foreign Direct Investment (FDI)

Foreign direct investment is the investment that is operating the ownership of a business by one country but placed in another country. it is a category of cross-border investment d which functions in one country but is controlled by another country. FDI is the most important element for the development of an economy. It expands the economy by increasing production levels, increasing job opportunities, transfer of advanced technologies, improving managerial skills, and availability of new infrastructure. It is also helpful in determining the trade flow of an economy as capital is moving in and outside of the economy. Foreign direct investment is used to measure the direct investment which flows into an economy. It is the total sum of reinvestment of earnings, equity capital, and other capital which is reflected in the balance of payments. it is categorized in terms of management, transfer of technology, joint venture, and expertise.

iii) Total Assets of Firm

Total assets state the number of assets which is owned by a firm. These Assets have economic value, which can be beneficial for a firm. At the firm level, these assets are recorded in the bookkeeping records and shown in the financial report of the firm at end of the year. It can be calculated as the ratio of current and noncurrent assets to total equities and liabilities. This variable is also important to explain the firm's performance and the estimates of product quality.

4.8. Data Sources

The sample is selected from non-financial firms in Pakistan. These firms are listed on the Pakistan Stock Exchange (PSX). Data is collected to explore the determinants of product quality that affect the trade flows from different data sources. The data on non-financial firms are taken from the reports of Balance Sheet Analysis of Non-Financial Companies of Pakistan which are published by the State Bank of Pakistan (SBP). The data is selected from 2000 to 2018. As this study is focused on the exports of the manufacturing firm, so the financial firms are excluded from the study.

The macroeconomic control 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.

4.9. Estimation Methodology

First, we have applied the Hausman test to check whether the fixed effect model is more suitable than a random effect model. After the collection and construction of different indicators, We have also normalized the data as the unit of measurement is different. We choose the min-max normalization method provided by OECD (2008) which is defined as:

$$I_{norm} = \frac{Value_t - Value_{min}}{Value_{max} - Value_{min}} \quad (4.44)$$

where $Value_t$= value of indicator at time t

$Value_{min}$= Minimum value of an indicator

$Value_{max}$= Maximum value of an indicator

4.7.1. Determinants of Product Quality and The Moderator Effect

To examine the determinants of Product Quality and to explore the moderator effect, the Fixed Effect and Random Effect model is used. The fixed Effect Model explores the relationship between outcome and predictor variables within an entity (person, company, country, etc.). Every entity has its characteristics that may or may not affect the predictor variables. When using FE, it is assumed the effect of predictor and needs to control its effects. Another assumption of the FE model is that the individual has unique time-invariant characteristics. There is no correlation between the error term and the constant of each entity. The the fixed effect is not suitable If the error terms are correlated. This is the main reason for the Hausman test. Consider the regression model

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_i + u_{it}$$

Where the Z_i are time-invariant the entities $i = 1, \ldots\ldots, n$. The main focus to estimate β_1, the effect of a change in X_{it} on Y_{it} by keeping Z_i constant. Taking $\alpha_{i=}\beta_0 + \beta_2 Z_i$, the following model is obtained.

$$Y_{it} = \alpha_i + \beta_1 X_{it} + \beta_2 Z_i + u_{it} \qquad (4.45)$$

Having all intercepts $\alpha_i, i = 1, \ldots\ldots, n$ every entity of i is explained by the fixed effect. So this model is called the *fixed effects model*. The variation in all intercepts α_i taken from the Z_i.

The fixed effects model can be generalized to obtain more than one determinant of Y that is related to X and changes over time.

4.7.2. The Mediation Effect

To check the mediation effect, we have used SUR Model. The seemingly unrelated equations model proposed by sum allows for cross-sectional dependency. It

captures efficiency due to the correlation of disturbances across country-specific equations. The seemingly unrelated equations model is designed to estimate the system of linear equations (with a potentially different set of explanatory variables) and which accounts for the cross-equation correlation of error term. Each equation is a valid linear regression on its own and can be estimated separately, which is why the system is called seemingly unrelated, although some authors suggest that the term seemingly related would be more appropriate since the error terms are assumed to be correlated across the equations. Suppose the data are on each cross-section unit over T periods. Consider the following set of equations:

$y_i = X_i\beta_i + \varepsilon_i$ i=1,2.....M

Conventionally, the two-step estimation includes the following steps

1. Running the OLS regression for the considered system of equations to get consistent and unbiased estimates of the variance-covariance matrix of the error term.

2. Based on the estimates of the variance-covariance matrix of the error term, a standard GLS estimator can be applied[19]:

$$\hat{\beta}^{SUR} = (\grave{X}\hat{\Omega}^{-1}X)^{-1}\grave{X}\hat{\Omega}^{-1}y$$

Note that if the variance-covariance matrix of the error term is diagonal then β^{SUR} will be close to the OLS estimator. In the context of long and narrow panel data, the SUR can be applied to account for potential heterogeneity in the slopes.

[19]Where estimation will be done by using commands in stata from Stata module: Estimation of system regression equations with unbalanced panel data and random effects. Minh Nguyen and Hoa Nguyen. 2010.

The SUR method provides more efficient estimates since it accounts for cross-equation dependence. Cross-equation dependence can be tested with the LM statistic (Breusch & Pagan, 1980):

$$LM = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{i,j}^2$$

Where $\hat{\rho}_{i,j}^2$ is cross-sectional correlation coefficient:

$$\hat{\rho}_{i,j} = \frac{\sum_{t=1}^{T} \hat{\varepsilon}_{it} \hat{\varepsilon}_{jt}}{(\sum_{t=1}^{T} \hat{\varepsilon}_{it})^{\frac{1}{2}} (\sum_{t=1}^{T} \hat{\varepsilon}_{jt})^{\frac{1}{2}}}$$

The LM statistic is valid for fixed N as $T \to \infty$ and is asymptomatically distributed as χ^2 with N (N − 1)/2 degrees of freedom. The commands for analysis will be taken from[20] (Nguyen & Nguyen (2010).

The most commonly used methodology for panel data analysis is the fixed effect (FE) and random effect (RE) models. These models specified the intercept term which is taken as random for RE models and fixed for the FE models. However, the new econometric methods are available for unbalanced panel data which is an estimate of a system of equations. A procedure is developed by Biorn (2004) for the estimation of a Seemingly Unrelated Regression (SUR) model. According to Monte Carlo, the SUR technique is superior to the single equation for FE and RE estimators[21]. This methodology has many advantages as this process controls firm heterogeneity and provides unbiased estimators. Furthermore, these estimates provide enough estimates and more efficient estimators (Biorn, 2004; Baltagi et al., 2005).

[20]Nguyen, M. and Nguyen, H. (2010). Stata Module: estimation of system of regression equations with unbalanced panel data and random effects: Working Paper.

[21] See, Bhatti et al., (2013).

Chapter 5

Results and Discussion

This chapter presents the empirical findings of the study to address the objectives of the study accordingly. The chapter is covered in five sections. The first section (5.1) describes the measurement of product quality at the firm level in Pakistan. The second section (5.2) presents both the endogenous and exogenous determinants of product quality for the non-financial firms listed on the Pakistan Stock Exchange over the period 1999 to 2018. Section (5.3) describes the relationship between product quality and export flow of Pakistan's non-financial firms, whereas section (5.4) discusses the role of moderators in product quality and export flow nexus. Finally, section (5.5) illustrates the role of mediators in product quality and export flow nexus.

5.1. Measurement of Product Quality

Product quality is the collection of features that satisfy consumers' needs (Garvin, 1984). It is a standard set by the customer for his lifestyle. Product quality must fulfill a few attributes like the purpose and use of a product, market value, delivery time, maintenance of high standards, no defective items, and achieving the requirements and satisfaction of the customer play a significant role in improving product quality (H. Lee et al., 2000; Vandenbussche, 2014).

The quality of the product is important for both the firm and the consumer. As far as a firm is concerned, a firm can achieve customer confidence by producing a high-quality product. In addition, a firm can increase sales and therefore capture more market share. However, the firms can achieve product quality by using suitable raw materials,

implementing advanced production technologies, hiring highly qualified, skilled, and trained workers, and utilizing the resources which are used for production (Murphy & Shleifer, 1997; Essaji & Fujiwara, 2012; Fernandes & Paunov, 2013; Brambilla & Porto, 2016). On the other side, the consumer is willing to pay high prices for a high-quality product to achieve satisfaction. Product quality is also important for a firm that supplies its product in international markets. The export product quality is used to improve a country's export flow by generating high revenue from selling its product. The improvement in the export product quality is very necessary for the survival of exporting firms (Eshraghi & Ismail, 2013; Ferro et al., 2015; Chen & Juvenal, 2016).

Product quality measurement is not directly observable in the data, as the attributes are based on qualitative characteristics. Hence, the researchers used different proxies to capture product quality. In existing studies (Bagwell & Riordan, 1991; Thatcher, 2004; Bernard et al., 2007; Alvarez & Fuentes, 2011; Szczygielski & Grabowski, 2012; Tian, 2017), the two commonly used proxies are prices and the unit value of the product. The reviewed studies (Thatcher 2004; Jensen, et al. 2007) have made some justification for the price of a product. For instance, it is argued that it provides relevant and accurate information about the quality. In addition, there is a direct and significant connection between prices and the quality of a 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), Harrigan et al. (2015), etc. However, Benskovkis and Worz Kugler & Verhoogen (2012) highlighted that the CES is a very simple mathematical 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 Comite et al. (2014) by separating the taste effects of product quality.

Most of the studies used the Khandelwhal (2010) approach to estimate product quality due to its simple mathematical form. The basic concept of this approach is that high-quality products lead to high market shares at conditional prices in a given destination. Based on this concept, he measured quality estimates by deriving a demand function that reflected both the vertical and the horizontal characteristics of the goods. This approach represents the quality of exported goods from one country to another country at a certain period. However, the quality estimates can be varied by product, market, industry, country, and year.

In this study, product quality is estimated by following the method of Manova and Yu (2017). They maximize consumers' utility function that depends on product variety, quantity, and product quality. Consumer utility can be increasing with increases in all aspects of product variety, quantity, and quality which implies that output prices can reflect all the aspects of product quality. Hence, this framework explains the relationship between 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). The proxy for product quality is measured as follows.

$$\ln q_{ft} = \sigma \ln x_{ft} + \ln p_{ft} \qquad (5.1)$$

Where q_{ft} is the product quality of firm f at time t, x_{ft} is the export quantity, and p_{ft} is the price of a product for a firm f at the time t, where the elasticity of substitution (σ) is set at value $\sigma = 1$. In this study, the product quality is constructed for the data of China.

Therefore, it is convenient to take the same value $\sigma = 1$ as the features of both countries are almost the same. Substituting the value $\sigma = 1$ in Equation (5.1), we yield,

$$\ln q_{ft} = 1*\ln x_{ft} + \ln p_{ft} \quad (5.2)$$

This quality proxy can also be relevant to the features of CES preferences used in Khandelwal et al. (2013), and Fan et al. (2015). Table 4.1 and figure 4.1 present descriptive statistics and a histogram of our estimated product quality of the non-financial firms, respectively.

Table 5.1: Construction of Product Quality

Number of obs.		6879
Number of Firms		366
Mean		86.5431
Percentile	25th	80.5880
	50th/(Median)	86.2350
	75th	92.2656
St dev	Overall	10.1574
	Between	8.6656
	Within	5.6535
Min	Overall	37.8834
	Between	60.0231
	Within	40.1138
Max	Overall	118.3674
	Between	113.1918
	Within	126.7849
Source: Author's Calculations		

Table 5.1 presents the summary statistics, such as 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. Statistics presented in Table 5.1 show the minimum value of product quality is 37.88, and the maximum value is 118.37. The percentile value presents the range of product quality at three different levels: low, medium, and high, as the product quality at a low level is (80.24), the medium level is (86.24), and the high level is (92.27). The value of standard deviation describes that fewer variations exist in the constructed variable. Figure 5.1 plots the histogram for the product quality which shows the nature of product quality which is estimated for Pakistan's non-financial firms.

Figure 5.1: Histogram of Product Quality

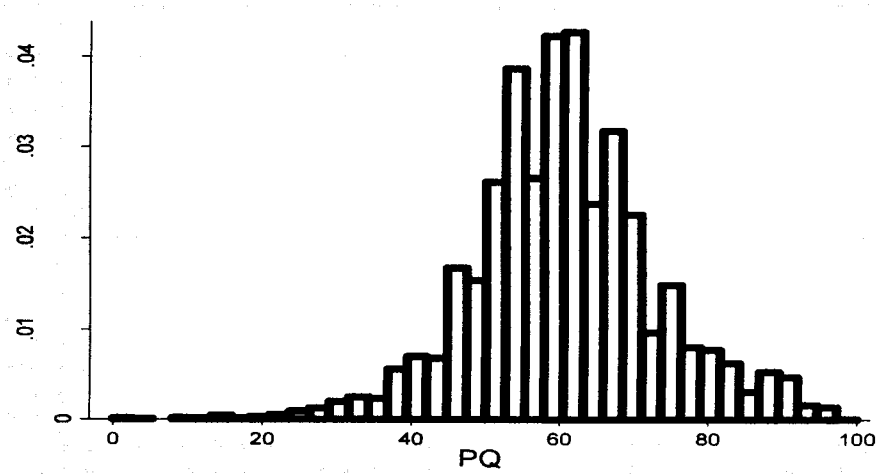


Figure 5.1explains the frequency distribution of constructed product quality at different points of data value. Figure 5.1 indicates that the value of product quality is varied over time across the firm level. The graph shows that product quality is varied for the different sectors and different firms.

5.2. Determinants of Product Quality

Product quality is a parameter that is used to maximize the satisfaction level of consumers by fulfilling their requirements and needs. It plays a significant role on both the consumer and producer sides. Product quality can be determined by different endogenous (firm-specific) as well as exogenous (country-specific) factors. In this section, we plot all the main independent variables of the study and explain the exogenous and endogenous determinants which have a significant influence to confirm product quality. The section is divided into two sub-sections. The first subsection (5.2.1) presents findings of the determinants of product quality at the firm level, whereas the second subsection (5.2.2) reports country-level determinants of product quality. The rationale behind the separate investigation for firm-level and country-level determinants is that they are distinct by nature and characteristics.

5.2.1 Endogenous (Firm-Level) Determinants of Product Quality

We take account of various endogenous variables based on the existing literature. In the first phase, the analysis is approached in graphical representation coupled with descriptive statistics of firm-specific determinants. In the second phase, the regression analysis of the firm-level determinants of product quality has been carried out.

Table 5.2.1 presents the summary statistics of firm-level determinants of product quality. We consider total assets, total factor productivity, leverage, advertising expenditure, performance, sale growth, purchases, and market share as endogenous (firm-level) determinants of product quality. We normalize some variables like PQ_{ft}, TA_{ft}, TFP_{ft}, AEX_{ft}, PUR_{ft}, MS_{ft}, and $SIZE_{ft}$.to standardize the measurement of the unit. This process also reduced their percentile values within the range of 0 and 1.

