

**The Impact of Exchange Rate Changes on Firms' Exports in  
Pakistan: An Empirical Analysis using Firm-Level Data**



Shahid Mahmood

92-SE/MSEF/F12

Supervised by

Dr. Abdul Rashid

This thesis has been submitted in partial fulfillment of the requirements for the degree  
of Master of Philosophy (Economic and Finance).

**International Institute of Islamic Economics**

**International Islamic University, Islamabad**



Accession No.

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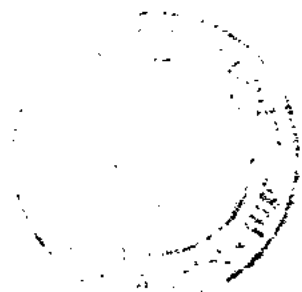
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**APPROVAL SHEET**

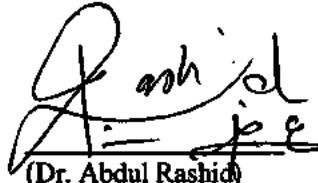
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— An Empirical Analysis using Firm-Level Data**

by

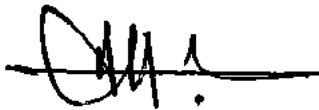
**Shahid Mahmood**  
Reg. No: 92-SE/MS-EF/F12

Accepted by the International Institute of Islamic Economics, International Islamic University, Islamabad, as partial fulfillment of the requirements for the award of degree of MS in Economics & Finance


**Supervisor:**

  
(Dr. Abdul Rashid)  
Assistant Professor, IIIIE  
International Islamic University, Islamabad

**Internal Examiner:**

  
(Dr. Arshad Ali Bhatti)  
Assistant Professor, IIIIE  
International Islamic University, Islamabad

**External Examiner:**

  
(Dr. Muhammad Ayub Siddique)  
Associate Professor, DMS, Bahria  
University, Islamabad

  
Head  
International Institute of Islamic Economics  
International Islamic University, Islamabad

  
Director General  
International Institute of Islamic Economics  
International Islamic University, Islamabad

Date of Viva Voce: 07-11-2014

## **Dedication**

This thesis is dedicated to my beloved parents. To my father Dr. Dil Aqa Waqar who supported me since the beginning of my studies and did great efforts for my education and intellectual development. To my mother, who incredibly cared me much and motivated me for learning and has been a source of strength during the moments of discouragement.

## **Declaration**

I declare that this dissertation is the product of my own original research work.

Wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature, and acknowledgement of collaborative research and discussions.

**Shahid Mahmood**

**12<sup>th</sup> November, 2014**

## Acknowledgments

Alhamdulillah All praises to Allah (SWT) for the strength and his blessing in completion of my MS thesis.

First of all, I would like to express my deepest sense of gratitude to my supervisor Dr. Abdul Rashid for his great efforts, continuous advice, constructive comments and encouragement throughout the course of this thesis.

I would like to express my appreciation to the Director General, IIE, Dr. Hafiz Muhammad Yasin and also to the Head, School of Economics, Dr. Arshad Ali Bhatti for their support and help towards my work on the thesis. Sincere thanks to all my friends who helped me in writing up of my thesis. Special thanks goes to my cousins Mr. Ataullah and Mr. Abdullah for their hospitality during my stays in Islamabad. My acknowledgement also goes to all the technicians and office staffs of School of Economics.

Last but not the least, my heartily thanks and deepest gratitude goes to my beloved parents for their endless love, prayers and encouragement. Indeed, the encouragement and continues support – both spiritually and materially – of my father, Prof. Dr. Dil Aqa Waqar made this thesis possible. I would like to express my profound gratitude to my brothers, sisters, my fiancée and the rest of my family for their love and sincere prayers. I would like to appreciate all those who directly or indirectly supported me in my thesis. Thank you.

Waqar

12<sup>th</sup> November, 2014

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## Abstract

The main purpose of this thesis is to examine the impact of exchange rate changes on the export of a large panel of manufacturing firms, listed on Karachi Stock Exchange (KSE), covering the period 2001-2012. The study used the dynamic panel data estimator, namely, the Blundell-Bond GMM estimator (system GMM) to estimate the model. The results show that exchange rate changes have a positive and statistically significant impact on the export performance of manufacturing firms, suggesting that one percent depreciation of Pak rupee causes firms' exports to increase approximately at 18 percent on the average. The results further show that the exchange rate volatility affects the export performance of the firms adversely at approximately 20 percent on the average. On the other hand, firm size emerged as an essential determinant of the export performance of firms in Pakistan, as it positively and significantly affects the exports of the firms. Other firm-specific variables such as firm size, firm efficiency and firm ability to borrow externally do affect the export performance of manufacturing firms positively and significantly. However, we found that changes in domestic demand and changes in nominal wages both affect the export performance of manufacturing firms negatively. Overall, the analysis suggests that the government is required to regulate the foreign exchange market regularly, so that to protect the export of the firms from negative shocks of the exchange rate. In addition, government is supposed to provide incentives and better atmosphere of investment for firms to expand their activities and to contribute further to their exports.

## **Chapter 1**

### **Introduction**

This chapter includes the introduction of the study. First, we present the background of the study, its objectives and significance and will describe the topic. Secondly, we show what other researchers have been done regarding this issue and what the gap is. Finally, we present the plan for our study.

#### **1.1 Background of the study**

Exchange rate is a significant policy variable which has a key role in enhancing and strengthening the trade level and is considered as a main tool through which the policy makers regulate the economy. However, variations in exchange rate have an essential role in the determination of trade balance. Through exchange rate policy, the balance of trade could be controlled into a certain direction. In this study, we will have more focus on exports rather than imports. Export performance is another tool that has a significant effect on the health of the economy. A high level of the export performance will definitely improve the trade balance, and will help to enhance the employment, GDP, and production levels in the economy. Further, higher level of exports will increase levels of international foreign reserves with central bank, and hence, will improve the balance of payment. Thus, if there is a stabilized exchange rate policy, there will be an improved balance of trade, balance of payment, and higher and sustainable level of economic growth.

Both theorists and empiricist have documented that exchange rate shocks and its fluctuations are among the factors that significantly affect the export performance both at firm level and at aggregate level. (Krugman and Obstfeld, 1999; Pilbeam, 1998; Majeed, Ahmad and Khuaja, 2006). From the time when the fixed exchange rate system

has been broken down in the early 1970s, exchange rates have been varied widely. This paved a way for policy makers and researchers to investigate the impact of variations in exchange rate on the healthiness of the economy in general, and on exports and imports, particularly.

Numerous studies have been carried out to empirically examine the impact of exchange rate variations on exports. However, most of the studies have used aggregate level data. Studies that have used firm level data are limited and mostly have been done for developed countries, leaving a gap in developing countries literature. Examples of the studies that used aggregate data are Sana and Saqib (2012), and Aqeel and Nishat (2006) for Pakistan, and similarly Ahmad (2009) and Kandil, Berument and Dincer (2007) for Bangladeshi and Turkey, respectively. A common finding emerging from these studies is that exchange rate variations negatively affect the aggregate exports. However, there are also some studies such as Aristotelous (2001) and Hwang and Lee (2005) for the USA and China, respectively, that have failed to find any evidence for a significant effects of changes in exchange rate on aggregate exports.

Recently, researchers started to investigate the effects of exchange rate dynamics on exports using firm level data. In fact, in order to dig deeply, it is useful to utilize disaggregated data (either firm level or sector level), as firms' and sectors' exports are likely to be exposed differently to exchange rate changes. Along these lines, Cheung and Sengupta (2012) found an evidence for negative association of Indian rupee appreciation and firms' export shares. Their results also imply the firms having lower level of export shares and produce services are affected highly by exchange rate changes as compared to those having higher level of export shares and produce goods. However, Li, Ma, Xu, and Xiong (2012) explored the influences of exchange rate movements on firms' exports using firm level data for a sample of Chinese firms, and

found a small and statistically insignificant effect of exchange rate variations on firms' export volume. However, they also found a small and significant effect of exchange rate changes on firms' export prices. Further, they found that more productive firms adjust the prices of exports, while less productive firms adjust the volume of exports in response to exchange rate dynamics. Moreover, Greenaway, Kneller, and Zhang (2007) found that export share is adversely affected by exchange rate fluctuations, while decisions regarding entry and exit of firms' to export market is not strongly linked to exchange rate movements. They further show that as compared to domestic firms, export behavior of multinationals are less likely to be influenced by exchange rate changes.

Although, the firm level studies provide interesting results regarding firms' characteristics and their responses to exchange rate changes, on the whole, empirical evidence is limited. Further, the existing studies in this issue are also limited to few countries. None of the existing studies has examined the response of firms' exports to exchange rate variations for a relatively small open economy, such as Pakistan. However, for better and complete understanding of how firms with different characteristics respond to changes in currency values, it is worthwhile to explore firms' response to exchange rate variation. It would also be useful to know whether firm size plays any role in firm's response to exchange rate dynamics. It is expected that larger firms are not only of being capable to get more benefits from favorable movements in exchange rate, but they also have more capacity to absorb the adverse shocks of the exchange rate.

## 1.2 Problem statement

Developing countries suffer much from high volatility and movements in the value of currency, which might be due to political instability, ineffective economic policies, import dependent economy and energy crises. Recently, Pakistan has been suffering much from such economic and political problems, for instance war on terror, energy crises, trade deficit and high level of debt burden caused the Pak rupee to fluctuate widely. These fluctuations in Pak rupee may have adverse effects on the economy and particularly on firms' exports. Standardized economic theory says that a depreciation of a currency will make exports cheaper relatively for foreigners and hence will increase the demand for exports.<sup>1</sup> Further, the exchange rate elasticity of exports demand does matter. If the export has less elastic demand, the depreciation of exchange rate will have lesser effects on the exports demand proportionally. However, if the export demand is more elastic, the exchange rate depreciation will have proportionally higher effects on exports demand. Moreover, if the demand for exports is unitary elastic, the impact of exchange rate depreciation would be exactly off set by the quantity change in the volume of exports. Thus, the higher the elasticity of exports demand, more it will be fruitful for the improvement of the balance of payments (BOP).<sup>2</sup> Moreover, it is also found that exchange rate shocks are passed through to import prices, absorbed in firms' selling prices (Lassmann (2013)). So, it is useful to explore the impact of exchange rate changes on export performance of manufacturing firms in Pakistan.

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<sup>1</sup>See Bernanke (2005) and Arnold (2011).

<sup>2</sup>See Glanville (2011).

### **1.3 Objectives and research questions of the study**

#### **1.3.1 The objectives of the study**

The main objective of this study is to examine the impact of exchange rate changes on exports of Pakistani manufacturing firms using firm level panel data covering the period 2001-2012. The study will also examine the effects of exchange rate volatility and firm size on firms' export performance. In other words, the study explores whether the size of the firm does matter for the response of firms to exchange rate fluctuations.

#### **1.3.2 The Research Questions**

Specifically, the study attempts to seek the answers of the following research questions:

- a. What is the impact of changes in exchange rate and its volatility on firms' exports?
- b. Does the size of the firm matter for the responses to exchange rate changes?

#### **1.4 Significance of the study**

From policy point of view, empirical evidence on how firms' exports respond to changes in exchange rate is worthwhile. The results of our study will assist the policy makers in designing effective policies, so that to achieve the goals for a healthy economy. Likewise, empirical evidence on the different impacts of exchange rate changes across small and large firms helps to enhance our overall understanding regarding this issue. Moreover, the study will benefit and will guide the future researchers and will serve as a future reference for them on examining the impact of exchange rate movements and its volatility exports using firm level data. However, prior studies have left gap in the literature, to fill this vacuum, the study adds to the



existing literature by analysis of the exchange rate movements and export behavior of the firms for a large panel of Pakistani manufacturing firms. Additionally, it will also help firms' management to take effective decisions regarding their export shares, particularly, when exchange rate is instable.

### **1.5 Brief summary of the findings**

The results of the study indicate that exchange rate changes and firm's export performance are positively associated. To be more thorough, a one percent increase in REER index will cause the export of the firms to be enhanced by roughly at 18 percent on the average. This finding is in accordance to the hypothesis 1 of our study, mentioned in Chapter 3. We also find that volatility in exchange rate has negative effects on export performance of firms. This result is also in accordance to the second hypothesis of our study. We also show that firm size does matter for the effects of exchange rate changes on firms' exports. In Particular, we observe that larger firms are less likely to be affected by unexpected exchange rate shocks as compared to their smaller counterparts.

### **1.6 Study Plan/organization of the study**

The study is organized as following. Chapter 2 presents an overview of the export performance of Pakistan economy, particularly in the last decade. Chapter 3 gives a theoretical framework of the study, by describing the variables and their relationship with each other. Additionally, Chapter 3 also contains our research hypotheses which are being tested in the study. Chapter 4 is meant to serve as review of the existing literature on the impact of exchange rate changes on exports, in all, aggregate, firm and sector levels. In Chapter 5, we are finally moving to one of the important part of the dissertation, namely the methodology and data sources. Chapter 5 further contains the explanation of the model and the application of the system GMM estimator. In the

following chapter, Chapter 6, the results, their interpretation, and economic analysis are being presented. The closing chapter, Chapter 7, contains a brief summary of the study, concluding remarks, and policy implications.

### **1.7 Conclusion**

For the regulation and controlling of the economy as whole, and particularly for the trade balance, exchange rate policy is a key instrument. Exchange rate movements could affect the export performance either at country or at firm level, which will ultimately have an effect on the health of the economy. Various studies have been conducted to examine the response of the firms for exchange rate movements, but the results of the most of the studies are inconclusive at best. However, most of these studies are confined to developed countries. Empirical evidence on this issue is limited for a relatively small developing economy, namely Pakistan. Therefore, the current study focuses on the impact of exchange rate movements and exchange rate volatility on export behavior of manufacturing firms, using micro level data, covering the period 2001-2012 for Pakistan. The results reveal a positive association of exchange rate fluctuations on export performance. The findings, however, indicate negative relationship between volatility of exchange rate and firms' export performance. More clearly, a depreciation (appreciation) of exchange rate will boost (deteriorate) firm's exports. These results suggest that abrupt and unpredicted variations in exchange rate are harmful for firms' exports.

## **Chapter 2**

### **A Brief Overview of Pakistan's Exports**

In this chapter, we present a brief overview of the export performance of Pakistan economy. We focus mainly on export growth, major markets of exports, and export concentration and composition of Pakistan's economy.

#### **2.1 Export growth**

In last 30 years Pakistan has experienced a healthy export growth, particularly in last few years, with an annual export growth of about 16 percent over the period 2002-2006. After the month of July 2006, the exports of Pakistan declined sharply to less than 4 percent for about 10 months. In the fiscal year of 2006-07, due to bad weather condition the production of food group was lesser as compared to the previous years, which caused the prices of rice and fruits to increase, and it was profitable for the producers to sell them domestically rather than to export them abroad. Hence, the export of food group particularly rice and fruit decreased by 2.6% and 14.3% respectively in mentioned fiscal year. In addition, the export growth of manufacturing sector was 6.2%, and for other textile materials even it registered 17.2% export growth. On the other hand, the remaining manufacturing exports which include carpets, sports goods, chemicals products, surgical materials, rugs & mats and some other textile products such as, cotton cloth, raw cotton and bed wear recorded a negative export growth in this period.

In the next fiscal year (2007-08), the overall export growth of Pakistan was about 10.2% which shows good performance of export as compared to the previous year which had an export growth of 3.6%. In this fiscal year, all the exporting sectors posted a

handsome growth of export, except the textile sector. For example, other manufacturing items registered 33.2% rise in their exports, along with this, the exports of food group and petroleum group have grown up by 22.4% and 38%, respectively, which shows a remarkable growth in these sectors. However, the export performance of the textile sector, which accounts for more than half of the total exports, was weak, as it recorded the decline of 2.5% in export growth. With the exception of the raw cotton and other textile items, all the remaining items witnessed a negative export growth, which pulled the overall export to be decreased. Despite of the provision of the financial support by the government through R&D, the export performance of the textile sector has not been improved. So it is clear, that the problem is structural problem, which should be solved by the industry itself. In addition to structural problems, there were some other related issues which caused the export performance of textile to grow negatively. For example, the weakening law and order condition in the country, slowdown of the demand for exports of Pakistan in the US economy which is considered as a major export destination of Pakistan and facing of Pakistan with tough competition of China, Bangladesh, Turkey and India in European market for textile apparel.

**Table 2.1: Export growth of different groups of goods in different periods.**

| Particular         | Export growth |         | Export growth |         | Export growth |         | Export growth |         | Export growth |         |
|--------------------|---------------|---------|---------------|---------|---------------|---------|---------------|---------|---------------|---------|
|                    | 2005-06       | 2006-07 | 2006-07       | 2007-08 | 2007-08       | 2008-09 | 2008-09       | 2009-10 | 2009-10       | 2010-11 |
| Food Group         | -3.5          | 22.4    | 24.9          | 7.1     | 29.1          |         |               |         |               |         |
| Textile Group      | 6.2           | -2.5    | -9.3          | 7       | 32.1          |         |               |         |               |         |
| Petroleum Group    | -0.2          | 38.1    | -27.9         | 7.3     | 32.6          |         |               |         |               |         |
| Other Manufactures | -12.8         | 33.2    | 0.4           | 0.7     | 8.6           |         |               |         |               |         |
| All other Items    | 67.6          | 59.5    | 16.9          | 65.9    | 45.5          |         |               |         |               |         |
| Total              | 3.6           | 10.2    | -3            | 8       | 27.8          |         |               |         |               |         |

Source: Pakistan Economic Survey 2010-11

On the other hand, in the upcoming fiscal year (2008-09), the overall export of Pakistan witnessed negative growth. The poor performance of textile and petroleum sector,

contributed negative growth to the overall exports, as the exports of the textile and petroleum group decreased by 9.3 % and 27.3 %, respectively. The decline in the textile export might be attributed to the decrease in its demand globally due to global economic meltdown, constrained credit availability, political law and order situation, and the lack of energy supply. In addition, the share of the textiles in total export has also been decreased from 57 percent in previous year to 53 percent in this year. However, the export of raw cotton, cotton cloth and towels and other textile manufactures exhibited a positive export growth.

Further, the export of other manufactures which accounts 19.9 percent of the overall exports also grew up by about 0.4 percent, and contributed about 2.7 % to total export growth of the country. Quite the reverse, in the forthcoming fiscal year (2009-10), Pakistan's overall export observed a notable positive growth of 8 percent against 3 percent negative growth in preceding year. The main reason behind the increment in the export growth of the period under review could be the higher level of the production in major export items, the recovery of the demand in international market, and the depreciation of the exchange rate. The textile sector has witnessed a recovery, as it had an export growth of 7 percent, and other manufacture group has also seen an increase in its exports in the period under review. However, due to decrease in external demand and expected competition by Saudi Arabia in cement industry, the performance of the export of cement industry has been fell down by 17.1 percent in year under consideration, as compared to its impressive growth in the previous year.