Table 5.2.1: Summary Statistics of the Endogenous Determinants of PQ

Variables	*No of obs.*	*Mean*	*St Dev.*	*Min*	*Max*	*p25*	*p50/ (Median)*	*p75*
PQ_{ft}	6877	60.4589	12.5936	0	100	53	60	68
TA_{ft}	6783	0.0939	0.0479	0	1	0.08	0.08	0.09
TFP_{ft}	6491	8.5036	1.8300	-1.6197	15.1992	7.3556	8.4720	9.6473
LEV_{ft}	4036	0.3042	46.3437	-13.1237	139.0047	0.0624	0.2042	0.59391
AEX_{ft}	5143	0.0553	0.0554	0	1	0.04	0.04	0.05
$XPER_{ft}$	3244	5.5778	1.0023	-0.9751	7.6324	5.0186	5.7064	6.2960
SG_{ft}	7144	3.5032	2.5707	-100	2.1709	-3.8677	9.5741	24.2958
PUR_{ft}	2179	0.9371	0.5407	0	1	0.0625	0.9371	0.71939
MS_{ft}	7126	0.0264	0.5973	0	1	0.0082	0.0264	0.1025
CF_{ft}	3987	0.0131	19.58212	-683.8571	1165.175	-0.0002	0.0131	0.0951
$SIZE_{ft}$	6880	0.1851	0.4077	0	1	0.6651	0.1851	0.54489

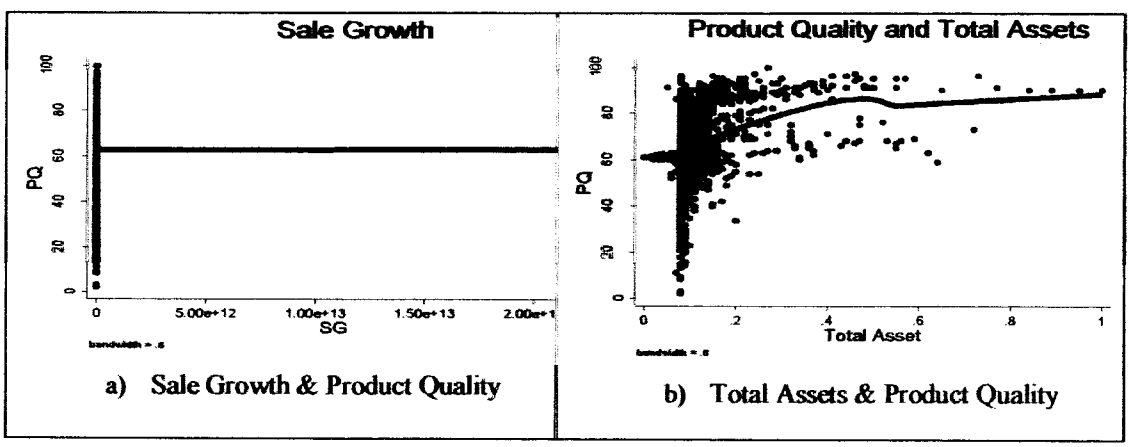
The percentile value describes the level of a variable at low (p25), medium (p50), and high (p75). The value of standard deviation for all variables is minimum except for the leverage ratio which implies that the leverage ratio is a more volatile variable. The remaining statistics have summarized the value of the mean, median, standard deviation, minimum, maximum, and percentile values at 25^{th} , 50^{th} , and 75^{th} levels. Table 5.2.2 provides the correlation matrix of firm-level determinants for product quality. Table 5.2.2 depicts the correlation among determinants of product quality at the firm level. The findings show that PQ_{ft}, TA_{ft}, TFP_{ft}, AEX_{ft}, $XPER_{ft}$, SG_{ft}, PUR_{ft}, MS_{ft}, and $SIZE_{ft}$ are positively related to all other variables except leverage and cash flow which are inversely affected by the remaining variables.

Table 5.2.2: Correlation Matrix of Endogenous Determinants

Variables	PQ_{ft}	TA_{ft}	TFP_{ft}	LEV_{ft}	AEX_{ft}	$XPER_{ft}$	SG_{ft}	PUR_{ft}	MS_{ft}	CF_{ft}	$SIZE_{ft}$
PQ_{ft}	1.0000										
TA_{ft}	0.4516	1.0000									
TFP_{ft}	0.8787	0.3432	1.0000								
LEV_{ft}	-0.1086	-0.0227	-0.0558	1.0000							
AEX_{ft}	0.1983	0.3225	0.1127	-0.0611	1.0000						
$XPER_{ft}$	0.3683	0.6769	0.3057	-0.0456	0.1642	1.0000					
SG_{ft}	0.0254	0.0213	0.0089	-0.0299	0.0992	0.0070	1.0000				
PUR_{ft}	0.3278	0.5518	0.2221	-0.0655	0.1300	0.4043	0.0120	1.0000			
MS_{ft}	0.3600	0.2463	0.2836	0.0256	0.0172	0.0931	0.0101	0.2073	1.0000		
CF_{ft}	-0.0288	-0.0308	-0.0408	-0.0563	-0.0422	0.0488	0.0009	0.2482	0.0191	1.0000	
$SIZE_{ft}$	0.6869	0.5119	0.5988	-0.0032	0.1336	0.4555	0.0165	0.3562	0.4342	0.0064	1.0000

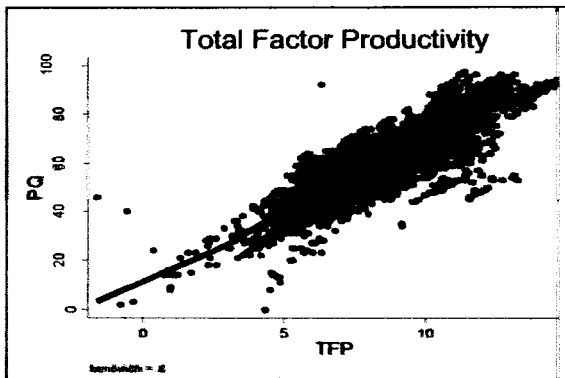
After presenting the descriptive analysis of firm-level determinants, the upcoming discussion is about the graphical analysis of endogenous determinants. Figure 5.2 plots the endogenous determinants of product quality. In all figures, we have different endogenous determinants on the horizontal axis, while the vertical axis labels product quality.

Figure 5.2: Scatter Plots for Endogenous Determinants of Product Quality

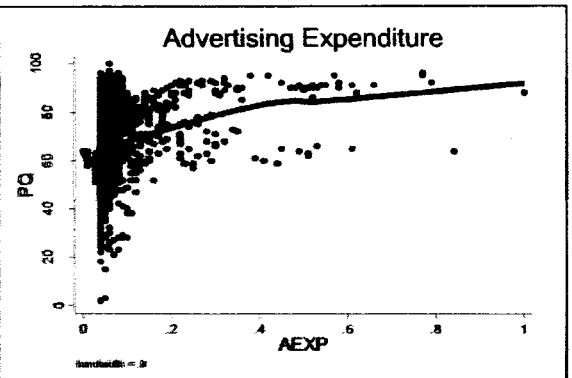


a) Sale Growth & Product Quality

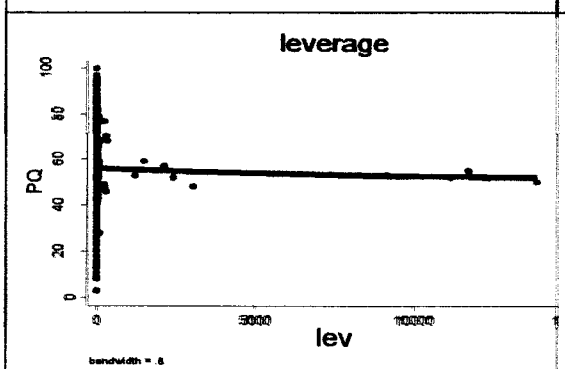
b) Total Assets & Product Quality



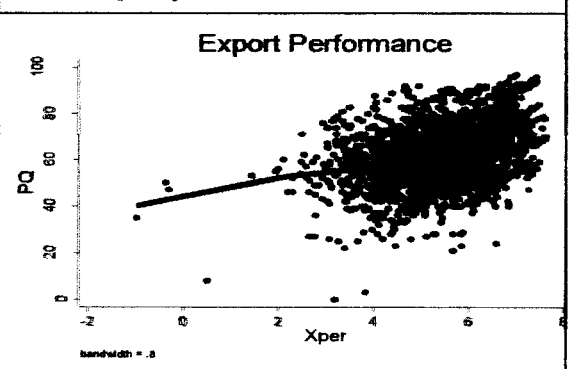
c) Total Factor Productivity& Product Quality



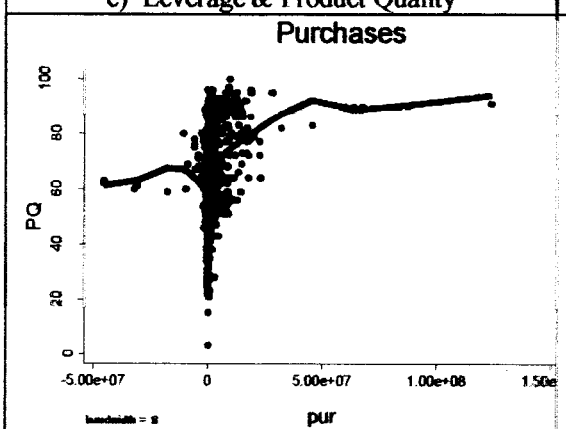
d) Advertising Expenditures &Product Quality



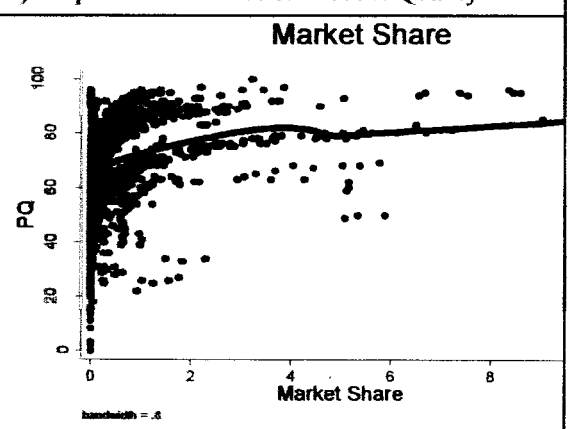
e) Leverage & Product Quality



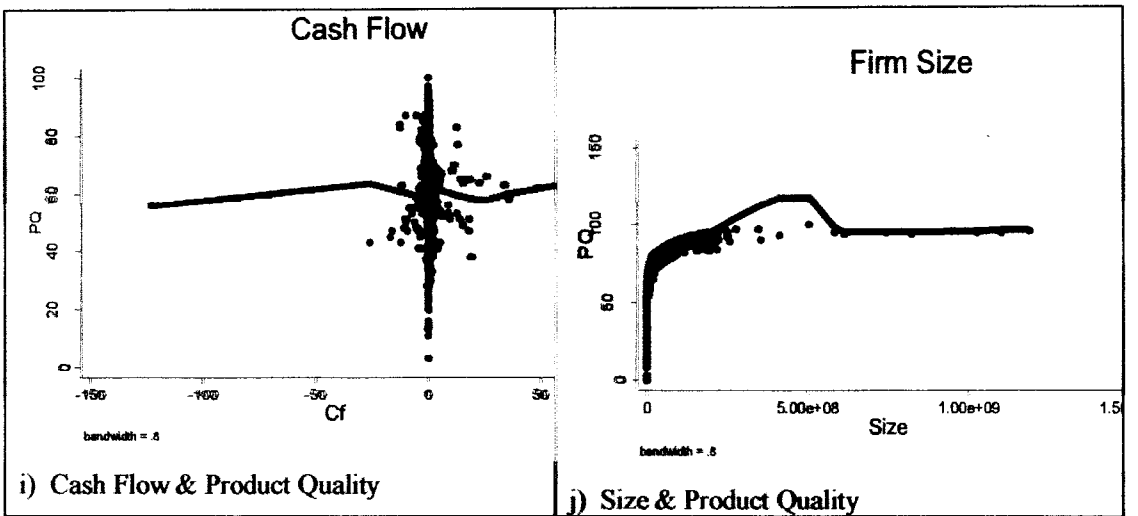
f) Export Performance & Product Quality



g) Purchases & Product Quality



h) Market Share & Product Quality



i) Cash Flow & Product Quality

j) Size & Product Quality

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

Panel (a) shows that sales growth has no definite relation to product quality. The reason for that is a higher sales growth does not necessarily mean the product quality is ensured as indicated by Curzi & Olper (2012). Panel (b) indicates a positive correlation between the total assets of the firms and product quality. The larger the total assets the more would be the net worth of the firm is enhanced and the higher would be the capability of the firm to allocate more resources to the R & D activities (Anwar & Sun, 2018). Panel (c) explains the positive and parallel movement of the total factor of productivity and product quality. The reason is obvious the higher the TFP higher would be the product quality. As they indicated that such productive factors of production are engaged in producing a good quality product. Similarly, panel (d) provides the positive relationship of a firm's advertising expenditure with its product quality. If a firm spends more resources on advertising its sale, ultimately improve product quality. as firms put more focus on achieving high-quality products (Khanna & Sharma, 2018). Panel (e) depicts the negative correlation of leverage to product quality. The relationship should be

justified by the debt burden of the firm. As the debt burden puts pressure on the firm's expenses. Hence to pay back the debt, the firm reduces expenditures on the R&D activities that in turn pose a negative relationship with the quality of the product (Bellone et al., 2010). Panel (f) shows that there is a positive relationship exists between export performance and product quality. The firm has better export performance and therefore competes with international standards. This suggests that firms pay more attention to enhancing product quality for survival in foreign markets (Can et al., 2020). The rest of the panels: (g), (h), (i), and (j) show that there is no exact correlation exists between MS_{ft}, $SIZE_{ft}$, CF_{ft}, and PUR_{ft} of the firm with product quality respectively. The reason might be that Pakistan's firms are not enough efficient to capture the market share (MS_{ft}) both at the domestic and foreign levels. There are very few measures are taken to increase the size ($SIZE_{ft}$) of the firm. The Pakistani firms are not enough efficient to manage the out and inflows of cash (CF_{ft}) available for business purposes. The purchases (PUR_{ft}) of the firm are more than the sales, so the business of the firm is negatively effects. Hence there is no significant relationship exists between the size, market share, purchases, and cash flow of a firm to product quality.

After descriptive and graphical analysis, we conduct a regression-based analysis of the endogenous determinants of product quality. An important driving factor of product quality is the firm size (Brooks, 2006; Curzi & Olper, 2012; Brambilla & Porto, 2016), total assets (Brooks, 2006; Anwar & Sun, 2018), market share (Castillejo et al., 2006; Essaji & Fujiwara, 2012; Fan et al., 2015), productivity (Zailani et al., 2007; Fang et al., 2019; Shen et al., 2020; Demir & Hu, 2020), leverage (Bellone et al., 2010; Minetti & Zhu, 2011), advertising expenditures (Hall & Mairesse, 1995; Anderton, 1999), export

performance (Zhu & Fu, 2013; Flach, 2016), sale growth (Curzi & Olper, 2012) and cash flow (Bernini et al., 2015), purchases (Colantone & Crino, 2014). In this section, we examine the endogenous determinants of product quality.

We used a fixed-effect model after applying the diagnostic test[22]. When we apply the Hausman test, it is decided that the fixed effect model is a more suitable estimation technique for our analysis. Results for the final model exploring endogenous determinants of the product quality as mentioned in methodology by (Equation 4.29) are reported in Table 5.2.3. Column 2 of the table presents the estimated values of our fixed effect general model that includes all determinants at the firm level. After analysis, a few determinants such as market share, firm size, purchases, and cash flow of the 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_{ft}), total factor of productivity (TFP_{ft}), advertising expenditure (AEX_{ft}), leverage (LEV_{ft}), export performance ($XPER_{ft}$), and sale growth (SG_{ft}) are highlighted in a specific model. The estimated results are presented in column 3.

The total asset (TA_{ft}) of a firm enters the model positively which is statistically significant. Findings indicate that the more the total assets of a firm held higher would be the product quality. The coefficient of total assets indicates that a one-unit increase in total assets increases product quality by 29.16 units. The total assets are the wealth of the firm, if the assets of firms are more then the firm can spend more expenditure on research and development activities to improve the quality of its product. Our results are

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

consistent with the results of Brooks (2006) and Anwar & Sun (2018) who argued about the positive relationship between total assets and product quality. According to their findings, 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.

Table 5.2.3: Estimates of Firm's Endogenous Determinants of Product Quality

	Estimated Results of Fixed Effect Model	
Variables	**General Model**	**Specific Model**
TA_{ft}	38.7329** (0.011)	29.1608** (0.018)
LEV_{ft}	-3.5048*** (0.000)	-4.3725*** (0.000)
TFP_{ft}	5.5864*** (0.000)	5.7556*** (0.000)
AEX_{ft}	9.9807** (0.033)	13.2283*** (0.002)
SG_{ft}	3.1206** (0.016)	3.5806*** (0.000)
$XPER_{ft}$	(0.8866)*** (0.000)	0.8721*** (0.000)
PUR_{ft}	-1.0407 (0.167)	----
MS_{ft}	0.0832 (0.771)	----
CF_{ft}	-0.1177 (0.866)	----
$SIZE_{ft}$	1.3908 (0.237)	----
Cons.	9.8495** (0.024)	5.6567** (0.007)
Obs.	1345	1345
R-Squared	0.86	0.83
No. of firms	222	222
F.Stat.	56.9092*** (0.000)	53.0321*** (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 parentheses.

Leverage (LEV_{ft}) is the second endogenous determinant that can affect product quality. Our findings indicate a negative and significant effect of leverage on product quality. The estimated coefficient shows that one unit increase in leverage ratio decreases the product quality by 4.37 units. Leverage is the amount of debt that a firm used to finance its assets, which is an investment plan using borrowed money and borrowed capital. High financial leverage means a firm has a high debt to equity ratio that can reduce the firm profit. The high debt-to-equity ratio 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 & Wang (2010) which explain that high leverage puts a burden on the expenditures of the firm. Hence, ultimately firm covers the expenditures instead of the improvement of product quality.

The total factor of productivity (TFP_{ft}) is the third endogenous determinant of product quality for a firm.TFP holds a positive sign that is statistically significant. The coefficient of TFP indicates that a 1 unit increase in TFP increases the product quality by 5.76 units. Existing studies on the subject argued that TFP is the most feasible way for firms to improve their product quality. Our findings indicate a positive and significant influence of TFP on a firm's product quality. Our results are consistent with the study of Fan et al. (2018) and Demir & Hu (2020) which came with findings that an increase in the productivity of a firm leads to high profitability, and hence, an increased likelihood of a firm entering the international market.

Advertising expenditure (AEX_{ft}) is the fourth factor that affects a firm's product quality. Our results show that theAEX_{ft} has a positive and statistically significant impact

on product quality. The coefficient of advertising expenditure indicates that a 1 unit increase in advertising expenditure increases product quality by 13.28 units. 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 items that meet international standards. These firms can easily produce high-quality products. Our result is consistent with the study of Khanna & Sharma (2018) which explains more expenditure on advertising products can use in the promotion of product quality.

The sale growth (SG_{fi}) is the fifth endogenous determinant that can affect the product quality of a firm. Our findings show that sales growth poses positive and significant effects on the product quality of a firm. The coefficient of the firm's sales shows that one unit increase in sales causes an increase in product quality by 3.58 units. The firm's sale plays an important role in affecting product quality. 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 & Porto (2016) which describes the increase in sales growth of a firm indicating that a firm can produce good quality product .on the other side, high-quality product also affects the sales growth of the firm.

Export performance ($XPER_{fi}$) is the sixth factor that can affect product quality. Our results show that XPER is a progressive and significant determinant of product quality for a firm. The coefficient of export performance indicates that a one-unit increase in the performance of export leads to an increase firm's product quality by 0.87 units. The one possible justification is if a firm involved in exporting activities can affect

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. Due to the high survival rate, they have to supply high-quality products. Our results are in favor of the studies of Lee & Choi (2015) and Manova & 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_{ft}), market share (MS_{ft}), cash flow (CF_{ft}), and size of the firm ($SIZE_{ft}$) 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 negative effect on product quality. Similarly, in the case of Pakistan, cash flow 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 product quality. All of these variables are excluded from the analysis due to the insignificant impact on product quality.

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

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

Product quality is not only subjected to firm characteristics but also country-level factors pose its impact. In this section, we have examined exogenous determinants which affect the product quality of a firm. Our preliminary analysis is based on two sub-section: descriptive statistics and graphical analysis. Afterward, we describe the regression analysis of the country-level (exogenous) determinants of product quality. Table 5.2.4 explains the summary statistics of exogenous determinants of product quality.

Table: 5.2.4: Summary Statistics of Exogenous Determinants of Firm's PQ

Variables	*No of obs.*	*Mean*	*St Dev.*	*Min*	*Max*	*p25*	*p50/ (Median)*	*p75*
PQ_{ft}	6877	60.4589	12.5936	0	100	53	60	68
TF_t	7380	30.4745	3.189314	25.30623	35.6817	27.6304	31.4856	32.9049
$LGDP_t$	7380	30.0818	0.7516	28.70888	31.1753	29.3842	30.1033	30.7983
RD_t	7380	0.3189	0.1970	0.0300	0.7700	0.14835	0.28142	0.4443
RIR_t	7380	1.2626	4.140713	-5.0800	8.321459	-2.5127	1.541173	4.44
$REER_t$	7380	10.6576	7.005815	6.48814	21.4732	9.4166	10.3806	27.6745
POP_t	7380	2.2674	0.1912	2.05588	2.7700	2.0961	2.2466	2.325
WR_t	7380	38.3245	1.8781	35.2500	42.9600	36.9950	38.42	39.77
TR_t	7380	15.695	4.348501	12.1200	26.4100	13.0450	13.445	17.23
LF_t	7380	52.0725	1.535684	50.0100	54.6800	50.6350	52.045	53.455

Table 5.2.4 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. The percentile value describes the level of variables at low (p25), medium (p50), and high (p75) levels which can be helpful for further analysis. The value of standard deviation for all variables is minimum which means that there is less variation in the variable. Table 5.2.5 explains the nature of the correlation between macro determinants of product quality. Table 5.2.5 presents the

correlation among exogenous determinants of product quality at the country level. The findings show that all variables like PQ_{ft}, TF_t, $LGDP_t$, RD_t, RIR_t, $REER_t$, WR_t, and LF_t are positively correlated to all other variables except POP_t, and TR_t which are inversely affected by the remaining variables for Pakistani non-financial firms.

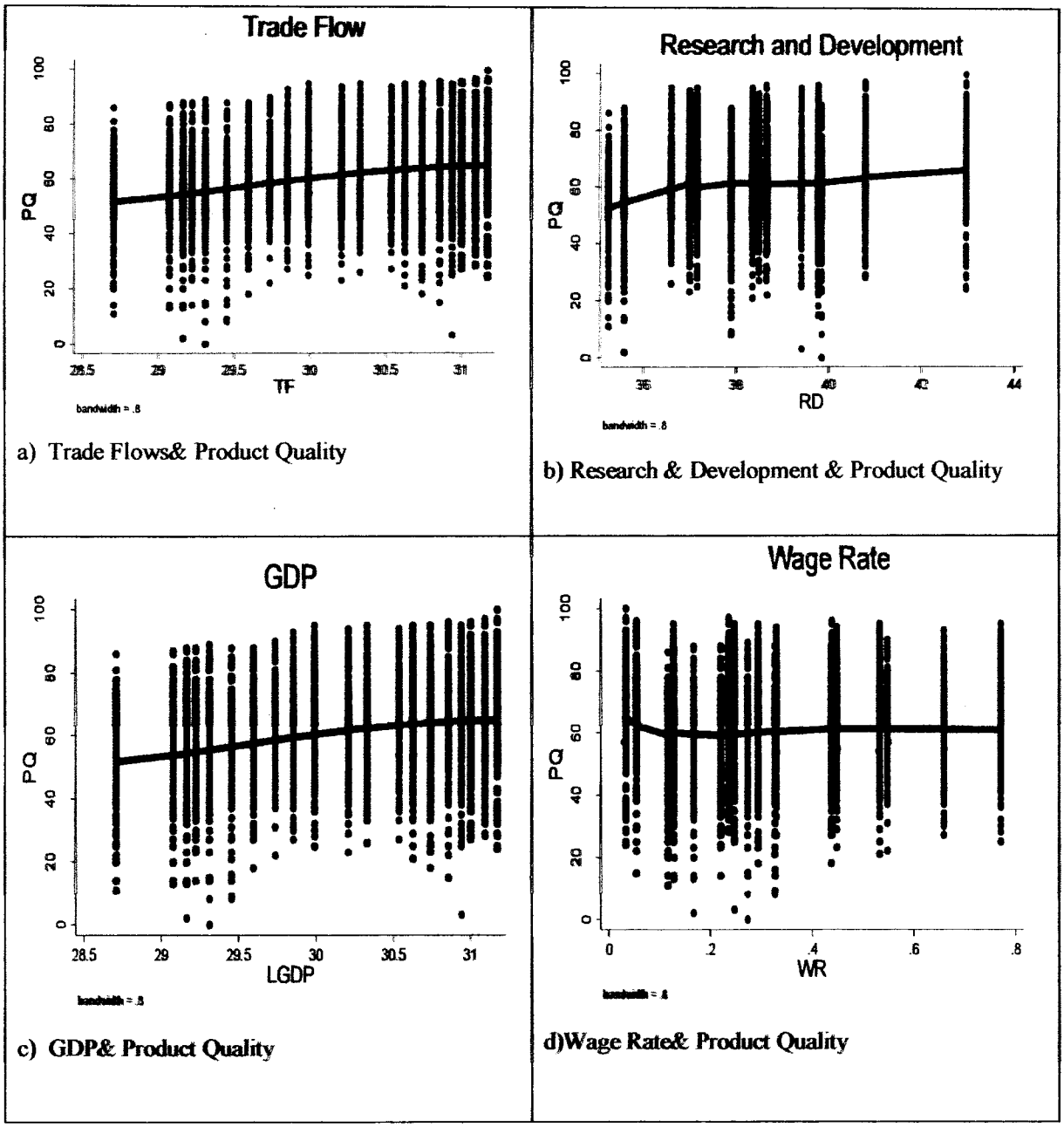
Table 5.2.5: Correlation Matrix of Exogenous Determinants of Firm's PQ

Variables	PQ_{ft}	TF_t	$LGDP_t$	RD_t	RIR_t	$REER_t$	POP_t	WR_t	TR_t	LF_t
PQ_{ft}	1.0000									
TF_t	0.0526	1.0000								
$LGDP_t$	0.3487	-0.0442	1.0000							
RD_t	0.0369	0.5025	-0.0195	1.0000						
RIR_t	0.2448	-0.0820	0.7218	0.1101	1.0000					
$REER_t$	0.1227	-0.5500	0.4662	-0.2543	0.4742	1.0000				
POP_t	-0.3313	-0.0632	-0.9318	-0.1451	-0.7282	-0.2479	1.0000			
WR_t	0.1858	-0.1757	0.6048	-0.1404	0.6290	0.3204	-0.6681	1.0000		
TR_t	-0.3018	-0.3524	-0.7836	-0.4134	-0.5807	0.0066	0.9179	-0.4868	1.0000	
LF_t	0.0421	-0.6495	0.2671	-0.6937	0.1917	0.7114	0.0215	0.2651	0.3642	1.0000

After presenting the descriptive analysis of firm-specific determinants, we explain the graphical analysis of firm-level determinants. Figure 5.2 plots the endogenous determinants of product quality. On the horizontal axis, we have different exogenous determinants while the product quality is taken on the vertical axis.

These scatter plots show the relationship between a firm's product quality and exogenous factors namely: trade flow, GDP, R&D expenditure, wage rate, real effective exchange rate, real interest rate, population, tariff rate, and labor force. Panel (a) shows a positive correlation between trade flow and product quality which reveals that good trading activities can enhance a firm's profitability that in turn improve its product quality (Hu & Lin, 2016).

Figure 5.2. Scatter Plots for Exogeneous Determinants of Firm's Product Quality

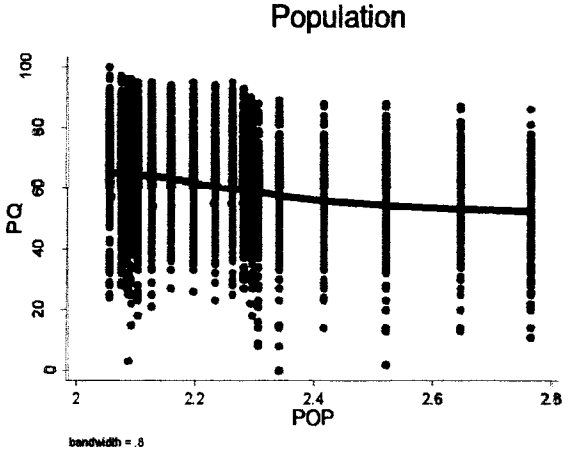


a) Trade Flows& Product Quality

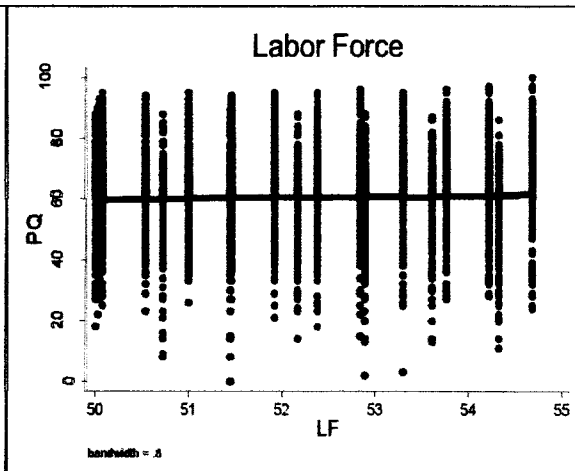
b) Research & Development & Product Quality

c) GDP& Product Quality

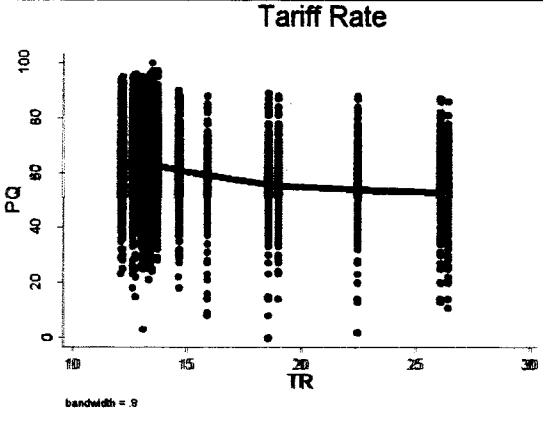
d)Wage Rate& Product Quality



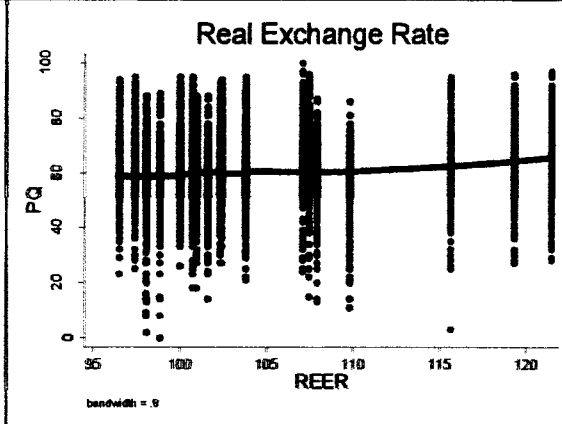
e) Population& Product Quality



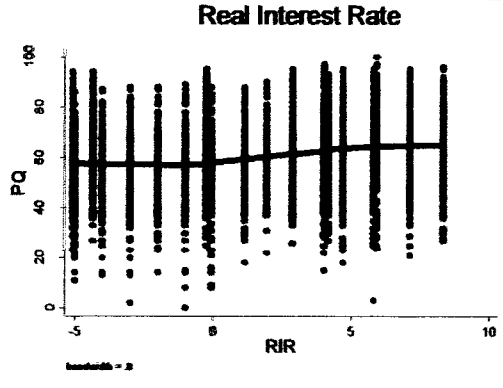
f) Labor Force& Product Quality



g) Tariff Rate & Product Quality



h) Exchange Rate & Product Quality



i) Real Interest Rate& Product Quality

Panel (b) presents the positive effect of R&D activities on product quality. This may be due to the reason that the R&D activities introduce advanced production technologies which improve the efficiency of the firm by producing a high-quality product as indicated by Faruq (2011). Panel (c) presents a positive relationship between GDP and product quality, which indicates that the high GDP level of a country has a positive relationship with product quality. The GDP level reflects the income of a nation; if income is high the country can spend more finances on promoting product quality. Hence, a country with high GDP can bear high costs related to high product quality (Sheikh & Wang, 2010). Panel (d) explains the negative relationship between product quality and wage rate. The high wage rate means that there is a high cost of production. And the high cost of production restricts the firm to produce high-quality products because good product quality is also associated with a high cost of the improvement (Hallak & Sivadasan, 2013). The remaining panels: (e), (f), (g), (h), and (i) indicate that there is no economical and statistically significant relationship between POP_t, LF_t, TR_t, POP_t, $REER_t$, RIR_t is shown with product quality. The reason might be that a high population rate (POP_t) leads to an increase in the consumption level. In this situation, the firms in Pakistan put more focus on quantity instead of the quality of the product. Furthermore, the labor force (LF_t) of Pakistan is also not efficient to produce quality goods. The tariff rate (TR_t) is also not implemented in its full context in Pakistan, therefore it does not affect product quality. The exchange rate ($REER_t$) always deteriorates in the case of Pakistan. The value of the Rupee declining over time. Devalue of Rupee does not affect product quality. The economic and political situation of Pakistan discourages foreign and domestic investors

to invest in Pakistan. Hence interest rate (RIR_t) is also not affecting the quality of the product.

After descriptive and graphical analysis, we conduct a regression-based analysis for exogenous (country-level) determinants of product quality. The important exogenous determinants are exchange rate (Kneller & Yu, 2016), real interest rate (Dennis & Shepherd, 2011), GDP ((Sheikh & Wang, 2010), and wage rate (Essaji & Fujiwara, 2012). Tariff rate (Fan et al., 2018), trade balance (Hu & Lin, 2016), the labor force (Flach, 2016; Brambilla & Porto, 2016), R&D (Faruq, 2011), and population growth (Szczygielski & Grabowski, 2012). 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. We used a fixed-effect model after applying the diagnostic test[23]. When we apply the Hausman test, it is decided that the fixed effect model is a more suitable estimation technique for our analysis. Following table 5.2.6 presents the estimated result of our empirical model (Equation 4.29) that explores exogenous determinants of product quality.

First, we estimate 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.

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

Consequently, the country-level determinants GDP, trade flow, R&D, and wage rate are highlighted in our specific model.