Accordingly, the export performance of Pakistan in the fiscal year 2010-11 was inordinate, as the merchandise export witnessed an impressive growth rate of 27.8 percent. Indeed, all the export sectors registered positive growth in the mentioned period. Though, the foremost share of this period's overall export was of the textile

sector and food group with an export growth of 61.8 % and 18.1 % respectively, and the key factor behind this growth is the increment in the unit values of the textile manufactures compared to the conforming period in preceding year. However, export performance in the upcoming fiscal year 2011-12 was poorer over the previous year. As compared to the 32.1 percent growth in previous year, textile exports dropped by 9.6 percent in 2011-12. This decline is attached to the decrease in the quantity of exports, and the main reason behind this miracle is the energy crises and fall in international demand. Although, the export of other manufactures has increased with a striking growth rate of 19.9 percent, but this increment was offset with a 5.9 percent, 15.6 percent and 6.3 percent negative export growths of carpets, leather garments and cutlery respectively.

## **2.2 Export concentration and composition**

There are five items which are considered as a main exporting items of Pakistan, namely, cotton, leather, rice, sport goods and textile manufactures. These five items accounts a higher share of about 77.2 percent of total exports in 2006-07. Indeed, if we see to the export performance of Pakistan in the fiscal year 2006-07, it is clearly concluded that Pakistan is moving slowly to highly value added exports in textile sector, as the shares of the knitwear, bedwear and towels have increased during the preceding seven years.

For the next two fiscal years of 2007-08 and 2008-09, the degree of concentration of the export has been changed a little. For instance, the share of the five main export categories, mentioned earlier has decreased to 72.4 percent and to 73.5 percent in 2007-08 and 2008-09 respectively, as compared to their shares in corresponding periods of their preceding fiscal year. The foremost contribution from these five main categories

was of the cotton which contributed 54.7 percent to total exports, followed by rice (7.1%), leather (6.1%), textile (2.9%) and sports goods (1.6%). However, the high value added exports observed a decline in the period under review. Beside this, the cotton yarn and cotton cloth has also witnessed a decline.

**Table 2.2: Pakistan's major exports (Percentage Share)**

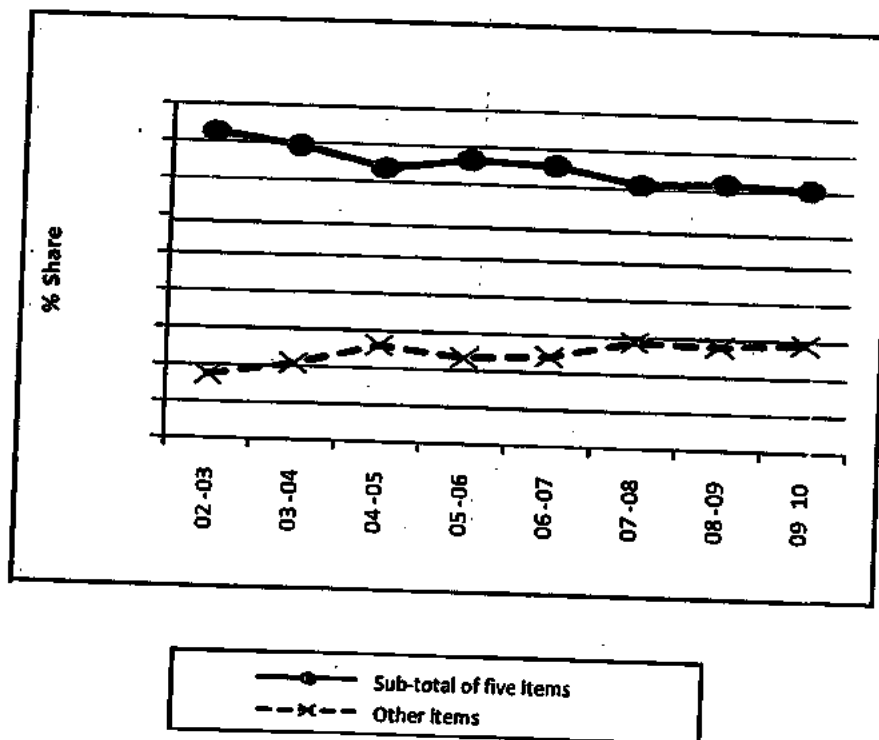
| Commodity            | 01-02 | 02-03 | 03-04 | 04-05 | 05-06 | 06-07 | 07-08 | 08-09 | 09-10 |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Cotton Manufacturers | 59.4  | 63.3  | 62.3  | 57.4  | 59.4  | 59.7  | 51.9  | 52.2  | 51.3  |
| Leather              | 6.8   | 6.2   | 5.4   | 5.8   | 6.9   | 5.2   | 5.8   | 5.4   | 4.3   |
| Rice                 | 4.9   | 5.0   | 5.2   | 6.5   | 7.0   | 6.6   | 9.8   | 11.2  | 11.4  |
| Synthetic Textiles   | 4.5   | 5.1   | 3.8   | 2.1   | 1.2   | 2.5   | 2.1   | 1.6   | 2.4   |
| Sports Goods         | 3.3   | 3.0   | 2.6   | 2.1   | 2.1   | 1.7   | 1.6   | 1.5   | 1.5   |
| Sub-Total            | 78.9  | 82.6  | 79.3  | 73.9  | 76.6  | 75.7  | 71.2  | 71.9  | 70.9  |
| Other Items          | 21.1  | 17.4  | 20.7  | 26.1  | 23.4  | 24.3  | 28.8  | 28.1  | 29.1  |
| Total                | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100   | 100   |

Source: Pakistan Economic Survey 2009-10

Similarly for the upcoming fiscal year 2009-10, export concentration remained unchanged as it was in preceding few years, as they still accounted 70.9 percent share in overall export. Yet again, the key contributor among these five main items is the cotton, which contributed 51.3 percent share to overall exports. Despite of the concentration of the exports of Pakistan in these five items, the share of the export of the other items has increase from 17.4 percent in 2002-03 to 29.1 percent in the period under consideration. On the other hand, during the fiscal year 2010-11, Pakistan's exports have concentrated into three main categories, namely, cotton manufactures, rice and leather, as they recorded the share of 66.3 percent in overall exports. Again, cotton manufactures contributed about 80% among these three categories to their share in overall exports. The higher contribution of cotton manufactures indicates that the export

concentration is much intense, and thus, it needs to be diversified, in order to be protected against unexpected external shocks.

**Fig 2.1: Comparison of the shares of the sub-total of five items and other items in overall exports**



In Fig 2.1, the vertical axis shows the percentage shares of different items in overall exports, while the horizontal axis shows years. Although, the concentration of export is changing over time, but at much sluggish rate. This changes in concentration continues to the next fiscal year 2011-12, and the share of the other items increases to 39 percent in overall exports.

Despite of such structural changes in export shares, the concentration of the export of Pakistan still remains in few items, namely, cotton manufactures, leather and rice, as they registered a share of 61 percent in overall exports during the fiscal year 2011-2012.



**Table 2.3: Export of textile manufactures (% Share)**

| Item                      | 01-02       | 02-03 | 03-04 | 04-05 | 05-06 | 06-07 | 07-08 | 08-09 | 09-10 |
|---------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
|                           | Cotton Yarn | 16.1  | 12.9  | 14.0  | 12.7  | 13.7  | 13.6  | 12.5  | 11.7  |
| Cotton Cloth              | 19.6        | 18.6  | 21.3  | 23.3  | 21.6  | 19.3  | 19.4  | 20.5  | 17.2  |
| Knitwear                  | 14.6        | 15.9  | 18.1  | 18.9  | 17.6  | 18.7  | 18.0  | 18.2  | 17.0  |
| Bed wear                  | 15.9        | 18.4  | 17.2  | 16.4  | 20.8  | 19.0  | 18.3  | 18.2  | 16.6  |
| Towels                    | 4.6         | 5.2   | 5.0   | 5.9   | 5.8   | 5.7   | 5.9   | 6.7   | 6.5   |
| Tents, Canvas & Tarpaulin | 0.9         | 1.0   | 0.9   | 0.8   | 0.3   | 0.7   | 0.7   | 0.6   | 0.6   |
| Readymade                 | 15.1        | 15.1  | 12.4  | 12.9  | 13.8  | 13.2  | 14.0  | 12.9  | 12.6  |

Source: Pakistan Economic Survey 2008-09

Indeed, the export of Pakistan consists primary commodities, semi-manufactured products and manufactured good in its composition. Over the years, the composition of Pakistan's export has been changed in the favor of manufactured goods, as it recorded an impressive share of about 75 percent of overall export during the fiscal year 2008-09.

**Table 2.4: Composition of exports of Pakistan (% Share)**

| Year    | Primary Commodities | Semi-Manufactures | Manufactured Goods | Total |
|---------|---------------------|-------------------|--------------------|-------|
| 2001-02 | 11                  | 14                | 75                 | 100   |
| 2002-03 | 11                  | 11                | 78                 | 100   |
| 2003-04 | 10                  | 12                | 78                 | 100   |
| 2004-05 | 11                  | 10                | 79                 | 100   |
| 2005-06 | 11                  | 11                | 78                 | 100   |
| 2006-07 | 11                  | 12                | 77                 | 100   |
| 2007-08 | 14                  | 11                | 75                 | 100   |
| 2008-09 | 16                  | 10                | 74                 | 100   |
| 2008-09 | 17                  | 9                 | 74                 | 100   |
| 2009-10 | 18                  | 11                | 71                 | 100   |

Source: Pakistan Economic Review 2009-10

The composition of the export of Pakistan has remained almost same for last few years, as the manufactured goods constitute three fourths of them. The stagnation of the composition of the exports in past few years exhibits slow movements of the exports toward sophistication through inventions and technology.

### 2.3 Pakistan's export directions

Pakistan trade with different countries, but its exports are highly concentrated into a few destinations, namely, the USA, the UK, Germany, Hong Kong, Japan, UAE, and Saudi Arabia. These few countries receive about one-half of the Pakistan's exports, as among them, the US is the single leading market which accounts for 28.4 percent of Pakistan's exports in 2006-07. Similar to the concentration of the exports, Pakistan's export directions remained stagnant to few countries, mentioned earlier. Remaining in the historical tendency, these few countries persisted the key directions for the exports of Pakistan during the fiscal year 2008-09.