Table 5.2.6.Estimates of Exogenous Determinants of Firm's Product Quality

Variables	*General Model*	*Specific Model*
TF_t	0.1828*** (0.000)	0.2238*** (0.000)
$LGDP_t$	7.3227*** (0.000)	0.2254*** (0.000)
RD_t	0.4685** (0.017)	0.6402** (0.008)
WR_t	-0.0851** (0.099)	-0.1552*** (0.000)
$REER_t$	-0.0135 (0.320)	----
RIR_t	0.0125 (0.377)	----
POP_t	3.2201 (0.229)	----
TR_t	0.0558 (0.350)	----
LF_t	-0.2969 (0.266)	----
Cons.	-155.26*** (0.000)	-129.037*** (0.000)
Obs.	6,877	6,877
R-Squared	0.4071	0.4071
No of firms	365	365
F.Stat.	62.94*** (0.000)	112.96*** (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 ***, **, and * respectively. P-values of individual coefficients are presented in parentheses.

The Gross Domestic Product (GDP_t) is the first determinant of product quality, which is a major and most important economic indicator. Our findings indicate that GDP

has a positive and significant effect on product quality. The estimated coefficient shows that a one-unit increase in GDP increases product quality by 0.23 units. Our results show the same argument that an increase in GDP causes an improving product quality. The graphical and descriptive analysis also supports this argument that GDP has a positive impact on product quality. It gives the signal of economic growth and development that the economy grows in the right direction. So, researchers put more focus on the behavior of GDP while examining any economic situation. If the economy grows quickly, it means that the GDP level is high in that economy. The good economic condition encourages producers to produce high-quality products. Our results are consistent with the study of Sheikh & Wang (2010) and Kneller & Yu (2016). Hence, high GDP indicates that the economy grows rapidly and producers are motivated to produce high-quality products and export them to developed countries.

Next, the trade flow (TF_t) is the second factor that affects product quality. The result of our study shows that trade flow has a positive and significant effect on product quality. The coefficient of trade flow explains that the one-unit increase in trading activity increases the product quality by 0.22 units. This result is also supported by graphical and descriptive analysis which suggests a positive relationship with trade flow. It can refer to the growth of the economy. More trade flows mean more knowledge and technology are 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. If a country is integrating with the rest of the world, they have to export high-quality products. The firm involves in these trading activities, can improve the product quality to meet the standards of international markets. Our results are in line with the findings of

Calantone & Knight (2000), Johnson (2012), and Saudi et al. (2019), which argue for a positive effect of trade flow on product quality.

The next determinant of product quality at the country level is research and development activities (RD_t). our findings reveal that product quality increase with an increase in R&D activities as it enters the model positively and statistically significant. The coefficient of RD_tshows that a one-unit increase in R&D activities increases the product quality by 0.64 units. This regression analysis supports the graphical and descriptive analysis which also explains the positive relationship between R&D activities. 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 improves their sale and product quality. More research and development activities motivated both the country and the firm to enhance its sale by producing high-quality products. Moreover, such countries 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 & Ismail (2013) which stated that R&D activities help improve product quality.

Finally, the wage rate (WR_t) enters the model with a negative sign which is statistically significant and suggests that there is a negative but significant relationship between wage rate and product quality. The coefficient of WR_tshows that a one-unit increase in wage rate decreases the product quality by 0.15 units. The high wage rate 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 & 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, and labor force which are excluded for a specific model. All these variables are economically significant but statistically insignificant except labor force and interest rate which are economically and statistically significant. The economic significance means that the expected sign of these variables is in line with economic theory. The high population (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, and 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.

5.3. Product Quality and Trade flow

As one objective of the study is to examine the relationship between product quality and export flow. As export product quality is a crucial topic in international trade.

Product quality can be improved by adopting advanced technologies. Product quality plays an important role in determining the exporting activities of a country. A country can only enjoy the benefits of international trade by exporting high-quality products. high product quality can increase sales in the international market by getting the confidence of old customers and attracting new customers. Table 5.3.1 shows the summary statistics of product quality and export flow.

Table 5.3.1: Summary Statistics of Product Quality and Export Flow

Variables	*No of obs.*	*Mean*	*St Dev.*	*Min*	*Max*	*p25*	*p50/ (Median)*	*p75*
PQ_{ft}	6877	60.4589	12.5936	0	100	53	60	68
SAL_{ft}	6880	111.9242	40.6897	141.7890	1311.9070	66.5182	185.1847	544.8915
LS_{ft}	6820	113.2407	53.4540	0	1111.9270	53.1531	144.0252	438.1621
ES_{ft}	3195	205.5074	43.0501	0.0015	929.0334	54.7651	508.1360	997.1907
FDI_t	7380	-19.1405	14.8651	-54.9200	-297.0000	-23.5550	-17.0300	-78.8500
TF_t	5535	5.9071	2.0510	1.63	8.6808	4.4775	5.9725	7.9791
TA_{ft}	6783	9.3977	4.7903	0	100	8	8	9

Table 5.3.1 gives us the summary statistics as the number of observations, mean, median, minimum value, and maximum value. The percentile values at the 25^{th}, 50^{th}, and 75^{th} levels indicate the low, medium, and high values of variables. The percentile value can be useful for further analysis. The value of the standard variable is low which shows there is less variation in all variables except export sales, local sales, and total sales. Here. PQ_{ft}, SAL_{ft}, LS_{ft}, and$ES_{ft}$are product quality, total sales, local sales, and export sales respectively. However, there are two country-level control variables are used: foreign direct investment (FDI_{ft})and Trade flow (TF_t), and one control variable from the firm level is used which is a total asset (TA_{ft}). In table 5.3.2, a correlation matrix between export flow and product quality is provided.

Table 5.3.2: Correlation Matrix of Export Flows and Product Quality

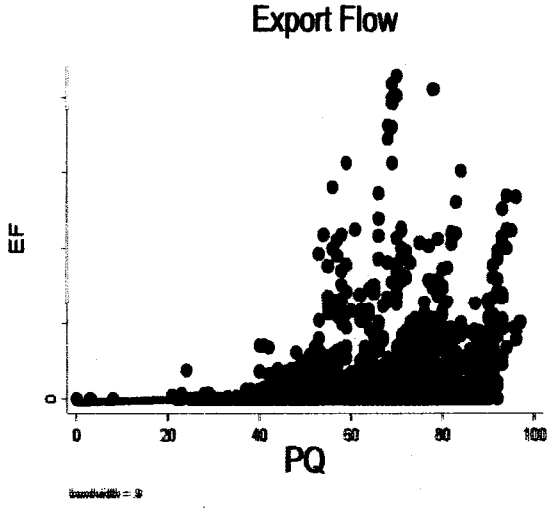
Variables	PQ_{ft}	SAL_{ft}	LS_{ft}	ES_{ft}	FDI_t	TF_t	TA_{ft}
PQ_{ft}	1.0000						
SAL_{ft}	0.6393	1.0000					
LS_{ft}	0.4679	0.5964	1.0000				
ES_{ft}	0.3162	0.2978	0.3833	1.0000			
FDI_t	0.0021	0.0184	0.0185	0.0403	1.0000		
TF_t	0.0126	0.0262	-0.0501	0.0158	0.4452	1.0000	
TA_{ft}	0.4291	0.5123	0.6664	0.4590	0.0034	0.0753	1.0000

Table 5.3.2. presents the correlation between all types of sales with product quality. The findings show that all variables like PQ_{ft}, SAL_{ft}, LS_{ft}, ES_{ft}, FDI_{ft}, TF_{ft}, and TA_{ft} are positively related to all other variables except the correlation of LS_{ft}andTF_{ft}. the correlation between trade flow and local is negative which means that the correlation matrix does not support this relationship.

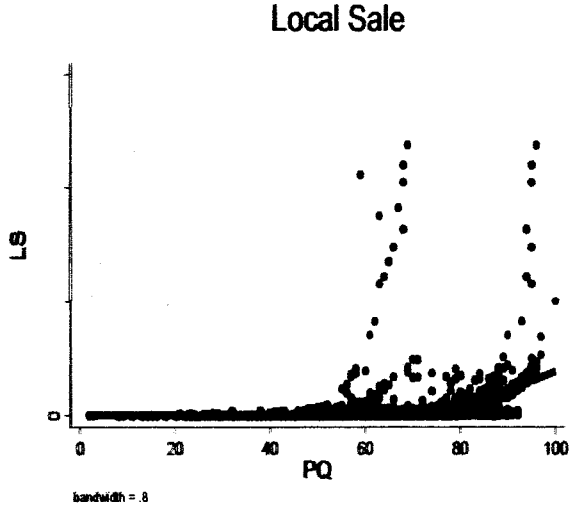
After presenting the descriptive analysis of export flow, we explain the graphical analysis of all types of sales with product quality. The graphical analysis is conducted by plotting the scatter diagram. Figure 5.3.1 plots the local sale, export sales, and total sales with product quality. On the horizontal axis, we have a different level of sale at the firm level while the product quality is taken on the vertical axis.

Panel (a) shows that there is a positive and significant relationship between export sales and product quality which implies that product quality is improving with an increase in export. Similarly, Panel (b) depicts a relationship between local sales and product quality, which is positive. If the high-quality product is available in the local market, then domestic customers are more likely to purchase that item.

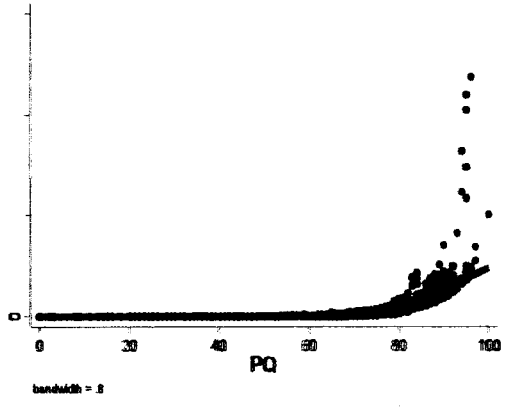
Figure 5.3.1: Scatter Plots for Product Quality and Different type of Sales



a)Product Quality and Export Sale



b)Product Quality and Local Sale



c) Product Quality and Total Sale

Note: The figure shows the relationship between product quality export sales, local sales, and total sales.

Panel (c) indicates the positive link between total sales and product quality. The product quality also affects the total sale as well as local and export sales. The high product quality has also a positive effect on the level of total sales. Good quality products

are more demanded and ultimately increase the sales of the firm. After descriptive and graphical analysis, so now we have estimated the relationship of product quality with all sales of firms.

Following the existing literature, we take a few firm-specific control variables like firm size (Naslmosavi & Jahanzeb, 2016), total assets (Anwar & Sun, 2018), TFP (Demir & Hu, 2020), Return on assets (Brooks, 2006), R&D activities (Johnson, 2012). We further consider some country-level control variables, such as FDI (Sheikh & Wang, 2010), R&D expenditures (Faruq, 2011), trade flow (Dennis & Shepherd, 2011), investment (Bernini et al., 2015), and GDP (Lee & Hwang, 2003; Lee & Choi, 2015).

After the screening, only two macro-control variables namely: FDI and trade flow, and only one micro-control variable that total assets are considered for analysis. All statistically insignificant variables are excluded sequentially. The estimation was carried out with a fixed-effect model using the Hausman test[24]. Table 5.3.1 presents the estimated results of our empirical model (Equation 4.29) whereas the dependent variable is different types of sales.

Our results indicate that there is a positive link between product quality and export, local and total sales. The results for export sales are presented in column (1) which shows that there is a positive relationship between export sales and product quality. The estimated results indicate that a firm can increase its sale with an increase in its product quality. So, it is also helpful in generating positive revenue and profit at the firm level. In an open side economy, the firm can enter a foreign market and compete with international standards by producing high-quality products. It means that product quality is not only

[24] Hausman test statistics (22.78) with p value(0.000) decided the Fixed Effect Model is applicable technique.

important for domestic sales as well as for export sales. Hence, high product quality leads to an increase in local sales, export sales, and ultimately in total sales.

Table 5.3.3: The Relationship between Product Quality and All Types of Sales

Variables	ES_{ft} Model (1)	LS_{ft} Model (2)	TS_{ft} Model (3)
PQ_{ft}	11.5412*** (0.000)	5.2741** (0.046)	10.8864*** (0.000)
FDI_t	0.0212*** (0.000)	0.0432** (0.009)	0.0672*** (0.000)
TA_{ft}	9.6372*** (0.005)	4.1309* (0.059)	14.3116** (0.010)
TF_t	8.1253*** (0.000)	4.5380 (0.277)	6.5227 (0.655)
Const.	-138.112*** (0.000)	-68.4402*** (0.000)	-66.6321*** (0.000)
Obs.	3101	6601	6659
R – Squared	0.24	0.24	0.26
No. of Firms	258	360	360
F. Stat.	17.62*** (0.000)	27.11*** (0.000)	20.47*** (0.000)

Note: Where ES_{ft} is used for export sales, LS_{ft} is for local sales, and TS_{ft} is for the total sale. Significance at 1, 5, and 10 percent are denoted by ***, **, and * respectively. P-values of individual coefficients are presented in parentheses.

The coefficient of PQ explains that a one-unit increase in product quality increases the export sale by 1.5 units. Our results are consistent with the studies of Hummels & Klenow (2005), Verhoogen (2008), Can et al. (2020), and Fang et al.

(2019)which investigated the positive correlation between export flow and product quality.

The control variables FDI_t, TF_t, and TA_{ft} also have a positive and significant effect on export flow. The estimated coefficient of FDI states that a one-unit increase in FDI increases the export sale by 0.02 units. as the FDI of an economy increases its means foreign investors are more interested to invest in our country. This can boost local and foreign businesses by providing better opportunities which ultimately increase production and sale at both domestic and foreign levels. The examined coefficient of TF indicates that a one-unit increase in trade flow leads to an increase in export sales by 8.12 units. Trade flow is based on two types of transactions that is export and import. If the export flow of a country increases it will ultimately enhance the trade flow. Similarly, the coefficient of TA explains that a one-unit increase in total assets increases the export sale by 9.63 units. As the total assets of the firm increase, it will increase the sale at the domestic and foreign levels. Hence the export flow of a country can also increase.

The results for local sales are given in column (2) which indicates there is a positive relationship between local sales and product quality. The estimated coefficient of PQ indicates that a one-unit increase in product quality increases the local sale by 5.27 units. The control variables for local sales are also positive and significant. The coefficient of FDI indicates that a one-unit increase in foreign direct investment increases the local sale by 0.0432 units. The coefficients of TF suggest that a one-unit increase in trade flow leads to an increase in local sales by 4.53 units. Similarly, the coefficient of TA indicates that a one-unit increase in total assets increases the local sale by 4.13 units.

The results for total sales are given in column (3) which highlighted the positive relationship between total sales and product quality. The estimated coefficient of PQ indicates that total sale increases by 10.88 units with a one-unit increase in product quality. This positive link is in favor of the results of descriptive and graphical analysis. The control variables are also positive and significant. The coefficient of FDI highlights that a one-unit increase in foreign direct investment increases the total sale by 0.0672 units. And the coefficients of TF indicate that a one-unit increase in trade flow leads to an increase in total sales by 6.53 units. Similarly, the coefficient of TA explains that a one-unit increase in total assets increases the export sale by 14.13 units. Next, we aim to highlight the impact of firm size on all types of sales. We generate dummies for large and small-size firms respectively. Table 5.3.2 shows the outcome of model 4.29 when the effect of the size dummy is included in the analysis. This analysis is done for a robustness check.

Table 5.3.3 shows the outcome of model 4.29 when a dummy for firm size is included. The firm's size is a very important indicator to analyze the firm performance. The more productive firm is more likely to increase its sale and become a large size firm. A large firm in size has more chance to enter and survive in the export market. Consequently, new entrant tries to improve their product quality for survival in a foreign market.

When we included a dummy for size in the model, the result highlighted that firm size is also positively affected by all types of sales. The coefficient of the size dummy (5.89) is a positive and significant effect on export sales and the coefficient of the size dummy (11.75) has also a positive and significant effect on total sales.

Table 5.3.3:Product Quality and Trade Flow (Size Dummy)

Variables	ES_{ft}		LS_{ft}		TS_{ft}	
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
PQ_{ft}	11.5241***	10.5588***	5.1214*	4.3598*	10.8364***	88.4951***
	(0.000)	(0.000)	(0.046)	(0.060)	(0.000)	(0.000)
Size dummy		5.8931**		4.5467		11.7528***
	----	(0.022)	----	(0.110)	----	(0.0000)
FDI_t	0.0212***	0.0212***	0.0432**	0.0672***	0.0672***	0.0672***
	(0.000)	(0.012)	(0.009)	(0.000)	(0.000)	(0.000)
TA_{ft}	9.6372***	6.9422***	4.1309*	14.3116**	14.3116**	14.3116**
	(0.005)	(0.008)	(0.059)	(0.010)	(0.010)	(0.010)
TF_t	8.1253***	8.4856***	4.5380	6.5227	6.5227	6.5227
	(0.000)	(0.000)	(0.277)	(0.655)	(0.655)	(0.655)
Const.	-138.112***	-133.17***	-68.4424 ***	-66.6321***	-66.6321***	-66.6321***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	3101	3101	6601	6659	6659	6659
R – Squared	0.24	0.25	0.24	0.26	0.26	0.26
No. of Firms	258	258	360	360	360	360
F. Stat.	17.62***	16.26***	27.11***	20.47***	20.47***	20.47***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Note: As follows Table 5.3.1 table when incorporating the effect of the size dummy.						