**Table 2.5: Major exports markets (Percentage Share)**

| Country          | 01-02       | 02-03       | 03-04       | 04-05       | 05-06       | 06-07       | 07-08       | 08-09       | 09-10       |
|------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| USA              | 24.7        | 23.5        | 23.9        | 23.9        | 25.5        | 24.6        | 19.5        | 18.9        | 17.3        |
| Germany          | 4.9         | 5.2         | 4.9         | 4.8         | 4.2         | 4.1         | 4.3         | 4.2         | 4.2         |
| Japan            | 1.8         | 1.3         | 1.1         | 1.1         | 0.8         | 0.7         | 0.7         | 0.6         | 0.5         |
| UK               | 7.2         | 7.1         | 7.6         | 6.2         | 5.4         | 5.6         | 5.4         | 4.9         | 5.5         |
| Hong Kong        | 4.8         | 4.6         | 4.7         | 3.9         | 4.1         | 3.9         | 2.7         | 2.1         | 2.1         |
| Dubai            | 7.9         | 9.0         | 7.3         | 3.3         | 5.6         | 1.1         | 0           | 0           | 0           |
| Saudi Arabia     | 3.6         | 4.3         | 2.8         | 2.5         | 2.0         | 1.7         | 2.0         | 2.6         | 2.0         |
| <b>Sub-Total</b> | <b>54.9</b> | <b>55.0</b> | <b>52.3</b> | <b>45.7</b> | <b>47.6</b> | <b>41.7</b> | <b>34.6</b> | <b>33.3</b> | <b>31.6</b> |
| Other Countries  | 45.1        | 45.0        | 47.7        | 54.3        | 52.4        | 58.3        | 65.4        | 66.7        | 68.4        |
| <b>Total</b>     | <b>100</b>  | <b>100</b>  | <b>100</b>  | <b>100</b>  | <b>100</b>  | <b>100</b>  | <b>100</b>  | <b>100</b>  | <b>100</b>  |

Source: Pakistan Economic Survey 2011-12

So Pakistan needs to diversify its exports in both, in terms of destinations and in terms of products, because keeping exports heavily concentrated into few products and markets may result in export instability.

However, Pakistan attained important geographical diversification in exports since the fiscal year 2009-10, as the share of above seven countries decreased continuously to 31.6 percent, as compared to their 55 % share in overall exports throughout the fiscal year 2001-02. This diversification further increased in the upcoming fiscal year. The main reason behind the increment in the geographical diversification of the Pakistan's export was the introduction of (STPF<sup>3</sup> 2009-12), and the escalation in exports to three other countries, namely, China, Afghanistan, and Bangladesh.

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<sup>3</sup> Strategic Trade Policy Framework

## Chapter 3

### Theoretical framework

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This chapter includes the some theories related to our study. In Section 3.1, we explain the theory of exchange rate and its relationship with export performance. Afterwards, we discuss the size of the firm and show its relationship with export behavior of firms. Finally, we describe the relationship of export performance with foreign income and domestic demand.

#### 3.1 Exchange rate and export performance

Exchange rate is the price of one currency in terms of another currency. It is considered among the most significant prices in an open economy as it has a strong influence on balance of payment and on other macroeconomic variables, namely, interest rates, prices etc. Different countries use different currency units, through which they value their goods and services. Exchange rate has a vital role in international trade, through which we can compare the prices of produced goods and services across the globe. There two ways for the quotation of the exchange rate, one is direct (American) quotation in which foreign currency is quoted in terms of Pak rupees, and the second one is indirect (European) quotation, in which Pak rupee is quoted in terms of foreign currency.

Regarding the exchange rate, one of the important question which comes into mind is that what are the implications of changes in exchange rate on the economy as a whole and particularly, on the balance of payment? Policy makers are concerned much with changes in exchange rate and its impact on the macroeconomic variables. Because, the exchange rate by itself does not convey enough information as compared to the changes

in exchange rate. Therefore economist compile indices of nominal, real and effective exchange rates, to explore and analyze the effects and implications of movements in exchange rate on the economy.

### 3.1.1 Nominal and real exchange rates

Nominal exchange rate is the price at which one currency is transacted with another one. This is the exchange rate which prevails at a given date in the forex market. So as to know the competitiveness of a country, getting information from an increase or decrease in the value of the nominal exchange rate is not enough. Therefore, we need to look at the real exchange rate to get such information. Real exchange rate (RER) can be defined as the nominal exchange rate, adjusted for the relative price levels among the countries under consideration. In other words, RER is the price of US basket of goods in terms of Pak rupees relative to that of the price of Pakistan's basket of goods.

Symbolically, we can write as following:

$$RER = E * P_{us} / P_{pk}$$

Where, RER is real exchange rate, E is nominal exchange rate,  $P_{us}$  is price level in USA, and  $P_{pk}$  is domestic price level in Pakistan. The national currencies are transacted against each other in forex market. The basic function and establishment of the foreign exchange market is the transformation of purchasing power from one currency/country to another currency/country. It also provides credit for international trade and facilitate hedging from foreign exchange risk (Krugman and Obstfeld, 1999). The exchange rate is determined in forex market through market forces, i.e. supply and demand for that currency.

The flow of goods and services across nations in the globe requires the conversion of the currency of importing country into the currency of the exporting country. Therefore, the export from Pakistan will generate the supply of foreign exchange and the demand for Pak rupees. On the other hand, the import to Pakistan from abroad will generate the supply of Pak rupees and the demand for foreign currencies (Chacholiades, 1990). Tourist travelling, emigration, sale and purchase of foreign assets etc. are other factors that bring changes in supply and demand of the currencies.

### **3.1.2 Movements in exchange rate**

Movements in exchange rate are shown either by depreciation or appreciation. A decrease in Dollar price in terms of Pak rupee is the depreciation of Dollar. Whereas, a decrease in Dollar price in terms of Pak rupee is the appreciation of Dollars. However, it should be taken into consideration that a depreciation of Pak rupees against Dollars, is at the same time the appreciation of the Dollars against Pak rupees. Keeping in mind this rule, we reach to the conclusion, that if the currency of a country depreciates, foreign residents can purchase its exports cheaper and the domestic residents find the import from abroad more expensive. However, an appreciation has inverse impact on the trade, such that if Pak rupee appreciates the exports of Pakistan become more expensive for foreigners, and at the same the imports become cheaper for domestic residents. Thus, the demand for exports will deteriorate, and the demand for foreign products will rise (Krugman and Obstfeld, 1999).

Similarly, for real exchange rate, if the rupee price of US basket of goods rises, the purchasing power of the rupee will fall in US relative to its purchasing power in Pakistan. This situation is referred as real depreciation of rupee against dollars. Similarly, if the rupee price of US basket of goods declines, the purchasing power of

the rupee will rise in US relative to its purchasing power in Pakistan, which is referred as real appreciation. In short, an increase in the value of real exchange rate shows depreciation of domestic currency, whereas, a decrease in the value of real exchange rate shows appreciation of that currency. An increase in money supply causes depreciation of the currency, while fiscal expansion causes the currency to appreciate. However, in both, an increase in money supply and fiscal expansion the output level is increased.

### 3.1.3 Real effective exchange rate

In today's globalized world, majority of the countries do not enter into trade only and only with one country, rather, they do enter into trade with more than one country. Economists are not concerned with what is happening to their exchange rate against a single foreign currency, but instead, what is happening to it against a basket of foreign currencies (currencies of the major trade partners). In the real world, there are many currencies, against which we want to value Pak rupee. Indeed, Pak rupee does not depreciate at the same rate relative to all other currencies. Rather, Pak rupee may depreciate at different rates relative to some currencies, while it may appreciate at different rates relative to some other currencies. Thus, it would be difficult to determine the external value of Pak rupee, whether it has increased or decreased. Therefore, to measure the average change in external value of Pak rupee, the effective exchange rate index has been developed, which measure the price of Pak rupee in terms of a basket of foreign currencies.

In other words, the effective exchange rate measures what is happening to the exchange rate against a weighted basket of foreign currencies, (Pilbeam, 1998). For example, if Pakistan is conducting 40 percent of its trade with the USA, and 60 percent with China,

this means that a weight of 0.4 will be assigned to the bilateral exchange-rate index with dollar, and 0.6 with the Chinese Yen. Although, nominal exchange rate is easy to compile on a daily basis, and provide a reasonable measure of changes in a country's competitive position, but it does not take into account the effect of price movements. Therefore, to get full information of changes in competitive positions of countries, we are required to look into the real effective exchange rate (REER). To find and calculate REER, the real exchange rate of each country should be compiled with each of the trading partners' currencies in index form.

If REER increases in Pakistan, foreign buyers will respond through an increase in the demand for the exports of Pakistan, as in this case, the domestic output can buy less units of foreign output. Whereas, reverse is the case for the appreciation. In conclusion, all the things remain same, an appreciation of Pak rupee causes the exports value to decrease and the imports value to increase, which results in a deterioration in the current account of Balance of Payment. The reverse is true for the case of depreciation.

*Hypothesis 1: An increase in REER (depreciation) will strengthen the export performance of a firm, while a decrease in REER (appreciation) will deteriorate the trade and particularly export performance of a firm.*

On the other hand, there are a strand of studies (Mundell, 2000; Arize, Osang and Slotge, 2008; Doroodian, 1999) which demonstrates in their theoretical models that exchange rate volatility generates uncertainty and is more likely to increase the riskiness regarding the export activities, which may ultimately lead to depress the export performance of firms.



*Hypothesis 2: There is a negative relationship between exchange rate volatility and the export performance of manufacturing firms. To be more precise, the higher level of volatility will have adverse effects on the export performance of firms.*

### **3.2 Firm size and export performance**

Among the variables specified for each firm, firm size is another important variable which affects firms' export performance significantly. Firm size is measured by several proxies. For example it is measured by employee's number, volume of sales, total assets and level of investment and R&D. For the competitiveness of a firm in global market, its size has a vital role. Therefore, if a firm is larger, it owns higher level of human and financial resources, which enable it to enter into world market easily and enhance its competition there.

In addition, economies of scale is another factor which will help the larger firms in their international competitiveness, as larger firms are able to minimize per unit cost of production through economies of scale. Further, larger firms can get benefit from economies of scope, which is considered to be efficient in the production of different varieties of output, as compared to a number of firms to produce separately (Gabbitas and Gretton, 2003). Moreover, it is also important for larger firms to take advantage of price discrimination for different segments of the market, risk taking ability and expenditure on R&D. Thus, theoretical literature suggest positive and significant association of firm size with export performance. (Verwaal and Donkers, 2002; Dhanaraj and Beamish, 2003).

*Hypothesis 3: Larger firms respond differently to exchange rate changes and exchange rate volatility as compared to their smaller counterparts.*

However, an increase in export performance is not guaranteed by firm size, because above a certain size, firms are supposed to change their directions to foreign direct investment, so that to minimize their total cost and to avoid trade restrictions implemented by different governments. (Schlegelmilch and Crook, 1988). In addition to firm size, firm efficiency in capital utilization (measured by sales to total assets) and firm ability to borrow externally (measured by a collateral, such as the ratio of net fixed assets to total assets) are two other firm characteristics which have positive relationship with export performance. The underlying hypothesis will be that more efficient firms and firms that have higher ability to borrow are more likely to grip negative exchange rate shocks.

Foreign income is another factor which influence the export performance of a country. If foreign income is higher, foreigners can buy large amount of domestic goods of a country, and hence will increase the export. On the other hand, if foreign income is lower, it means the purchasing power of the foreigners are low, and they are unable to purchase domestic goods of a country. Thus, foreign income is expected to has positive relationship with export performance, (Funk and Ruhwedel, 2001; Akal, 2010; Burment, Dincer, and Mustafaoglu, 2014). Further, changes in domestic demand (which is proxied by change in GDP) and changes in wages do affect the export performance of firms, such that if the demand for goods increases, it will negatively affect the export supply. On the other hand, if wages increases, it will increase the cost of production for firms, and will have influence on the competitiveness of the firm

negatively in the global market. Thus, a rise in wage and in domestic demand will decline the export supply of a firm.

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## Chapter 4

### Literature Review

The literature review of this study is organized by reviewing the existing literature of the relationship of the export performance with each of its determinant and with some other country-level control variables separately. However, we will focus more on the main variables of the study, namely changes in exchange rate, exchange rate volatility, and firm size. First, the study reviews the literature regarding the effects of exchange rate changes and its volatility on export behavior at country, sector and firm levels. Secondly, the study reviews the literature concerning the relationship of the export behavior and firm-specific control variables, particularly, firm size. Finally, the study reviews the literature describing the relationship of the export performance with country level macro variables and finally the chapter is closed with concluding remarks.

#### 4.1 Exchange rate and export performance

Recently, many empirical studies have been carried out to investigate the association between exchange rate movements and exports. The studies are categorized into three parts. The first category includes studies that investigate the effects of exchange rate changes and its volatility on exports at aggregate level. The second type of studies are those which explore the association between changes in exchange rate and exports at sector and industry level, which include both changes in exchange rate and the volatility of exchange rate in their models. The third and final type of the studies are those that investigate the effects of changes in exchange rate and volatility of exchange rate on exports at firm level. Below, we will review the literature regarding each of these categories separately.

#### 4.1.1 Aggregate level analysis

Majority of the studies conducted at aggregate level examine the impact of volatility in exchange rate rather than changes in exchange rate on export performance. Sana and Saqib (2012) found a negative relationship between exchange rate volatility and exports of Pakistan for the period 1981-2010, using time series data. Their results further show that import has direct effect on export performance of the country. Similarly, Aqeel and Nishat (2006) found same results for Pakistan employing the quarterly data for the period 1982:1-2000:4 using co-integration and vector error correction model techniques. Likewise, Arize, Osang and Slottje (2008) empirically examined the effects of exchange rate volatility on export behavior of eight Latin American countries over the quarterly period 1973-2004. They found a negative relationship between volatility of REER and export demand in both the short run and the long run in all Latin American countries. Similarly, Kandil, Berument and Dincer (2007) focused the impact of exchange rate changes on aggregate demand, particularly on exports, aggregate supply and demand for domestic currency in Turkish economy for the period 1980-2004. The study decomposed the exchange rate movements into anticipated and unanticipated, and found that both anticipated and unanticipated appreciation of exchange rate is going to have an adverse and statistically significant impact on export progress, while the depreciation of both will boost the export growth. In the same way, Ahmad (2009) shows the same results for Bangladesh.

On the contrary, Altintas, Cetin and Öz (2012) found a significant positive effects of the RER volatility on Turkish exports. Likewise, Olayungbo, Yinusa and Akinlo (2011) found a positive effect of exchange rate volatility on aggregate trade in 40 selected sub-Saharan African countries for the period 1986-2006, employing gravity model and allowing for fixed effects and panel GMM techniques. Moreover, Mustafa, Nishat and

Kernal (2004) made an attempt to examine the relationship between export growth and exchange rate volatility in Pakistan with its major trade partners. The study used co-integration and error correction techniques to establish the relationship, using quarterly data from 1991:3 to 2004:2. Their results indicate that the exchange rate volatility has negative and significant effects both in the short run and in the long run on trade with the UK, the USA, Australia, Bangladesh, and Singapore. The findings further reveal that the established relationship of exchange rate volatility and export growth for Pakistan and India observed only in long run perspective, while no empirical relationship is found for both New Zealand and Malaysia.

Campa (2004) found a quantitatively small response of aggregate trade volumes to changes in exchange rate. His results also indicate sunk costs hysteresis in entry and exit of the exporting firms. However, Bredin and Fountas (2003) found no effect of exchange rate volatility on Irish exports in the short run, while a positive effect in the long run. Recently, Bekele (2013) made an attempt to examine whether Ethiopia's exports are determined by changes in real exchange rate. The study has taken the aggregate export and the exports of two main subsectors, the coffee and oilseeds into consideration, and used bilateral exports to seventeen major exporting partners over the period 2000-2009. The author used a dynamic panel data model using the system GMM estimator. His findings suggest that both lagged and current real exchange rate changes does not have significant effect on Ethiopia's bilateral exports for all export categories under consideration. Furthermore, Fang, Lai and Miller (2009) investigated the asymmetric effects of exchange rate risk on bilateral disaggregated (firm level) exports of eight Asian countries to the USA, employing a dynamic conditional correlation bivariate GAARCH-M model. The findings indicate that real exchange rate volatility

affect exports asymmetrically, which means that real exchange rate affect exports negatively during depreciation and positively during appreciation.

#### **4.1.2 Sector/Industry level analysis**

Dincer and Kandil (2011) found adverse effects of exchange rate variations on export volumes of twenty one exporting sectors in Turkish economy. The authors used a theoretical model which decompose variations in exchange rate into two categories, one is anticipated and another is unanticipated. Their findings further suggest that the effects of depreciation in enhancing and boosting the export growth has lost momentum over time in Turkey. Similarly, Wong and Tang (2008) investigated the effects of exchange rate movements on the demand for merely electrical exports in Malaysia. Their findings indicate that exchange rate movements have a negative impact on Malaysia's electrical exports. Their results also show that foreign income and prices are key determinants of electrical exports. Their results are consistent in both, the short run and the long run. Shah, Mehboob, and Raza (2012) also empirically examined the association of the exchange rate with the performance of exporting sectors in Pakistan, and found a significant long run relationship between them. Their results reveal that in case of Pakistan, a depreciation currency stimulate the performance and competitiveness of the exporting sectors.

Klein (1990) made an attempt to investigate the impact of exchange rate volatility on nine main groups of exporting goods to different major industrial countries, using disaggregated data, employing fixed effect framework. The results of the study indicate that there are different responses across different categories of exporting goods. It shows a significant influence of exchange rate volatility for six out of the nine categories of exporting goods, while a positive effect for five categories.

Furthermore, Tabar and Akbari (2009) investigated the effects of RER volatility on export flows of agriculture sector products of Iran covering the period 1975-2006. Their results reveal a strong significant link between volatility in exchange rate and Iran's agriculture sector export performance depending on the measure used for volatility. In the same way, Okamura, Asahi and Yamaguchi (2012) found an adverse effect of exchange rate volatility on most of the manufacturing exports (six out of eight industries) in Japan. The exchange rate fluctuations has been captured by one of the time series model, EGARCH model. The study used export action model constructed based on VAR (Vector Auto Regressive) model to investigate the association between exchange rate volatility and export performance, typically for eight kinds of industries.

#### **4.1.3 Firm level analysis**

Cheung and Sengupta (2012) explored the influences of changes in exchange rate and volatility in exchange rate on export shares of a large panel of manufacturing firms in India. Their results conclude that a currency appreciation has statistically significant adverse effects on export shares of manufacturing firms in India. Their findings further show that firms having smaller export share and that produce are less likely to be influenced by exchange rate movements as compared to the firms having larger export shares and which produce goods. In the same way, Berman, Martin, and Mayer (2009) found different reactions of high and low productivity firms for exchange rate changes in France, employing a rich firm level dataset. Their findings conclude larger firms which have higher level of performance respond to a depreciation of currency by rising their export prices rather than their export volume, while on the other hand the case of reverse is true for those exporter firms which have lower performance.