Meanwhile, the coefficient of size dummy (4.54) for local sales is positive but insignificant which implies that firm size is not important for local sales as small firms also run their business in the local market. The sign and magnitude of control variables are similar to the basic model except for TF which is positive but insignificant for local sales and total sales. Our results are consistent with the studies of Bernard & Jensen (1999) and Brakman et al. (2020). The trade flow has no significant effect on the local

market. One more important dummy for entry into the export market is also constructed to check the strength of the relationship between product quality and trade flow.

Table 5.3.3 shows the outcome of model 4.29 after including the effect of the size dummy in the analysis. Table 5.3.3 shows the results of model 4.29 after incorporating the effect of the entry dummy. Model (2), Model (4), and Model (6) are estimated by including an entry dummy in the baseline models The results reveal that the coefficient of the entry dummy (2.42) is positive and statistically significant for export sales and the coefficient of entry (1.58) is also positive and significant for total sales.it implies that when a firm wants to enter the export market, a firm pays more attention to increasing its sale at both local and domestic levels and the sale can increase by improving the quality of the product.

Whereas, the effect of the entry dummy is meaningless for local sales. Our results are consistent with the study of Arnold & Hussinger (2005) and, Bernard et al. (2012). At the initial stage, the firm's main focus is to set its business at the local level with small investments. However, with time, the firm starts investing in larger projects by generating high revenue, and therefore firm's size increases. A firm can enter the foreign market when it gains sufficient experience and success in the local business. The exporting firm puts more focus on the quality of a product when competing in international markets. Such firms engage themselves in highly productive activities, which help them produce high-quality products to integrate and compete in the international market.

Table 5.3.4: Product Quality and Trade Flow(Entry Dummy)

Variables	ES_{ft}		LS_{ft}		TS_{ft}	
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
PQ_{ft}	11.5241***	7.9832***	5.1214*	51.2348**	10.8364***	10.8106***
	(0.000)	(0.004)	(0.046)	(0.046)	(0.000)	(0.000)
Entry dummy	-----	2.4248***	------	2.5342	-----	1.5819***
		(0.000)		(0.130)		(0.001)
FDI_t	0.0212***	0.0164***	0.0432**	0.0438**	0.0672***	0.0645**
	(0.000)	(0.000)	(0.009)	(0.009)	(0.000)	(0.017)
TA_{ft}	9.6372***	661.5683***	4.1309*	4.3130**	14.3116**	14.3473***
	(0.005)	(0.001)	(0.059)	(0.059)	(0.010)	(0.003)
TF_t	8.1253***	6.7521***	4.5380	2.8492	6.5227	7.0632
	(0.000)	(0.000)	(0.277)	(0.279)	(0.655)	(0.514)
Const.	-13.8112***	-11.4613***	- 68.4424 ***	-67.1791***	-66.6321***	-70.2639***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Obs.	3101	3101	6601	6601	6659	6659
R – Squared	0.24	0.27	0.24	0.24	0.26	0.30
No. of Firms	258	258	360	360	360	360
F. Stat.	17.62***	42.20***	27.11***	21.69***	20.47***	16.65***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: As follows Table 5.3.1 table when incorporating the effect of the entry dummy. Significance at 1, 5, and 10 percent are denoted by ***, **, and * respectively. P-values of individual coefficients are presented in parentheses.

The coefficients of control variables are similar to the results of Table 5.3.4. The coefficients of FDI and TA are positive and statistically significant for all types of sales when the entry dummy is a matter of concern. However, the coefficient of TF is positive but statistically insignificant for the local and total sales.

5.4. Product Quality and Trade Flow: The Role of Moderators

In this section, the role of different moderators in the relationship between product quality and export flow is examined. These variables are used to check the significance and strength of the relationship between the two variables. We take three moderators[25], namely, firm heterogeneity, R&D activities, and financial constraints. Table 5.4.1 shows the summary statistics of the role of moderators for product quality and export flow.

Table 5.4.1: Summary Statistics of The Role of Moderators

Variables	*No of obs.*	*Mean*	*St Dev.*	*Min*	*Max*	*p25*	*p50 (Median)*	*p75*
PQ_{ft}	6877	60.4589	12.5936	0	100	53	60	68
EF_{ft}	3195	20.5574	43.0511	0.0159	42.9334	94.7516	108.1360	197.9070
FH_{ft}	6827	6.2028	0.8929	1.4149	8.8237	5.6810	6.1988	6.7713
FC_{ft}	2487	-60.5279	25.4148	-76.0327	272.1714	-435.090	-150.2848	-483.4318
RD_{ft}	6827	0.4996	0.9997	-47.4285	57.0242	0.3759	0.500	0.6479
FDI_t	7380	-19.1405	14.8651	-54.9200	-297.0000	-23.5550	-17.0300	-78.8500
TF_t	5535	5.9071	2.0510	1.63	8.6808	4.4775	5.9725	7.9791
TA_{ft}	6783	9.3977	4.7903	0	100	8	8	9

Note: Here FH is firm heterogeneity, FC Is for financial constraints and RD is for Research and development activities.

[25] Baron & Kenny (1986) is the first one who introduce the concept of moderators and mediators variables.

Table 5.4.1 describes the mean, median, minimum value, and maximum value. The percentile values explain the low(25^{th}), medium(50^{th}), and high (75^{th}) level of variables. The values of the standard deviation form FH_{ft}, FC_{ft} and RD_{ft} are minimum which implies that these variables are less volatile. The variables of PQ and TA are normalized. Table 5.4.2 provides a correlation matrix of product quality and trade flow in the presence of the moderator's effect.

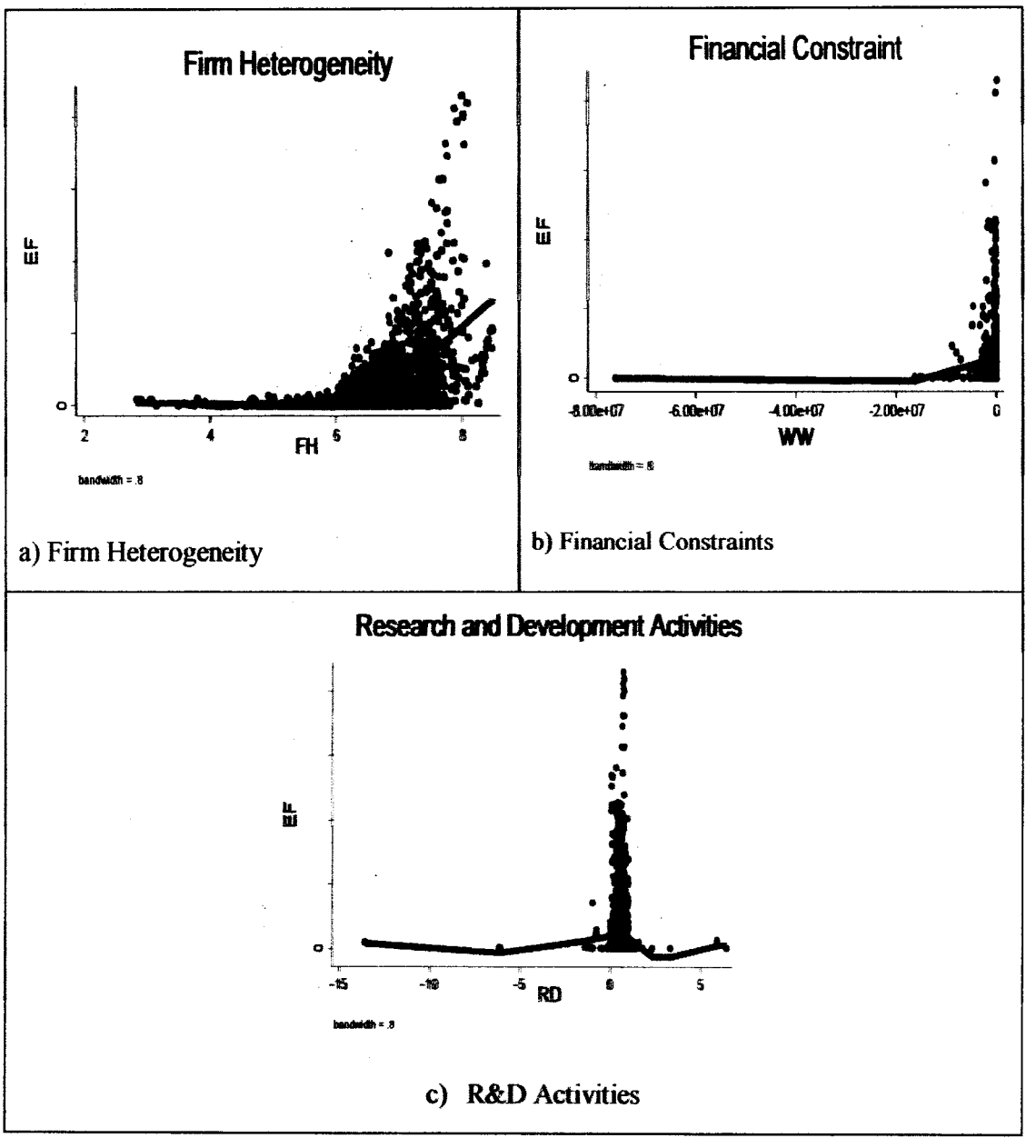
Table 5.4.2: Correlation Matrix of the Moderators

Variables	PQ_{ft}	EF_{ft}	FH_{ft}	FC_{ft}	RD_{ft}	FDI_t	TF_t	TA_{ft}
PQ_{ft}	1.0000							
EF_{ft}	0.2825	1.0000						
FH_{ft}	0.4557	0.4374	1.0000					
FC_{ft}	-0.0574	-0.0079	-0.0479	1.0000				
RD_{ft}	0.0483	0.0311	0.1480	-0.0740	1.0000			
FDI_t	-0.0103	0.0723	-0.0543	-0.0051	-0.0670	1.0000		
TF_t	-0.0059	-0.0346	-0.0086	0.0345	0.0391	-0.3835	1.0000	
TA_{ft}	0.4511	0.4093	0.6324	-0.1628	0.0703	0.0075	-0.0543	1.0000

Table 5.4.2 explains the correlation of moderators: firm heterogeneity, financial constraints, and R&D activities. Table 5.4.2 explains that there are positive relationships between all variables except FC_{ft} which negatively affects the remaining variables. If a firm has financial constraints, discourages improvement of the product quality and export flow. Figure 5.4.1 plots the effect of moderators on export flow. The horizontal axis

measures the role of different moderators of analysis like firm heterogeneity, financial constraints, R&D activities, and, while the vertical axis labels the variable product export flow.

Figure 5.4.1. Scatter Plots for the Moderators



a) Firm Heterogeneity

b) Financial Constraints

c) R&D Activities

Panel (a) shows that there is a positive relationship between firm heterogeneity and export flow. The heterogeneous firms are more likely to increase the export flow. Firms are heterogeneous in terms of size, sales, and productivity. As the sale of the firm increase, the firm can enter and sell its product into the export market (Gervais, 2015; Bai et al., 2017). Panel (b) explains the negative correlation between financial constraints and export flow. Financial constraints are hurdles faced by the firm in operating a business. If constraints are high then the firm is unable to extend its business to the domestic and foreign markets (Chaney, 2016; Choi, 2018). Panel (c) indicates that R&D activities are positively affecting the export flow. The firm involves more in R&D activities and has quick and easy access to new ideas and knowledge. Such firms are more likely to enter a foreign market (Klette & Griliches, 2000; Castillejo et al., 2006). After descriptive and graphical analysis, we investigated the role of all three moderators is discussed them in detail. We used the fixed-effect model to examine the role of moderators. When we apply the Hausman test, it is decided that the fixed effect model is a more suitable estimation technique for our analysis[26]. Now, we discuss the regression analysis to check the role of moderators.

5.4.1. Role of Financial Constraints

In this section, we explore the role of financial constraint as a first moderator in explaining the relationship between product quality and trade flows. Three indices are commonly used to measure financial constraints that are KZ index, WW index, and SA index which are constructed with the combination of different financial variables of the firm side. We have estimated all financial constraint indices as KZ, SA, and WW. In the

[26] Hausman test statistics (14.62) with p value(0.000) decided the Fixed Effect Model is applicable technique.

context of Pakistan's firms, only Whited (2006) model is a more suitable measure to analyze the effect of financial constraints (Rashid & Ashfaq, 2017; Qasim et al., 2021). Whited (2006) index is specifically used to explain the characteristics of financial constraints. This index is constructed with the cash flow, total assets, long-term debt, sale growth, and industry growth. A firm with a high WW index means that more financially constrained firms are categorized with low dividends low cash flow, low total assets, high leverage, low firm growth, and high industry sales growth.

Table 5.4.1(a) explains the coefficient of financial constraint (WW index) which is estimated for equation (4.30). We have used the fixed-effect model which is decided by the Hausman test[27]. Results of Table 5.4.1 (a) indicate that the coefficients of PQ_{ft} and FC_{ft} are positive and negative respectively but are statistically significant. It means that PQ_{ft} (12.0224) forms a direct significant relationship with the export flow which is consistent with earlier estimates of our empirical model (Equation 4.29). However, the negative coefficient of FC_{ft} (-0.0473) explains shows that financially constrained firms are unable to enter the export market. These firms do have not enough resources to finance the production of a high-quality product, hence are unable to compete in the international market. Our results are consistent with the study of Manova (2013), Hericourt & Poncet (2015), and M. Akram & Rashid (2018). However, when we introduce an interaction term in the model, the value of PQ_{ft} (13.0224) increases, whereas the value of FC_{ft} (-1.8009) decreases but remains significant. Hence, the interaction term

[27]Hausman Test Statistics (10.25) p-value(0.002).

($PQ_{ft} * FC_{ft}$) enters the model positively (0.0278) and is statistically significant, which complementarity between product quality and financial constraints.

Table 5.4.1 (a) Role of Financial Constraints in Product Quality- Trade Flow Nexus

Variables	Fixed Effect Model	
PQ_{ft}	12.0224***	13.6754***
	(0.000)	(0.000)
FC_{ft}	-0.0473*	-1.8009**
	(0.022)	(0.005)
$PQ_{ft} * FC_{ft}$	-	0.0278**
		(0.012)
FDI_t	0.0197***	0.0192**
	(0.002)	(0.006)
TF_t	4.9407**	4.9107**
	(0.035)	(0.034)
TA_{ft}	44.6746*	45.0519*
	(0.096)	(0.089)
Cons.	-1.1207***	1.1227***
	(0.000)	(0.000)
Obs.	1208	1208
R Squared	0.20	0.20
No. of Firms	184	184
F. Stat.	14.80***	13.74***
	(0.000)	(0.000)
Notes: ***, **,*are 1, 5, and 10 percent levels of significance respectively.		

The interaction term ($PQ_{ft} * FC_{ft}$) stands significant which implies that financial constraints play a moderator role in the relationship between the export flow and product quality. The interpretation will be accordingly provided with $FC_{ft} = 0$. one unit increase in product quality the expected value of export flow increases by 13.67 units while the value of $FC_{ft} = 1$, while with a one-unit increase in product quality, the expected value of export flow increases by 0.0278 units.

At the two different levels of financial constraints, we get two straight lines with different slopes. The parallel lines have the same slopes in case of interaction effects if we get parallel that provides evidence for no interaction effects. Interestingly, in this case, at the two levels of financial constraints, we find two straight lines with different slopes (13.67 and 0.0278), which confirms that the lines are not parallel. In the context of our problem, these non-parallel straight lines indicate that the magnitude of the positive relationship between product quality and export flow depends on the level of financial constraints. The role of financial constraints in adjusting the export flow with product quality has not been previously analyzed in such a manner.

Next, we examine the conditional effect of financial constraints at low, medium, and high levels of financial constraints. The results of the conditional effect are presented in Table 5.4.1 (b) which reveals that financial constraints are negative and significantly affect the export flow at low (25^{th}), medium (50^{th}), and high (75^{th}) levels. However, the value of the coefficient is decreased as the level of financial constraints increases from low (-8.5569), medium (-9.8856), and high (-10.3612) levels. This indicates that the export flow of a firm decreases as the level of financial constraints increases from low, medium, and high levels.