In the same way, Greenaway, Kneller, and Zhang (2007) found a significant negative impact of movements in exchange rate on export shares of the non-multinational firms, while a little impact on the export performance of multinational corporations, using dataset of a large panel of UK manufacturing firms. Their results further reveal that adjustments in export due to exchange rate changes occur mainly through adjustments in the shares of the exports of currently available exporting firms, rather than through changes in the number of the exporters. Their former findings are consistent with the results of the Cheung and Sengupta (2012).

Likewise, Deckle and Ryo (2007) found a significant impact of exchange rate fluctuations on export behavior of Japanese firms using firm-level panel dataset. Their findings also states that financing constraints have impact on hedging decisions and sensitivity of export behavior to movements in exchange rate. The results further show that firms which are not financially constrained much, are more likely to have lesser elasticities of exports with regard to movements in exchange rate, as compared to those firms which are financially constrained. However, Pessova (2013) found different effects of the size and the REER on export propensity, using logistic regression model, taking into consideration the ownership of the firms. He found a strong positive influence of size on export behavior of foreign owned firms in Brazil, while a low positive effect of REER on export propensity of Brazilian owned firms.

On the other hand, the findings of Guillou (2008) demonstrates that for most industries, movements in exchange rate have neutral effects on export sales, while it has a vital role in entry of the firms to export markets, exploiting the database of large panel of French manufacturing firms. Her results also indicates that the past export intensity of the firms is an important factor which has influence on current intensity of the firm's export. The later results supports the presence of sunk costs for firms. Similarly, Li,

Ma, Xu *et al.* (2012) found a lesser and statistically insignificant impact of movements in exchange rate on export volumes of firms, and a lesser but significant impact on export prices, exploiting dataset constructed for Chinese manufacturing firms. The results further reveals that high productivity firms do not adjust their export volume, but rather they do price-to-market by absorbing the effects of exchange rate movements into the exports prices, partially. While on the other hand low productivity firms adjust the volume of their export, rather their export prices. Their later findings are similar to the findings of Berman, Martin, and Mayer (2009). For 143 of 500 biggest Turkish firms, Solakoglu and Dimerag (2008) concluded that exchange rate volatility has neutral effects on export sales of firms, which means that it has neither positive nor negative impact on firms' exports for the period 2001-2003. His findings further show that the firm size and its global operations do not affect the size and significance of the impact of the exchange rate volatility on exports. His findings which show the neutrality of the impact of changes in exchange rate on the intensity of firms' exports are in line with the findings of Guillou (2008) who also reported neutrality in the effects of exchange rate changes on firms' exports.

Moreover, Tang and Zhang (2012) made an attempt to explore the relationship of exchange rate shocks with aggregated trade on extensive (entry and exit of exporter firms) and intensive margin (exchange rate elasticity of export supply) using monthly export data for a large panel of individual Chinese manufacturing firms. They found relatively less elastic exchange rate elasticity of export supply (i.e. elasticity of 0.4). Likewise, Fitzgeraldy and Haller (2012) investigated the elasticity of export market entry and export sales against real exchange rate movements and tariffs, using reduce forms and structural dynamic discrete choice models of export sales. They found the elasticity of export sales less than one and not significantly different from one, which

is consistent with the estimates based on the aggregate data. They found tariff elasticity of export sales about four to five which is greater than the real exchange rate elasticity of export. However, Lassmann (2013) analyzed how exchange rate shocks transmitted to the firms' export activity using data for a sample of Swiss firms. The author found that exchange rate movements are transmitted to import prices, absorbed in firm's selling prices, and lead to adjustments in firm's profits. His findings further suggest that a rise in the index of exchange rate leads to an increase in the probability of a decrease in firm-level costs, prices and profits.

To conclude, the findings of the empirical studies that examines the effects of movements in exchange rate on export performance at aggregate, sector, and firm levels are not consistent, as some finds negative, some neutral and even some concludes with a positive association of exchange rate movements and export sales. However, as regard to the effects of the exchange rate volatility on export performance, the common findings among the majority of the studies are in agreement with theoretical explanation, that shows its negative effect on export performance.

#### **4.2 Firm size and export performance**

The relationship between firm size and export performance is a controversial and broadly discussed issue in international business literature. Theoretical explanations state the existence of a direct association of firm size and export behavior. Larger firms, having higher level of financial and human resources and have economy of scale, enabling them to easily enter to world markets (Wagner 1995, 2001). Recently, it has been examined by many studies, and report inconclusive results. The large number of the studies in this field reveal inconsistencies and contradictions in their results, however, most of them approve a positive and significant relationship between firm

size and export behavior. Some studies (Moini, 1995; Wagner, 1995; Verwall and Donkers, 2001; Calof, 1994) show positive effects of firm size on export behavior, some others (Bonaccorsi, 1992; Gabbitas and Gretton, 2003; Pla-Barber Alegre, 2007) does not support this argument and show insignificant relationship between them, while there are even some studies (Paiblandla, 1995; Esteve-Perez, Gil-Parejay, Liorca\_Viero *et al*, 2011) which report negative influence of firm size on export sales.

Indeed, Majocchi, Bacchiocchi and Mayrhofer (2005) made an attempt to investigate the relationship between firm size and export behavior for a panel of Italian firms which spans 1997-2001 period. The study has been carried out, using longitudinal data, employing a dataset of 5-year time series financial reports of 144 manufacturing firms in Italy. The results of the study exhibit a strong significant evidence for the positive effects of firm size on export sales of firms.

Archarunroj and Hoshino (1998) found a significant effects of firm size on export intensity and attitude toward exports. The study empirically examined the effects of firm size on both the export intensity and attitude toward it. They use a comprehensive questionnaire by 86 Thai exporting firm managers. The study fails to find any evidence to support the argument that larger exporting firms do better in terms of export performance as compared to smaller exporting firms, nor do they have higher positive attitude toward export. Similarly, Pla-Barber and Alegria (2007) found the same relationship in a particularly, science based industry. The results of their study clearly state that firm size could not be considered as a determinant of the export intensity. They used the sample of 121 firms in a French biotechnology industry.

On the other hand, Monteiro (2013) has pointed out another issue related to the effect of firm size on export activity and concluded that as a result of variation in the proxies

used to measure firm size and export activity, the findings are also being changed. However, if the proxy for firm size is varied and the export performance proxy remained fixed, even then there are instable and opposite results in export performance. The study used responses of the questionnaire survey from a sample of major industries in Portugal.

In conclusion, despite of such a huge number of studies conducted in this field, the results are inconclusive and contradictory. The reason might be the usage of varies proxies for firm size and export performance by authors for their studies, which yields inconsistent and contradictory results. However, the majority of the studies point out a positive and statistically significant influence of firm size on export performance, which is in line with the theoretical explanation.

#### **4.3 Foreign income, GDP growth and export performance**

In this subsection, we will review the literature regarding the relationship between foreign income and export performance and GDP growth and export performance.

In addition to exchange rate, foreign income is considered as another important determinant and deriving force of export performance. Foreign income influences the export performance positively, as the foreign income increases, the export performance of firms also going to be increased. A wide range of studies have been carried out to estimate export demand functions and to analyze the income elasticity of export demand. Reviewing the empirical literature, it can easily be concluded that majority of the studies have found income elasticity of export demand greater than one. Funk and Ruhwedel (2001) estimated income elasticity of export for a group of East Asian countries more than three. In the same way, Akal (2010) found 1.99 income elasticity of export demand of Turkish exports to OECD countries. Further, Burment, Dincer and

Mustafaoglu (2014) analyzed income elasticity of export demand for different sectors of Turkish economy separately, and found the income elasticity of export demand more than one, which is in agreement with the literature. However, the study observed significant variations across countries. However, Shane, Roe and Somwaru (2008) estimated the income elasticity of export demand less than one, for US agriculture exports, covering the period 1970-2006.

Esteves and Rua (2013) investigated the effects of domestic demand on export performance of Portuguese firms from 1<sup>st</sup> quarter of 1980 to the 2<sup>nd</sup> quarter of 2012 using quarterly data and estimated error correction model. They found that in addition to exchange rate and foreign income, the domestic demand is also a highly substantial determinant of the export performance. Their results reveal the existence of a strong negative association of domestic demand and export performance of firms. They further discussed the asymmetry effects of domestic demand and found its existence, which shows that due to decrease in domestic, the export performance of firms' increases significantly at higher level as compared to the case when domestic demand is increasing. For instance, when domestic demand is increasing, firms' are not in a position to decline their export performance, because they have already incurred sunk costs.

#### **4.4 Concluding Remarks**

At the beginning, the study reviewed a vast number of empirical studies regarding the effects of movements in exchange rate and volatility in exchange on export performance, and concluded with an inconclusive results for the impact of exchange rate changes and its volatility on export performance. Subsequently, the relationship of the export performance with some firm-specific variables, particularly, firm size and

some other country level control variables have been reviewed. The findings of these studies also significantly vary, though majority of them concluded positive effect of both firm size and foreign income and negative effect of GDP growth on export performance.

As a final point of this section, we reach to the conclusion that, up to our knowledge, there does not exist any study which investigate and explore the impact of exchange rate changes and its volatility on firms export in a relatively small developing economy, such as Pakistan. To fill this gap, the objective of the current study is to explore the relationship and association of changes in exchange rate and volatility in exchange rate on export performance of firms in Pakistan. This is the first study which employ the system GMM, a dynamic panel data estimator, to estimate the impact of changes in exchange rate on export performance of manufacturing firms in Pakistan.

## Chapter 5

### Data and Methodology

In this chapter, first we present the data sources and its summary statistics. Then, we specify the model, and define all the variables included in the model and finally we explain the estimation technique used for the current study.

#### 5.1 Data

This study uses panel data for the analysis. The data for firms' exports are taken from the financial statements of the firms for the period 2001-2012, published by State Bank of Pakistan (SBP). The data on real effective exchange rates are collected from IMF database (International Financial Statistics). The standard deviation of the monthly REER indices of the year, shows the volatility in REER. The data for wages and GDP is taken from Labor Force Statistics, published by Pakistan Bureau of Statistics and World Development Indicators (WDI) respectively.

##### 5.1.1 Descriptive statistics of the data:

The descriptive statistics of the variables are given in Table 5.1:

**Table 5.1: Descriptive statistics of the variables**

| Variable           | Obs  | Mean    | Std. Dev. | Min      | Max       |
|--------------------|------|---------|-----------|----------|-----------|
| Log of exports     | 2103 | 5.456   | 0.958     | 1.934    | 7.558     |
| REER               | 1901 | 100.450 | 2.889     | 97.090   | 106.260   |
| REER_vol           | 2103 | 1.876   | 0.707     | 0.686    | 2.731     |
| For. Income (log)* | 2103 | 12.501  | 0.055     | 12.431   | 12.612    |
| Firm size          | 2069 | 6.300   | 0.601     | 4.547    | 8.355     |
| Firm Efficiency    | 2062 | 119.706 | 74.059    | 0        | 1122.755  |
| Firm's Ext. Bor**  | 2055 | 145.300 | 808.140   | 0        | 16164.800 |
| GDP (log)          | 2103 | 11.130  | 0.166     | 10.859   | 11.352    |
| Nominal Wage       | 1955 | 6695.24 | 2693.192  | 3432.370 | 12118     |

\* Log of foreign income

\*\*Firm external borrowing (ratio of net fixed assets to total assets)



Table 5.1 shows descriptive statistics of the variables used in current study. The first row shows the dependent variable of the study, which is reported in the form of common logarithm. The subsequent three rows presents the statistics for the key determinants of the export performance, in which foreign income is in the form of common logarithm. The next three rows show the summary statistics for firm-specific control variables. The final two rows represent the statistics for the country-level control variables. As the data regarding exports for some firms are missing for some years, therefore, we have included only those years in which the firms have exported. Thus, the observations shown for each variable in Table 5.1 represent only the observations of those years in which the corresponding firm has exported.

In order to see the relationship between different variables, we present table of correlation coefficients as below.

**Table 5.2: Correlation Coefficients**

|                      | $\Delta$ Exports | $\Delta$ REER | REER_vol | Firm Size | Firm Eff | Firm Bor Ext | $\Delta$ Foreign Income | % $\Delta$ Wage | % $\Delta$ GDP |
|----------------------|------------------|---------------|----------|-----------|----------|--------------|-------------------------|-----------------|----------------|
| $\Delta$ Exports     | 1                |               |          |           |          |              |                         |                 |                |
| $\Delta$ REER        | 0.0861           | 1             |          |           |          |              |                         |                 |                |
| REER_vol             | -0.031           | 0.141         | 1        |           |          |              |                         |                 |                |
| Firm Size            | 0.0664           | 0.1467        | 0.1388   | 1         |          |              |                         |                 |                |
| Firm Eff             | 0.0921           | 0.0266        | -0.0527  | -0.1531   | 1        |              |                         |                 |                |
| Firm Bor. Ext        | 0.0167           | 0.0362        | 0.0151   | -0.2179   | 0.028    | 1            |                         |                 |                |
| $\Delta$ Foreign Inc | 0.0631           | 0.2508        | -0.1069  | -0.0359   | 0.0877   | 0.0141       | 1                       |                 |                |
| % $\Delta$ in Wage   | -0.0259          | -0.0975       | 0.4121   | 0.2316    | -0.0439  | -0.0047      | -0.6022                 | 1               |                |
| % $\Delta$ in GDP    | 0.0655           | -0.0178       | -0.6806  | -0.1153   | 0.0493   | -0.0186      | 0.6258                  | -0.6599         | 1              |

Table 5.2 represents correlation coefficients for different variables. We observe in the table that there is positive correlation between changes in exchange rate and changes in exports, while there is negative association between exchange rate volatility and export performance. Similarly, firm-specific control variables have positive association with export performance.

## 5.2 Model Specification

Various studies have been conducted to show the key determinants of the export performance of a country, (Reis and Taglioni, 2013; Majeed, Ahmad and Khuaja, 2006; Sterlacchini, 2001; Zou and Stan, 1998). The common findings which they document are that the exchange rate, foreign income, firm size, firm efficiency, firm ability to borrow externally are the main determinants of the export performance in developing countries. However, in this study, we follow Cheung and Sengupta (2012) to specify our empirical model. The model used by Cheung and Sengupta (2012) includes main variables, firm-specific control variables, and country-specific control variables which are explained later on in this chapter.

$$\Delta X_{it} = f(\Delta X_{it-1}, \Delta REER, REER\_vol, \Delta I, FS, FE, FBE)$$

Where,  $\Delta X$  represents changes in exports;  $\Delta X_{it-1}$  is the lagged dependent variable;  $\Delta REER$  is changes in real effective exchange rate;  $REER\_vol$  is exchange rate volatility;  $\Delta I$  is foreign income;  $FS$  is firm size;  $FE$  is firm efficiency; and  $FBE$  is firm ability to borrow externally.

As far as the estimation of the model is concerned, we estimate four models in our study. First, we estimate equation (1), having only main determinants of the export performance. Next, we control firm-specific effects, and add firm-specific control variables to our preceding model. Afterwards, we control for macroeconomic effects and supplement the previous model with country-level control variables and finally, we will augment our empirical model by incorporating interaction terms to see the indirect effects of exchange rate changes and its volatility via firm size on export performance of firms. This model enable us to examine the differential impact of exchange rate changes and its volatility on exports across firm size.

### 5.2.1 The effects of exchange rate changes and its volatility on firms' export performance

To examine the impact of exchange rate changes and its volatility on firms' export performance, we estimate Model 1, which is the baseline empirical model for our empirical analysis and includes the key determinants of firms' export performance.

$$\Delta X_{it} = \alpha_0 + \Delta X_{it-1} + \alpha_1 \Delta REER_t + \alpha_2 REER\_vol_t + \alpha_3 \Delta I_t + \mu_i + \eta_t + \varepsilon_{it} \text{ ----- (1)}$$

where  $X_{it}$  represents the export performance, measured as the level of net exports (=exports-imports) of firm  $i$  at time  $t$ ;  $\Delta REER_t$  is the change in real effective exchange rate, an increase in exchange rate is indicating a depreciation of a Pak Rupee;  $REER\_vol_t$  is the volatility of real effective exchange rate, defined as the standard deviation of monthly REER indices of the year. While estimating the effects of exchange rate changes on firms' exports, we also control for foreign income effects by including  $I_t$  (Trade share weighted average income of top five trading partners of Pakistan) into the model. To capture the effects of time-invariant unobservable firms' specific attributes, such as managerial characteristics, product quality, and foreign experience, we include fixed-effects  $\mu_i$  variable in the model;  $\eta_t$  is an annual time effect, showing the variation in exports shares that are common to all firms in the sample. It may include trade liberalization across all firms, general technology advancement etc, and finally  $\varepsilon_{it}$  is the error term.

### 5.2.2 The effects of exchange rate changes and its volatility on firms' export performance (controlling for firm-specific effects)

We next estimate Model 2, in which we incorporate firm-specific control variables, in order to capture the effects specified for each firm separately. Our supplemented model will be as following:

$$\Delta X_{it} = \alpha_0 + \Delta X_{it-1} + \alpha_1 \Delta REER_t + \alpha_2 REER\_vol_t + \alpha_3 \Delta I_t + \alpha_4 Y_{it-1} + \mu_i + \eta_t + \varepsilon_{it} \quad (2)$$

where,  $Y_{it-1}$  which is a vector of observable characteristics of firm  $i$  at time  $t$ . These are firm-specific control variables included in the model to capture firm-specific effects. In particular, we included firm size (measured by log of total assets of the firm) and its efficiency (measured by the ratio of total sales to total assets) and firm ability to borrow externally (measured by collateral, as a ratio of net fixed assets to total assets). The rest of the variables are similar to Model 1.

### 5.2.3 The effects of exchange rate changes and its volatility on firms' export performance (controlling for both firm-specific and country-specific effects)

Next, to take into account the effects of macroeconomic conditions on firms' exports, we add country-level control variables into Model 2. Specifically, the model takes the following form.

$$\Delta X_{it} = \alpha_0 + \Delta X_{it-1} + \alpha_1 \Delta REER_t + \alpha_2 REER\_vol_t + \alpha_3 \Delta I_t + \alpha_4 Y_{it-1} + \alpha_5 Z_t + \mu_i + \eta_t + \varepsilon_{it} \quad (3)$$

where,  $Z_t$  includes percentage changes in nominal wage and percentage changes in nominal GDP. The effects of the operational costs captured by the changes in wage variable, while the effects of the domestic demand captured by changes in GDP. The rest of the variables are as in the Model 2.