Table 5.4.1 (b): Conditional Effects of Financial Constraints on Export Flow

FC_{ft}	*Coef.*	z test	p – value
$P - Low$ $(25th\ Percentile)$	-8.5569***	3.69	(0.000)
$P - Medium$ $(50th\ Percentile)$	-9.8856***	4.40	(0.000)
$P - High$ $(75th\ Percentile)$	-10.3612***	4.61	(0.000)
Notes: ***, **,*are 1, 5, and 10 percent levels of significance respectively. P-low, P-high, and P-medium are the 25th, 50th, and 75th percentiles respectively.			

Our results are consistent with previous empirical insights Dinopoulos & Unel (2011) example. These studies argued that a firm's export capacity decreases with financial constraints. Findings reveal that financial constraints play a significant role as a moderator for the relationship between export flow and product quality. Hence, the final remark extracted from the result is that financial constraint plays a role as a moderator in the relationship between product quality and export flow.

5.4.2. Role of Firm Heterogeneity

This section aims to analyze the role of our second moderator, that is firm heterogeneity, in the product quality-trade flow nexus. We used firm size as a proxy for firm heterogeneity (Helpman et al., 2008; Cole et al., 2010; Qureshi & Yousaf, 2014). Table 5.4.2 (a) reports the estimated results of our empirical model (Equation 5.31). Findings reveal that the coefficients of both the PQ_{ft} (11.3224) and FH_{ft} (3.4475) are positive and statistically significant, which implies that the more the firm heterogeneity in its products the more would be exported. As the firm size increases, that firm can turn its sale toward the international market. These outcomes are similar to the result of the descriptive and graphical analysis investigated earlier. When we incorporated the

interaction term in the model, the coefficient of PQ_{ft} (34.26) and FH_{ft} (9.79) increases. And, the coefficient of the interaction term $PQ * FH_{ft}$ (-16.1415) is negative and statistically significant. This reveals the substitutability of the independent variable PQ_{ft} and moderating variable FH_{ft} .

Table 5.4.2. (a): Role of Firm Heterogeneity

Variables	Fixed Effect Model	
PQ_{ft}	11.3224*** (0.000)	34.2637*** (0.004)
FH_{ft}	3.4475** (0.018)	9.7984** (0.024)
$PQ_{ft} * FH_{ft}$	-	-16.1415** (0.046)
FDI_t	0.0187*** (0.000)	0.0202*** (0.000)
TF_t	71.6947*** (0.003)	66.7200*** (0.004)
TA_{ft}	8.5307** (0.007)	8.807** (0.005)
Cons.	-1.4307*** (0.000)	-2.8407*** (0.000)
Obs.	2709	2709
R Squared	0.26	0.28
No. of Firms	242	242
F. Stat.	13.35*** (0.000)	10.54*** (0.000)
Notes: ***, **,*are 1, 5, and 10 percent levels of significance respectively.		

The interaction term ($PQ_{ft} * FH_{ft}$) stands significant which implies that firm heterogeneity plays a moderator role in the relationship between the export flow and product quality. The interpretation will be accordingly provided $FH_{ft} = 0$ which implies that with a one-unit increase in product quality the expected value of export flow

increases by 34.26 units. Whereas the value $FH_{ft} = 1$ indicates a one-unit increase in product quality, the expected value of export flow decreases by (-16.14) units. At the two different levels of firm heterogeneity, we get two straight lines with different slopes. The parallel lines have the same slopes in case of interaction effects if we get parallel that provides evidence for no interaction effects. Interestingly, in this case, at the two levels of firm heterogeneity, we find two straight lines with different slopes (34.26 and -16.14), which indicate confirms that the lines are not parallel. In the context of our problem, these non-parallel straight lines indicate that the magnitude of the positive relationship between product quality and export flow depends on the level of firm heterogeneity. The role of firm heterogeneity in adjustment of the export flow with product quality has not been previously analyzed in such a manner.

Furthermore, we analyze the conditional effect of firm heterogeneity at a low, medium, and high level. Results presented in Table 5.4.2 (b) show that there is positive and significant relationship exists at low (25^{th}), medium (50^{th}), and high (75^{th}) levels of firm heterogeneity, however, the value of the coefficients is decreased as the level of firm heterogeneity increases from low (11.41), medium (10.15), and high (8.73) levels. If we compare these coefficients, it is highest for the low level of firm heterogeneity and the lowest for the highest level of heterogeneity is positive and significant but the coefficient is decreased. This indicates that the export flow of a firm increases as the level of firm heterogeneity increases from low, medium, and high levels but with decreasing magnitude.

Table 5.4.2 (b) Conditional Effects of Firm Heterogeneity on Export Flow

FH_{ft}	*Coef.*	z test	p − value
$P - Low$ $(25th\ Percentile)$	11.4125***	4.42	0.000
$P - Medium$ $(50th\ Percentile)$	10.1581***	4.02	0.000
$P - High$ $(75th\ Percentile)$	8.7391***	3.14	0.002
Notes: ***, **,*are 1, 5, and 10 percent levels of significance respectively. P-low, P-high, and P-medium are the 25th, 50th, and 75th percentiles respectively.			

Our results are consistent with the received studies on the subject by Helpman et al. (2004)and Yeaple (2005). These studies came with the findings that firm heterogeneity poses a positive impact on export flow. From our estimated results we can safely conclude that firm heterogeneity plays a positive and significant role as a moderator in the relationship of export flow and product quality.

5.4.3. The Role of Research & Development Activities

The R&D activities are taken as one of the moderators in this study. In this context, we hypothesized that more expenditures on R&D activities lead to high and fast economic growth and quality production. The most commonly used proxy for a firm's R&D is intangible assets, and patents (Ukpabio & Siyanbola, 2017), hence we have taken intangible assets as the proxy of R&D activities. Table 5.4.3(a) shows the estimated results of our empirical model (Equation 4.32). The result shows that the coefficient of PQ_{ft} (11.5031) and RD_{ft} (9.8412) are positive which are statistically significant. Results indicate that both variables product quality and R&D activities have a direct significant

impact on export flow. Next, we introduce the interaction term in the model to examine the impact of R&D on the dependent variable (Export Flow). The coefficients also increased PQ_{ft} (12.1416) and RD_{ft} (11.56) and remain significant. However, the coefficient for the interaction term product quality and R&D activities ($PQ_{ft} * RD_{ft}$) is negative (-21.11) and statistically significant. This indicates that the independent variable PQ_{ft} and moderating variable RD_{ft} are substitutes for each other. This implies that both have similar characteristics and can be used as an alternative to each other.

Table 5.4.3 (a): Role of Research & Development Activities

Variables	Fixed Effect Model	
PQ_{ft}	11.5031*** (0.000)	12.14160*** (0.001)
RD_{ft}	9.8412** (0.038)	11.5697** (0.042)
$PQ_{ft} * RD_{ft}$	----	-21.1192** (0.052)
FDI_t	0.0212*** (0.000)	0.0214*** (0.000)
TF_t	81.2775*** (0.000)	81.5944*** (0.000)
TA_{ft}	7.0607** (0.005)	7.0707** (0.005)
Cons.	-1.3807*** (0.000)	-1.4307*** (0.000)
Obs.	3101	3101
R Squared	0.22	0.24
No. of Firms	258	258
F. Stat.	74.48*** (0.000)	12.43*** (0.000)
Notes: ***, **,*are 1, 5, and 10 percent levels of significance respectively.		

The interaction term ($PQ_{ft} * RD_{ft}$) stands significant which implies that R&D activities play a moderator role in the relationship between the export flow and product quality. The interpretation will be accordingly provided with $RD_{ft} = 0$ one unit increase in product quality the expected value of export flow increases by 12.14 units. The value of $RD_{ft} = 1$, with one unit increase in product quality, the expected value of export flow decreases by (11.56) units. At the two different levels of R&D activities, we get two straight lines with different slopes. The parallel lines have the same slopes in case of interaction effects if we get parallel that provides evidence for no interaction effects. Interestingly, in this case, at the two levels of R&D Activities, we find two straight lines with different slopes (12.14 and 11.56), which confirms that the lines are not parallel. In the context of our problem, these non-parallel straight lines indicate that the magnitude of the positive relationship between product quality and export flow depends on the level of R&D activities. The role of R&D activities in the adjustment of the export flow with product quality has not been previously analyzed in such a manner.

Next, we investigate the conditional effect of R&D at low, medium, and high levels that results are reported in Table 5.4.3 (b)which shows that there is positive and significant relationship exists at low (25^{th}), medium (50^{th}), and high (75^{th}) levels of R&D activities. The result depicts that all levels of R&D activities have a positive and significant effect on export flow, however, its effects decrease with an increase in its level. Consequently, the conditional effect of R&D expenditures at a low (11.39), medium (11.24), and high level (10.73) have a positive and highly significant effect on export flow but the estimated coefficient is decreasing as the level of the moderator is increased.

Table 5.4.3 (b): Conditional Effects of R&D Activities on Export Flow

RD_{ft}	Coef.	z test	P value
$P-Low$ $(25th\ Percentile)$	11.3973***	3.51	0.000
$P-Medium$ $(50th\ Percentile)$	11.2498***	3.43	0.001
$P-High$ $(75th\ Percentile)$	10.7357***	3.18	0.001
Notes: ***, **,*are 1, 5, and 10 percent levels of significance respectively. P-low, P-high, and P-medium are the 25th, 50th, and 75th percentiles respectively.			

Our results are consistent with the studies of Crino & Epifani (2012) and Bento (2016) which stated that export flow increases with an increase in R&D activities. The conclusion that can be drawn from the findings is that firm R&D activities play a moderator role in the relationship between product quality and export flow.

5.5. Product Quality and Export Flow: The Role of Mediators

Apart from the moderator, the role of mediators has also been analyzed to investigate the direct and indirect effects[28]. In mediation analysis, the effect is examined through which the independent variable (Product Quality) affects the dependent variable (export flow) by a mediating variable. We take two variables as mediation, namely growth in TFP of the firm ($TFPG_{ft}$) and the firm's growth (FG_{ft}). Table 5.5.1 shows the summary statistics of the role of moderators that are a total factor of productivity growth (TFPG) and firm growth (FG) for product quality and export flow.

[28]The mediator's effect describes the total effect into direct and indirect effects of the variable.

Table 5.5.1: Summary Statistics of Mediators: TFPG and FG

Variables	*No of obs.*	*Mean*	*St Dev.*	*Min*	*Max*	*p25*	*p50 (Median)*	*p75*
PQ_{ft}	6877	60.45892	12.5936	0	100	53	60	68
EF_{ft}	3195	205.5074	43.0511	0.001059	429.0334	94.7516	508.1360	1971.9070
$TFPG_{ft}$	6374	-0.0268	54.3079	-623.73	1605.34	-1.4251	0.6639	2.7272
FG_{ft}	5939	0.6023	0.0093	0	1	0.6024	0.6024	0.6024
FDI_t	7380	-19.1405	14.8652	-54.9200	-297.00	-23.5550	-17.0300	-78.850
TF_t	7380	30.4748	3.1893	25.3023	35.6813	27.6304	31.4856	32.9049
TA_{ft}	6783	9.3979	4.7903	0	100	8	8	9

Note: where TFPG is for the total factor of productivity growth and FG is for firm growth.

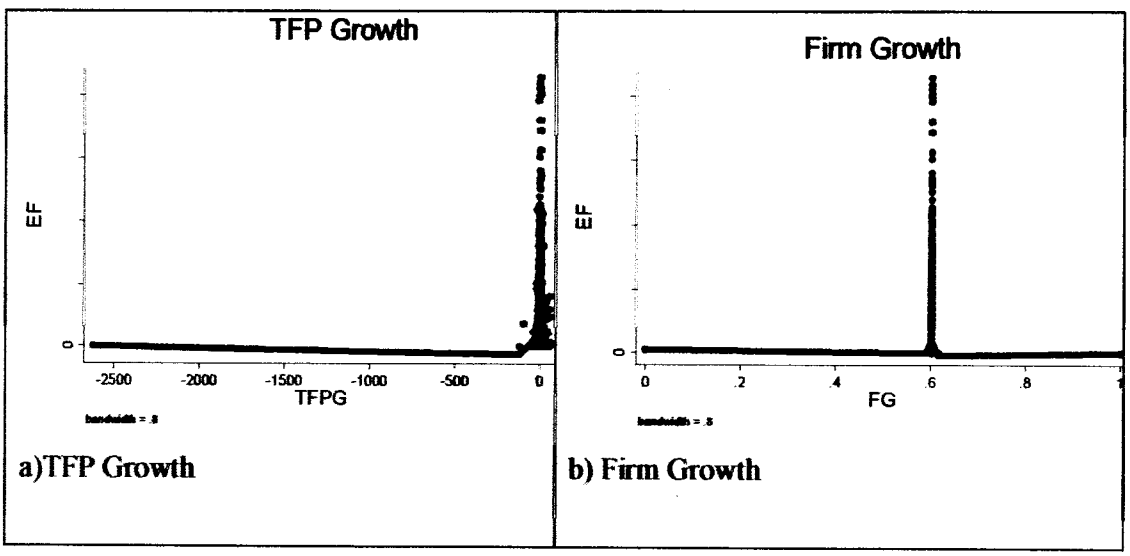
Table 4.5.1 describes the mean, median, minimum value, and maximum value. The percentile values explain the low (25^{th}), medium (50^{th}), and high (75^{th}) level of variables. The values of the standard deviation of $TFPG_{ft}$ and FG_{ft} are minimum which implies that these variables are less volatile. We have normalized the variable FG_{ft} to keep it in one unit of measurement. Table 5.5.2 provides a correlation matrix for analysis of the role of mediators on product quality and trade flow. Table 5.5.2 presents the correlation of mediator variables: $TFPG_{ft}$ and FG_{ft} under consideration which shows that both mediators $TFPG_{ft}$ and FG_{ft} have a positive and direct effect on the export flow 0.023 and 0.012 respectively.

Table 5.5.2: Correlation Matrix for The Role of Mediators

Variables	PQ_{ft}	EF_{ft}	$TFPG_{ft}$	FG_{ft}	FDI_t	TF_t	TA_{ft}
PQ_{ft}	1.0000						
EF_{ft}	0.3082	1.0000					
$TFPG_{ft}$	0.0232	0.0121	1.0000				
FG_{ft}	0.0123	0.0007	0.0151	1.0000			
FDI_t	-0.0036	0.0464	0.0210	0.0028	1.0000		
TF_t	0.0128	-0.0170	0.0428	0.0057	-0.4434	1.0000	
TA_{ft}	0.4238	0.4614	0.0108	-0.0027	0.0084	-0.0735	1.0000

Figure 5.5.1 plots the role of mediators in the relationship between export flow and product quality. The horizontal axis measures the different mediators of analysis and the vertical axis labels the variables of export flow.

Figure 5.5.1: Scatter Plot of the Mediators, TFPG and FG



a)TFP Growth

b) Firm Growth

Panel (a) shows that there is a positive relationship between export flow and the first mediator that is $TFPG_{ft}$ which indicates that TFP plays a role as a mediator. The marginal productivity increases if all factors of production perform efficiently. The efficient factor of production can increase sales by producing a high-quality product. And high-quality products ultimately increase the export flow of the firm as well as of the country (Satpathy et al., 2017; Haider et al., 2021).

Panel (b) describes a positive relationship between firm growth which is our second mediator and export flow. The high firm's growth means that the sale of that firm is more than other firms. Such firm can increase their domestic sale as well as foreign sale. Hencel, the export flow of the firm also increased (Hart, 2000; Keller & Yeaple, 2009).

5.5.1: The Role of Total Factor Productivity Growth

The TFP growth is the first mediator whose role is investigated in the relationship between product quality and export flow. In this study, a total factor of productivity is measured by using the methodology presented by Olley & Pakes (1992) and afterward estimated the growth of TFP for analysis. Table 5.5.1(a) gives the estimates of the Seemingly Unrelated Regression (SUR) model for unbalanced panel data as developed by (Biorn, 2004). These estimates are executed through two seemingly unrelated equations namely Eq 4.33 and Eq 4.34. the results of Eq 4.33 explain in column 1 suggested that TFPG has a positive and significant impact on product quality as an increase in product quality (10.6946) leads to an increase in the TFPG. These results are

consistent with the studies of (Nakao, 1982), Verhoogen (2008), and Aicala (2016), which found a positive relationship between $PQ_{ft}$and $TFPG_{ft}$.

Table 5.5.1(a): Estimates of SUR Model for Role of Mediation

Variables	Model 1	Model 2
	$TFPG_{ft}$	EF_{ft}
PQ_{ft}	10.6946**	51.0872***
	(0.048)	(0.000)
$TFPG_{ft}$	----	4.0586
		(0.678)
FDI_t	0.00201	0.0074***
	(0.614)	(0.000)
TF_t	46.5320**	67.8142***
	(0.005)	(0.000)
TA_{ft}	83.4594	323.2060***
	(0.904)	(0.000)
Note: P-values are given in parentheses. ***, **, and * show the level of significance at 1%, 5%, and 10% respectively.		

The estimates of the control variables (TA_{ft}, FDI_t, and TF_t) are significantly positive. In column 2, the estimates of Eq 4.33 are presented. The estimate of PQ_{ft} (51.0872) is the same as in Eq 4.33 and $TFPG_{ft}$ (4.0586) is positive but insignificantly affects the export flow. These results are consistent with the results of graphical and descriptive analysis earlier done. All control variables in this equation are positive and statistically significant. the main indicator to analyze the firm's performance. TFP is enhanced due to the use of good and efficient raw materials in the production process (Aghion et al., 2005). Productivity improvement is important in many aspects. A more productive firm can generate high revenue and profit. On the other side, more productive

firms can easily enter and also survive in international markets. These results are consistent with the studies (Khandelwal, 2010; Mitić et al., 2017; U. S. Khan et al., 2020). The role ofTFPG Activities for adjustment of the export flow with product quality has not been previously analyzed in such a manner.

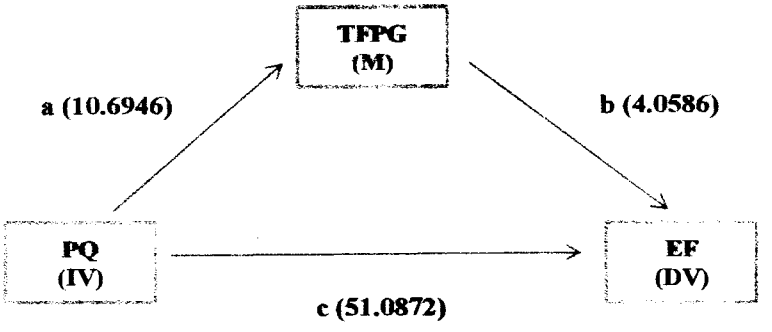
The result of Table 5.5.1(b) shows the mediation effects of $TFPG_{ft}$ on product quality and export flow. The total effect of the mediator $TFPG_{ft}$ is divided into two direct and indirect effects. The direct effect (51.0872) is positive and significant but the indirect effect (43.4061) and total effect (94.4933) of TFPG is positive but statistically insignificant. The mediation effect (43.4910) is also positive, however insignificant, which indicates that the TFPG effect on the export flow is increasing with an increase in product quality. Our estimated results reveal that the growth of TFP has an immediate response to a firm's product quality and its effect on export flow as a direct effect is positive and statistically significant. The significance of direct effect provides evidence of partial mediation.

Table 5.5.1(b): Mediation effect of $TFPG_{ft}$

$TFPG_{ft}$	Coefficient	$z-value$	$P-value$
Direct Effect	51.0872***	24.26	(0.000)
Indirect Effect (Mediation Effect)	43.4061	0.42	(0.671)
Total Effect	94.4933	0.94	(0.349)
Note: P-values are given in parentheses. ***, **, and * show the level of significance at 1%, 5%, and 10% respectively.			

The conclusion that can be drawn from the extended result is that TFPG plays the role of partial mediation in explaining the relationship between export flow and product quality. Figure 5.5.1 describes the link between export flow (Dependent Variable, DV), product quality (Independent Variable, IV), and TFP growth (Mediators, M). The effects of product quality are decomposed on the export flow of the firm (V) into direct and indirect effects.

Figure 5.5.1: The Link Product Quality, Export Flow, and TFP Growth



In Figure 5.5.1, the direct effect of PQ on EF is presented in arrow "c", whereas the indirect effect through the mediating variable (TFPG) can be examined by the multiplication of terms (a) and (b) $ab = (10.6946) * (4.0586) = 43.4061$. This indirect effect is verified in Table 5.5.1(b). These estimates are obtained by estimating the SUR model suggested by Biørn (2004).

However, the positive and significant direct effect of PQ and EF concludes that TFPG plays the role of partial mediation. Because of this, the indirect, total, and mediation effect of TFPG is although positive bust insignificant. Consequently, TFPG is a partial mediator for explaining the relationship between product quality and export flow.

5.5.2:The Role of Firm's Growth

The firm's growth is used as a second mediator to explain the relationship between product quality and export flow. The estimates of the SUR model which is presented by Biørn (2004) explains in table 5.5.1(a). These results are also obtained by estimating two seemingly unrelated equations (Eq. 4.35 and Eq 4.36). Column 2 (Model 1) presents the estimated results of the empirical model (Eq. 4.35) which suggests that product quality (9.3817) has positive but statistically insignificant. Column 3 (Model 2) presents the estimated results where the estimates of $PQ_{ft}(32.3369)$ and $FG_{ft}(11.1660)$ are a positive and highly significant impact on the export flow. These results are similar to the findings of descriptive and graphical analysis explained earlier.

Table 5.5.2 (a): Estimates of SUR Model for Role of Mediation

Variables	Model 1	Model 2
	FG_{ft}	EF_{ft}
PQ_{ft}	9.3817 (0.866)	32.3369*** (0.000)
FG_{ft}		11.1660*** (0.000)
FDI_t	0.00531 (0.987)	0.0069*** (0.000)
TF_t	28.6940 (0.810)	117.6829*** (0.000)
TA_{ft}	0.3772 (0.999)	404.6546*** (0.000)
Note: P-values are given in parentheses. ***, **, and * show the level of significance at 1%, 5%, and 10% respectively.		

The estimates of all control variables for Eq 4.35 are positive but insignificant. In column 2, the estimates of Eq 4.36 are presented. These results are consistent with the studies of Keller & Yeaple (2009) and Imbriani et al. (2014). These studies found a positive association between a firm's growth and product quality. The firms can grow fast if it adopts knowledge of advanced techniques. The firm expands its business and grows well. Firms' growth leads to new job opportunities, knowledge of new techniques, entry, and survival into foreign markets. We measured the firms' growth through data on its sale (Coad & Tamvada, 2012; Yu, 2013).

The result of table 5.5.2(b) explains the mediation effects of FG on product quality and export flow. Here, the total effect of the mediator is divided into two direct and indirect effects. The results explain the direct effect $PQ_{ft}(32.33)$ is positive and significant.

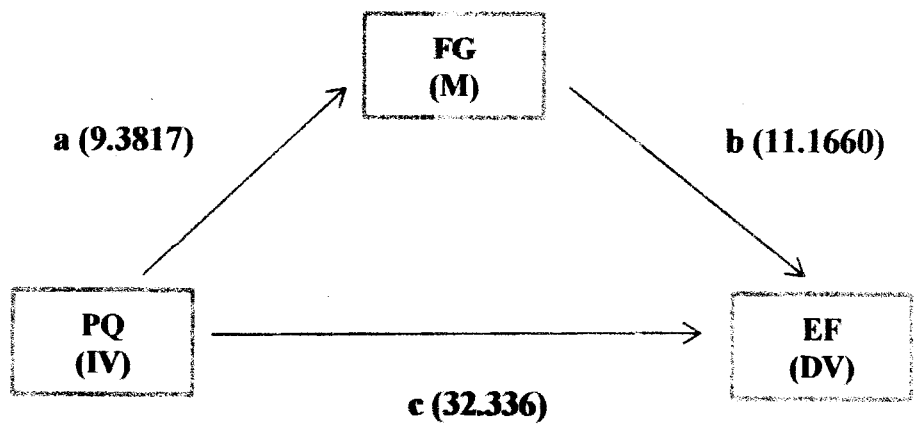
Table 5.5.2(b): Mediation effect of FG_{ft}

FG_{ft}	Coefficient	$z-$value	$P-$value
Direct Effect	32.3369***	26.03	(0.000)
Indirect Effect (Mediation Effect)	10.4757	0.17	(0.866)
Total Effect	42.8094	0.69	(0.492)
Note: P-values are given in parentheses. ***, **, and * show the level of significance at 1%, 5%, and 10% respectively.			

However, the indirect effect (10.4757) and the total effect (42.8094) of FG are positive but statistically insignificant. Similarly, the mediation effect is also positive but insignificant. Results indicate that the FG effect on the export flow is increasing with an increase in product quality. The insignificance of the indirect effect of FG provides a plausible reason to agree on the potential role of additional mediators present to play its role in the relationship between export flow and product quality.

Figure 5.5.2 describes the link between export flow (Dependent Variable, DV), product quality (Independent Variable, IV), and firm growth (Mediator Variable, MV). The effects of product quality are decomposed on the export flow of the firm (DV) into direct and indirect effects.

Figure 5.5.2: The Link Product Quality, Export Flow, and Firms Growth



In the figure, the direct effect of PQ on EF is shown by the arrow "$c = 32.336$". However, the indirect effect through the mediating variable (FG) is captured by the multiplication of terms (a) and (b) as $ab = (9.38) * (11.16) = 10.47$, which is the same value presented in Table 5.5.2 (b).

However, the positive and significant direct effect of PQ and EF concludes that FG plays the role of partial mediation. Because indirect, mediation and the total effect of FG are positive but it is insignificant in all cases. Consequently, FG is acting as a partial mediator in determining the relationship between product quality and export flow. Here, it is concluded that the two mediators TFPG and FG play roles as partial mediators of export flow and product quality.

Chapter 6

Conclusion and Policy Recommendations

This chapter presents the conclusion drawn from study findings and policy recommendations based on the study findings. In this context, the first section presents the conclusion, whereas the second section presents policy implications based on our analysis.

6.1. 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 from 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 on 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 their effect on product quality. Among the endogenous (firm-level) determinants of sale growth, total assets, 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 a firm's product quality.

This study also aims to explore how product quality can affect the export flow of Pakistan. In this context, sales at the firm level are categorized as total sales, local sales, and export sales. The findings of the study reveal that product quality plays an important role in the increase of all types of sales. In all cases, the positive and significant estimates of product quality explain that better quality of the product enhances the firm's sales at both domestic and international levels. Our results are robust having incorporated two dummies for size and entry in the model. Estimated results reveal that the size of a firm positively and significantly affects the export sale and total sales, however, the size of a firm does not signify its impact on local sales.in addition, the positive and significant coefficient of entry explains that decision to enter is important for a firm that is productive and produces high-quality products which indicate that a firm can expand its business and enter the export market by improving the quality of its product.

This study also examined the role of moderators in the relationship between product quality and export flow at the firm level. We consider three moderators, namely, financial constraints, firm heterogeneity, and R&D activities. The findings reveal that financial constraints are hurdles in the process of improvement in the firm's product quality, as a moderator it holds a negative sign that is statistically significant. Whereas, the estimates of our second moderator firm heterogeneity hold a positive and significant role in explaining the relationship between product quality and export flow. The R&D activities also play an important role in determining the link between export flow and product quality, as it holds a positive sign, which is statistically significant.

We also investigate the role of two mediator variables namely the Firm's growth and TFP growth. The total effect of mediators is divided into direct and indirect effects by explaining the dependent and independent variables. Our findings show that the direct effect of product quality is positive and statistically significant, however, the indirect effect of product quality through the firm's growth (mediator variable) remains positive but insignificant. we came up with the same findings on TFP growth. Here, we conclude that both TFP growth and firm growth play the role of mediators in determining the link between product quality and export flow partially.

6.2. Policy Recommendations

This study may prove beneficial for policy agents to make policies for the betterment of the export flow of Pakistan. Based on our findings for measuring product quality, the following policy guidelines may be derived. First, exchange rate policy plays a significant role in determining exporting activities. In the case of Pakistan, policymakers are unable to stabilize the exchange rate. Frequent fluctuations in the exchange rate lead to uncertainty in foreign business. Government should introduce different opportunities which are helpful to build the confidence of foreign and domestic investors in the business. The encouraging and certain business environment leads to a stable exchange rate.

Second, there is a dire need to improve export performance by increasing sales and profit at the firm level. Such policies should be designed which are helpful for producers to put more focus on the improvement of their methods of production. The following measures can be taken to improve export performance: stable exchange rate policy, political situations, reduction in tariffs, and agreements with trading countries on

fewer terms and conditions. The loan packages should be available at subsidized rates. The management of a firm should be highly qualified enough to control product quality efficiently.

Thirdly, product quality is important for domestic as well as foreign producers. The improvement in product quality can lead to increase domestic sales and export flow at the firm level. In the case of Pakistan, improvement in export flow is a fundamental need for economic development. The country may put attention to the implementation of such measures and processes through which a firm can improve its product quality. Government should provide R&D funds for new investors to increase their sales. There should be financial aid programs provided at the firm level to cover the high cost of improving the quality of the product. In the recent period, quality is more important than quantity. This study investigated the macro and micro determinants of product quality in the case of Pakistan. In this context, it becomes easier for policymakers to focus on the area that significantly affects product quality. A firm should take the steps to increase its production and sale, promote and advertise its product, and improve export flow for the improvement of the quality of the product.

Fourthly, the country may focus to reduce the financial hurdles to improve product quality. The firm should increase its size from small to large which can improve product quality. Research and development activities are getting famous in today's research. The firm and country put more attention to taking steps for introducing new inventions, innovations, and techniques in the production process.

Future Direction

The results of the study open some future directions for researchers in the economic field. Future studies can be done on the measurement of product quality by taking primary data and conducting a survey. The addition of moderators to the link between export flow and product quality is a novel area of research. A more rigorous analysis of the role of mediators may be done in explaining the relationship between product quality and trade flows.

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Appendix

Hausman test	14.62 *** (0.000)

Percentile Coefficient of FH

Variable	*N*	*p25*	*p50*	*p75*
FH_{ft}	6173	13.12743	14.15285	15.30882

Percentile Coefficient of FC

Variable	*N*	*p25*	*p50*	*p75*
FC_{ft}	2487	-435090	-150284.8	-48343.18

Percentile Coefficient of RD

Variable	*N*	*p25*	*p50*	*p75*
RD_{ft}	5145	13686	79717.04	309976

List of Non- Financial firms

Chemicals, Chemical Products & Pharmaceuticals			
SID	**PID**	**Firm's Name**	**Abb**
1	1	Abbott Laboratories (Pakistan) Ltd.	ALL
1	2	Agritech Ltd.	AGL
1	4	Bawany Air Products Ltd.	BAPL
1	5	Berger Paints Pakistan Ltd.	BPPL
1	6	Biafo Industries Ltd.	BIL
1	7	Buxly Paints Ltd.	BPL
1	8	Clariant Pakistan Ltd.	CPL
1	9	Colgate.Palmolive (Pakistan) Ltd.	CPPL
1	10	Data Agro Ltd.	DAL
1	11	Dawood Hercules Chemicals Ltd.	DHCL
1	12	Descon Oxychem Ltd.	DOL
1	13	Dewan Salman Fibre Ltd.	DSFL
1	14	Dynea Pakistan Ltd.	DPL
1	15	Engro Corporation Limited (Engro Cheml Pakistan Ltd.)	ECL
1	16	Fauji Fertilizer Bin Qasim Ltd	FFBQL
1	17	Fauji Fertilizer Company Ltd.	FaFCL
1	18	Ferozsons Laboratories Ltd.	FLL
1	19	Gatron (Industries) Ltd.	GIL
1	20	Ghani Gases Ltd.	GGL
1	21	GlaxoSmithKline Pakistan Limited	GPL
1	22	Highnoon Laboratories Ltd.	HIL

1	23	ICI Pakistan Ltd.	ICiPL
1	24	Ittehad Chemicals Ltd.	ICL
1	25	Leiner Pak Gelatine Ltd.	LPGL
1	26	Lotte Chemical Pakistan Ltd.	LCPL
1	27	Nimir Industrial Chemicals Ltd.	NICL
1	28	Nimir Resins Ltd.	NRL
1	29	Otsuka Pakistan Ltd.	OPL
1	30	Pakistan Gum & Chemicals Ltd.	PGCL
1	31	Pakistan PVC Ltd.	PVCL
1	32	Sanofi.aventis Pakistan Ltd.	SPL
1	33	Sardar Chemical Industries Ltd.	SarCIL
1	34	The Searle Company Ltd. (formerly Searle Pakistan Ltd.	SPL
1	35	Sitara Chemical Industries Ltd.	SCIL
1	36	Sitara Peroxide Ltd.	SPL
1	37	Wah Nobel Chemicals Ltd.	WHC
1	38	Wyeth Pakistan Ltd.	WYPL
1	39	ZIL Ltd.	ZIL
1	40	Shaffi Chemical Industries Ltd.	SCIL
1	41	Shield Corporation Ltd.	SCL
1	42	Engro Polymer & Chemicals Ltd.	EPCL
1	43	Fatima Fertilizer Company Ltd.	FFCL
Electrical Machinery & Apparatus			
2	44	Siemens (Pakistan) Engineering Co. Ltd.	SEC
2	45	Waves Singer Pakistan Ltd.	WSP
2	46	Pakistan Cables Ltd.	PCL
2	47	Pak Elektron Ltd.	PEL
Food: Sugar and Other Products			
3	48	Abdullah Shah Ghazi Sugar Mills Ltd.(Al-Asif Sugar Mills Ltd	ASG
3	49	Adam Sugar Mills Ltd.	ASM
3	50	Al-Abbas Sugar Mills Ltd.	ABS
3	51	Al-Noor Sugar Mills Ltd.	ANS
3	52	Ansari Sugar Mills Ltd.	ASM
3	53	Baba Farid Sugar Mills Ltd.	BFS
3	54	Chashma Sugar Mills Ltd.	CSM
3	55	Dewan Sugar Mills Ltd.	DSM
3	56	Faran Sugar Mills Ltd.	FSM
3	57	Habib - ADM Ltd.(Habib Arkady LTD.)	HAD
3	58	Habib Sugar Mills Ltd.	HSM
3	59	Haseeb Waqas Sugar Mills Ltd.	HWS

3	60	Husein Sugar Mills Ltd.	HSML
3	61	JDW Sugar Mills Ltd.	ISM
3	62	Khairpur Sugar Mills Ltd.	KhSM
3	63	Mehran Sugar Mills Ltd.	MeSM
3	64	Mirpurkhas Sugar Mills Ltd.	MSM
3	65	Mirza Sugar Mills Ltd.	MSML
3	66	Noon Sugar Mills Ltd.	NSM
3	67	Sanghar Sugar Mills Ltd.	SSML
3	68	Shahmurad Sugar Mills Ltd.	ShSM
3	69	Shakarganj Mills Ltd.	ShML
3	70	Sindh Abadgar'S Sugar Mills Ltd.	SAS
3	71	Tandlianwala Sugar Mills Ltd.	TSM
3	72	The Premier Sugar Mills & Distillery Co. Ltd.	PSM
3	73	Imperial Sugar Ltd.	ISL
3	74	Jauharabad Sugar Mills Limtied	JSM
3	76	Clover Pakistan Ltd.	CPL
3	77	Ismail Industries Ltd.	IIL
3	78	Mitchell'S Fruit Farms Ltd.	MFF
3	79	Morafco Industries Ltd.	MIL
3	80	Murree Brewery Company Ltd.	MBC
3	81	National Foods Ltd.	NFL
3	82	Nestle Pakistan Ltd.	NPL
3	83	Noon Pakistan Ltd.	NoPL
3	84	Punjab Oil Mills Ltd.	POM
3	85	Quice Food Industries Ltd.	QFI
3	86	Rafhan Maize Products Co. Ltd.	RMP
3	87	S.S. Oil Mills Ltd.	SOM
3	88	Unilever Pakistan Foods Ltd. (Rafhan Bestfoods Ltd.)	UPF
Fuel & Energy			
4	89	Altern Energy Ltd.	AEL
4	90	The Hub Power Co. Ltd.	THP
4	91	Japan Power Generation Ltd.	JPG
4	92	K-Electric	KESC
4	93	Kohinoor Energy Ltd.	KEL
4	94	Kohinoor Power Co. Ltd.	KPC
4	95	Kot Addu Power Co. Ltd.	KAP
4	96	Mari Petroleum Co. Ltd.	MPC
4	97	National Refinery Ltd.	NRL
4	98	Oil & Gas Development Co. Ltd.	OGDCL
4	99	S.G. Power Ltd.	SGP

4	100	Sitara Energy Ltd.	SEL
4	101	Southern Electric Power Co. Ltd.	SEP
4	102	Sui Northern Gas Pipelines Ltd.	SNG
4	103	Sui Southern Gas Co. Ltd.	SSG
Information, Comm. & Transport			
5	104	Pak Datacom Ltd.	PDL
5	105	Pakistan International Airlines Corporation Ltd.	PIA
5	106	Pakistan National Shipping Corporation.	PNS
5	107	Pakistan Telecommunication Co. Ltd.	PTCL
5	108	TRG Pakistan Ltd.	TPL
5	109	Worldcall Telecom Ltd.	WTL
Manufacturing			
6	110	Crescent Steel & Allied Products Ltd.	CSP
6	111	Dadex Eternit Ltd.	DEL
6	112	Diamond Industries Ltd.	DIL
6	113	Fateh Industries Ltd.	FIL
6	114	Emco Industries Ltd.	EIL
6	115	Gillette Pakistan Ltd.	GPL
6	116	Goodluck Industries Ltd.	GIL
6	117	Huffaz Seamless Pipe Industries Ltd.	HSP
6	118	International Industries Ltd.	IIL
6	119	KSB Pumps Co. Ltd.	KSB
6	120	Pakistan Engineering Co. Ltd.	PEC
6	121	Shield Corporation Ltd.	SCL
6	122	The Thal Industries Corporation Ltd.	TTI
6	123	Treet Corporation Ltd.	TCP
6	124	Bata Pakistan Ltd.	BPL
6	125	Service Industries Ltd.	SIL
6	126	Tri-Pack Films Ltd.	TPF
6	127	Leather Up Ltd.	LUP
6	128	Pak Leather Crafts Ltd.	PLC
Motor Vehicles, Trailers & Autoparts			
7	129	Agriauto Industries Ltd.	AIL
7	130	Atlas Honda Ltd.	AHL
7	131	Baluchistan Wheels Ltd.	BWL
7	132	Al-Ghazi Tractors Ltd.	GTL
7	133	Bolan Castings Ltd.	BCL
7	134	Dewan Farooque Motors Ltd.	DFL
7	135	Exide Pakistan Ltd.	EPL
7	136	General Tyre & Rubber Co.	GTR
7	137	Ghandhara Industries Ltd.	GIL

7	138	Ghandhara Nissan Ltd.	GNL
7	139	Ghani Automobiles Industries Ltd.	GAI
7	140	Hinopak Motors Ltd.	HML
7	141	Honda Atlas Cars (Pakistan) Ltd.	HAC
7	142	Indus Motor Co. Ltd.	IML
7	143	Millat Tractors Ltd.	MTL
7	144	Pak Suzuki Motor Co. Ltd.	PSL
7	145	Sazgar Engineering Works Ltd.	SEW
Other Non-Metallic Mineral Products: Cement and Mineral			
8	146	Power Cement	PC
8	147	Attock Cement Pakistan Ltd.	ACPL
8	148	Bestway Cement Ltd.	BCL
8	149	Cherat Cement Co. Ltd.	CCL
8	150	D.G. Khan Cement Co. Ltd.	DGCL
8	151	Dadabhoy Cement Industries Ltd.	DCIL
8	152	Dandot Cement Co. Ltd.	DCCL
8	153	Dewan Cement Ltd.	DCL
8	154	Fauji Cement Co. Ltd.	FCCL
8	155	Fecto Cement Ltd.	FeCL
8	156	Flying Cement Co. Ltd.	FlCCL
8	157	Gharibwal Cement Ltd.	GCL
8	158	Kohat Cement Co. Ltd.	KCCL
8	159	Lafarge Pak. Cement Ltd.	LPCL
8	160	Lucky Cement Ltd.	LCL
8	161	Maple Leaf Cement Factory Ltd.	MLCF
8	162	Pioneer Cement Ltd.	PCL
8	163	Zeal Pak Cement Factory Ltd.	ZPCF
8	164	Balochistan Glass Ltd.	BGL
8	165	Frontier Ceramics Ltd.	FCL
8	166	Ghani Glass Ltd.	GGL
8	167	Karam Ceramics Ltd.	KCL
8	168	Shabbir Tiles And Ceramics Ltd.	STC
8	169	Tariq Glass Industries Ltd.	TGI
Coal & Refined Petroleum Products			
9	170	Attock Petroleum Ltd.	APL
9	171	Attock Refinery Ltd.	ARL
9	172	Byco Petroleum (Formerly Bosicor Pakistan Ltd.)	Byco
9	173	Pakistan State Oil Company Ltd.	PSO
9	174	National Refinery Ltd.	NRL
9	175	Pakistan Oilfields Ltd.	POL
9	176	Pakistan Refinery Ltd.	PRL

9	177	Shell Pakistan Ltd.	SPL
		Other Services Activities	
10	178	Gammon Pakistan Ltd.	GPL
10	179	Haydari Construction Co. Ltd.	HCL
10	180	Javedan Corporation Ltd.	JCL
10	181	Pakistan Hotels Developers Ltd.	PHD
10	182	Shifa International Hospitals Ltd.	SIH
		Paper, Paperboard & Products	
11	183	Baluchistan Particle Board Ltd.	BPL
11	183	Baluchistan Particle Board Ltd.	BPL
11	184	Century Paper & Board Mills Ltd.	CPBL
11	185	Cherat Packaging Ltd.	CPL
11	186	Dadabhoy Sack Ltd.	DSL
11	187	Merit Packaging Ltd.	MPL
11	188	Packages Ltd.	PL
11	189	Pakistan Paper Products Ltd.	PPL
11	190	Security Papers Ltd.	SPL
		Textile	
12	191	(Colony) Sarhad Textile Mills Ltd.	STML
12	192	Ahmed Hassan Textile Mills Ltd.	AHML
12	193	Ali Asghar Textile Mills Ltd.	ATML
12	194	Allawasaya Textile & Finishing Mills Ltd.	ATFML
12	195	Apollo Textile Mills Ltd.	ApML
12	196	Artistic Denim Mills Ltd.	ADML
12	197	Ashfaq Textile Mills Ltd.	AsTL
12	198	Asim Textile Mills Ltd.	AsITL
12	199	Ayesha Textile Mills Ltd.	AyTML
12	200	Azgard Nine Ltd.(Legler-Nafees Denim Mills Ltd.)	ANL
12	201	Babri Cotton Mills Ltd.	BCML
12	202	Bhanero Textile Mills Ltd.	BTML
12	203	Bilal Fibres Ltd.	BFL
12	204	Blessed Textiles Ltd.	BTL
12	205	Chakwal Spinning Mills Ltd.	CSL
12	206	Colony Mills Ltd. (Colony Textile Mills Ltd.)	CML
12	207	Crescent Fibers Ltd. (Crescent Boards Ltd.)	CFL
12	208	D.M. Textile Mills Ltd.	D.M.TL
12	209	D.S. Industries Limited	DSIL
12	210	Dar Es Salaam Textile Mills Ltd.	DSTM
12	211	Data Textiles Ltd.	DTL
12	212	Dawood Lawrencepur Ltd. (Dawod Coton Mills)	DLL
12	213	Dewan Farooque Spinning Mills Ltd.	DFSL

12	214	Dewan Khalid Textile Mills Ltd.	DKTL
12	215	Dewan Mushtaq Textile Mills Ltd.	DMTL
12	216	Dewan Textile Mills Ltd.	DTML
12	217	Din Textile Mills Ltd.	DiTM
12	218	Elahi Cotton Mills Ltd.	ECM
12	219	Ellcot Spinning Mills Ltd.	ESM
12	220	Faisal Spinning Mills Ltd.	FSM
12	221	Fatima Enterprises Ltd.	FEL
12	222	Fazal Cloth Mills Ltd.	FCML
12	223	Gadoon Textile Mills Ltd.	GTML
12	224	Ghazi Fabrics International Ltd.	GFIL
12	225	Glamour Textile Mills Ltd.	GTM
12	226	Globe Textile Mills (OE) Ltd.	GTML(OE)
12	227	Globe Textile Mills Ltd.	GTML
12	228	Gulistan Spinning Mills Ltd.	GSM
12	229	Gulistan Textile Mills Ltd.	GuTM
12	230	Gulshan Spinning Mills Ltd.	GSML
12	231	Haji Mohammad Ismail Mills Ltd.	HMIL
12	232	Hala Enterprises Ltd.	HEL
12	233	Hamid Textile Mills Ltd.	HTML
12	234	ICC Textiles Ltd.	ITL
12	235	Ideal Spinning Mills Ltd.	ISML
12	236	Idrees Textile Mills Ltd.	ITML
12	237	Indus Dyeing & Manufacturing Co. Ltd.	IDML
12	238	Ishaq Textile Mills Ltd.	ITML
12	239	Ishtiaq Textile Mills Ltd.	ITM
12	240	Island Textile Mills Ltd.	IsTML
12	241	J.A. Textile Mills Ltd.	JATM
12	242	J.K. Spinning Mills Ltd.	JKSM
12	243	Janana De Malucho Textile Mills Ltd.	JTML
12	244	Jubilee Spinning & Weaving Mills Ltd.	JSWL
12	245	Karim Cotton Mills Ltd.	KCML
12	246	Khalid Siraj Textile Mills Ltd.	KSTM
12	247	Khurshid Spinning Mills Ltd.	KhSML
12	248	Khyber Textile Mills Ltd.	KhTML
12	249	Kohat Textile Mills Ltd.	KoTML
12	250	Kohinoor Industries Ltd.	KIL
12	251	Kohinoor Mills Ltd.	KML
12	252	Kohinoor Spinning Mills Ltd.	KSML
12	253	Kohinoor Textile Mills Ltd.	KTML
12	254	Landmark Spinning Industries Ltd.	LSIL

12	255	Mahmood Textile Mills Ltd.	MTML
12	256	Maqbool Textile Mills Ltd.	MTL
12	257	Masood Textile Mills Ltd.	MsTML
12	258	Mehr Dastagir Textile Mills Ltd.	MdTML
12	259	Mian Textile Industries Ltd.	MTIL
12	260	Mohammad Farooq Textile Mills Ltd.	MFTL
12	261	Mubarak Textile Mills Ltd.	MTML
12	262	Mukhtar Textile Mills Ltd.	MuTML
12	263	N.P. Spinning Mills Ltd.	NSML
12	264	Nadeem Textile Mills Ltd.	NTML
12	265	Nagina Cotton Mills Ltd.	NCML
12	266	Nazir Cotton Mills Ltd.	NzCML
12	267	Nishat (Chuntan) Ltd.	NL
12	268	Nishat Mills Ltd.	NML
12	269	Olympta Spinning & Weaving Mills Ltd.	OSWM
12	270	Paramount Spinning Mills Ltd.	PSML
12	271	Premium Textile Mills Ltd.	PTML
12	272	Prosperity Weaving Mills Ltd.	PWML
12	273	Quetta Textile Mills Ltd.	QTML
12	274	Ravi Textile Mills Ltd.	RTML
12	275	Redco Textiles Ltd.	RTL
12	276	Reliance Cotton Spinning Mills Ltd.	RSML
12	277	Reliance Weaving Mills Ltd.	RWML
12	278	Safa Textiles Ltd.	STL
12	279	Saif Textile Mills Ltd.	SiTM
12	280	Sajjad Textile Mills Ltd.	SjTML
12	281	Salfi Textile Mills Ltd.	STML
12	282	Sally Textile Mills Ltd.	SlTML
12	283	Salman Noman Enterprises Ltd.	SNEL
12	284	Sana Industries Ltd.	SIL
12	285	Sapphire Fibres Ltd.	SFL
12	286	Sapphire Textile Mills Ltd.	STML
12	287	Sargodha Spinning Mills Ltd.	SaSML
12	288	Saritow Spinning Mills Ltd.	SSML
12	289	Service Fabrics Ltd.	SFL
12	290	Service Industries Textiles Ltd.	SITL
12	291	Shadab Textile Mills Ltd.	ShTML
12	292	Shadman Cotton Mills Ltd.	SCML
12	293	Shahtaj Textile Ltd.	STL
12	294	Shahzad Textile Mills Ltd.	ShTML
12	295	Shams Textile Mills Ltd.	ShTML

12	296	Sunrays Textile Mills Ltd.	STML
12	297	taha Spinning Mills Ltd.	TSML
12	298	tata Textile Mills Ltd.	TTML
12	299	The Crescent Textile Mills Ltd.	CTML
12	300	Towellers Ltd.	TL
12	301	Yousaf Weaving Mills Ltd.	YWML
12	302	Zahidjee Textile Mills Ltd.	ZTML
12	303	Zephyr Textiles Ltd.	ZTL
12	304	Saleem Denim Industries Ltd.	SDIL
12	305	Samin Textiles Ltd.	STL
12	306	Hira Textile Mills Ltd.	HiTM
12	307	Aruj Garment Accessories Ltd.	AGA
12	308	Fateh Sports Wear Ltd.	FSW
12	309	Gul Ahmed Textile Mills Ltd.	GAT
12	310	International Knitwear Ltd.	IKL
12	311	Moonlite (Pak) Ltd.	ML
12	312	Al-Abid Silk Mills Ltd.	ASMl
12	313	Bannu Woollen Mills Ltd.	BWM
12	314	Crescent Jute Products Ltd.	CJPl
12	315	Ibrahim Fibres Ltd.	IFL
12	316	Assoctated Services (Latif Jute Mills Ltd).	AS
12	317	Pakistan Synthetics Ltd.	PSl
12	318	Rupali Polyester Ltd.	RPl
12	319	S.G. Fibres Ltd.	SGFl
12	320	Suhail Jute Mills Ltd.	SJMl
12	321	The National Silk & Rayon Mills Ltd.	TNSR
12	322	Tri-Star Polyester Ltd.	TSPl