### 5.2.4 Indirect and differential effects of exchange rate changes and its volatility on export performance

In addition to the direct effects of exchange rate changes and its volatility, sometimes they may have indirect effects on firms' export performance through changes in the size of a firm. To observe whether exchange rate changes and its volatility do affect firms'

export performance indirectly through firm size, we augment Model 3 by including interactions, namely, firm size-exchange rate changes, and firm size-exchange rate volatility. We finally write our fourth model as follows:

$$\Delta X_{it} = \alpha_0 + \alpha_1 \Delta REER_t + \alpha_2 REER\_vol_t + \alpha_3 \Delta I_t + \alpha_4 Y_{it-1} + \alpha_5 Z_t + \alpha_6 firm\_size * \Delta REER_t + \alpha_7 firm\_size * REER\_vol_t + \mu_i + \eta_t + \varepsilon_{it} \quad (4)$$

To see the indirect effects of exchange rate changes and its volatility on firms' export performance, we investigate the role of firm-size in export performance of firms. In particular, we examine whether larger firms and their smaller counterparts are different in responding to the exchange rate changes and its volatility. To see this, following Caglayan and Rashid (2014), we compute the total derivatives of firms' exports with respect to exchange rate changes and with respect to exchange rate volatility as shown in the following equations:

$$\frac{\partial X}{\partial dreer} = \beta_{dreer} + \beta_{firmsize\_exch} \times Firm\_size \quad (I)$$

$$\frac{\partial X}{\partial reer\_vol} = \beta_{reer\_vol} + \beta_{firmsize\_exv} \times Firm\_size \quad (II)$$

where,  $f_{exp}$  is the change in firms' exports;  $\beta_{dreer}$  and  $\beta_{firmsize\_exch}$  refer to the estimated coefficients of exchange rate changes and the exchange rate changes-firm size interaction, respectively. Likewise,  $\beta_{reer\_vol}$  and  $\beta_{firmsize\_exv}$  represent the estimated coefficients of exchange rate volatility and the exchange rate volatility-firm size interaction, respectively. Firm-size denotes a certain level of size of the firm which we compute at 10<sup>th</sup>, 20<sup>th</sup>, 30<sup>th</sup>, 40<sup>th</sup>, 50<sup>th</sup>, 60<sup>th</sup>, 70<sup>th</sup>, 80<sup>th</sup>, and 90<sup>th</sup> percentiles. Doing this, we examine the effects of exchange rate changes and its volatility on firms' exports at each percentile of firm size.

### 5.3 Defining variables

In this section, we define the variables of our model. First, we define main variables of the model, then we explain firm-specific and country-specific control variables.

#### 5.3.1 Main variables of the model

The model which we will use in this study includes three main variables, namely, changes in real effective exchange rate, the volatility of real exchange rate, and foreign income.

**Real Effective Exchange Rate:** Real effective exchange rate is nominal exchange rate adjusted for the relative price indices. The nominal effective exchange rate is the value of Pak rupee against a weighted basket of foreign currencies. The basket of foreign currencies may include the currencies of those countries which have high trade share with Pakistan and are considered as major trade partners with Pakistan. More clearly, CPI-based REER is computed by IMF as weighted geometric average of the level of consumer prices in the home country relative to that in its trade partners. Specifically, the CPI-based REER indicator of Pakistan is given by

$$E_i = \prod_{j \neq i} \left[ \frac{P_i R_i}{P_j R_j} \right]^{W_{ij}}$$

Where  $j$  is an index that runs over country  $i$ 's trade partners,  $W_{ij}$  is the competitiveness weight put by country  $i$  on country  $j$ ,  $P_i$  and  $P_j$  are consumer price indices in countries  $i$  and  $j$ , and  $R_i$  and  $R_j$  represent the nominal exchange rates of countries  $i$  and  $j$ 's currencies.<sup>4</sup>

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<sup>4</sup> See Zanillo and Desuelle (1997)

### 5.3.2 Firm-specific control variables

In addition to the main variables, we have included some firm-specific control variables to capture the effects specified for each firm separately. We will discuss each of them separately as following.

***Firm Size:*** Firm size is measured by different proxies, such as number of employees, sales volume, and total assets. However, we will measure it as the log of total asset in this study. It is one of a firm-specific control variable, which influences the export performance of the firm positively. If a firm is larger, it can easily engage itself in the competitiveness in global market, as they have enough resources to do so. Thus, firm size has a vital role in the export performance of the firms. Pla-Barber and Alegree (2007) and Cheung and Sengupta (2012) are studies which investigated the relationship between firm size and export performance, and found its significant positive impact on exports.

***Firm Efficiency:*** Firm efficiency in capital utilization is the next firm-specific variable which has a significant impact on the export performance of firms. It is measured as the ratio of a firm's sales to total asset of the firm. Firm efficiency is positively associated with a firm's exports. The higher the level of efficiency, the higher will be the level of a firm's exports. Rankin and Teal (2005) and Cheung and Sengupta (2012) have used this variable in their studies to see its effect on export performance, and found a positive impact of firm efficiency on exports.

***Firm Ability to Borrow Externally:*** It is measured by a measure of collateral, such as the ratio of net fixed assets to total assets, and is expected to be positively related to export performance of firms. The higher the ability of a firm to borrow externally, the higher will be the performance of a firm to export. Cheung and Sengupta (2012) have

used firm ability to borrow externally as a firm-specific control variable in their export performance model, and found a positive impact on export performance.

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### 5.3.3 Country level control variables

Some country-specific variables have also been incorporated to the model to capture the effects of the macroeconomic condition of the economy, they are as following:

***Changes in GDP of the Country:*** Domestic demand for goods do affect the export performance of the firms. Keeping in mind the components of GDP, in this study, we have proxied changes in GDP for changes in domestic demand. Domestic demand is negatively associated with the export of a firm. The higher the level of domestic demand, lower will be the export performance of firms. To measure changes in GDP, first we take the log of the GDP and then we find changes. Fitzgerald and Haller (2012) and Berman, Martin and Mayar (2009) have used this variable in their model to see its impact on export performance, and found a negative impact on exports.

***Changes in Wages:*** This is another macroeconomic variable which affects the export ability of firms. Higher wages will increase the cost of production, and hence will lower the exports. So wages have a negative relationship with firms' export. To find changes in wages, we take the first difference of the nominal average monthly wage for each year. Greenway, Kneller and Zhang (2006) and Cheung and Sengupta (2012) have used this variable in their studies to examine its effects on export performance. They found a negative impact of changes in wages on export performance of firms.



## **5.4 Estimation technique**

### **5.4.1 The GMM Estimator**

Panel data is widely used recently by the researchers in different interest areas of economics. GMM estimator is one of the best estimator for dynamic panel data estimation, as it gives consistent and reliable coefficient estimates of the variables. GMM estimator, developed by Arellano-Bond (1991), Arellano-Bover (1995)/Blundell-Bond (1998) is a dynamic panel data estimator, which recently became the most popular estimator among the researchers. This estimator is designed for situation when there are small number of time periods and large number of individuals (small T and large N). In addition, there should also exist the linear relationship between variables, when one dependent variables, which is dynamic in nature, that depends upon its past realizations. Further, this estimator is used, when there are independent variables, correlated with either the contemporaneous or the past realizations of the error term, which indicates that the independent variables are not strictly exogenous, but rather they are either predetermined or endogenous. Moreover, GMM estimator is also useful when there is heteroskedasticity and autocorrelation inside the individuals, but not across them.

#### **5.4.1.1 Types of GMM estimator**

There are two types of GMM estimator, namely, Arellano-Bond estimator (Difference GMM) and Blundell-Bond (1998) estimator (System GMM). In order to estimate the model, Arellano-Bond estimator (difference GMM) transform all the regressors, using differencing and then uses generalized method of moments. On the other hand, Blundell-Bond (1998) estimator (System GMM) add an extra assumption, that first differences of the instruments variables are orthogonal to individual fixed effects. In

fact, incorporating the above assumption intensely strengthens the efficiency of the estimator, due to the introduction of extra instruments. Blundell-Bond (1998) estimator consists a system of two equations, namely, the original equation and the transformed one, for that reason, it is called system GMM.

#### *5.4.1.2 Why the Blundell-Bond (1998) estimator (System GMM estimator)*

In real world, there are various variables which are dynamic in nature, which means that they are depended upon their historical realizations. The export performance of firms is one of them, which is dynamic in nature, as the last year export performance of a firm do have an influence on the current year's performance of the export. The classical linear regression estimator (OLS) minimizes the residual sum of squares and its main assumption is that the regressors are uncorrelated to the error term. To estimate our model using classical linear regression estimators (OLS and 2SLS) would yield inconsistent results, as the dependent variable and its lag are correlated with the individual fixed effects, known as dynamic panel bias. Thus, this correlation would attribute predictive power to the lagged dependent variable and will make it to be inflated. Beside this, the estimated coefficients are going to be underestimated. So, in this case, the OLS estimator provides unreliable and inconsistent coefficient estimates.

So how to find the solution and handle this problem of endogeneity? There are two ways to grip this problem. First, to get rid of the fixed effects by transforming the data through difference GMM. Second, to find an instrument for lagged dependent variable, which is uncorrelated with error term and highly correlated with lagged dependent variable itself. The latter option is incorporated in system GMM. Indeed, there are two types of transformation. First, the first difference transformation, through which the fixed effects is eliminated from the data, but the lagged dependent variable is still

endogenous, as it is correlated with the lagged error term. Likewise, some regressors which were already predetermined would become potentially endogenous, as it will also become correlated with lagged error term. The second type of transformation which is commonly used is the "Forward orthogonal deviation", in which instead of subtracting the previous observation from the present one, the mean of all available future observations is subtracted.

The second solution, as we mentioned earlier, was to use instruments for lagged dependent variables. As the estimator is designed for general application, it is not necessarily required to find instruments outside the dataset, rather the researchers can use instruments from within dataset. Usually,  $Y_{it-2}$  is considered as the natural candidate for lagged dependent variable,  $Y_{it-1}$ . However, if the data are in transformed form, then, both  $Y_{it-2}$  and  $\Delta Y_{it-2}$  can be used as instruments for lagged dependent variable  $Y_{it-1}$ , as both the instruments are mathematically related to the lagged dependent variable, while uncorrelated to the error term. In fact, if the dependent variable is near to random walk, then the performance of differenced GMM would be poor, as the past levels does not provide enough information to predict the future changes. Thus, for differenced variables, the using instruments in untransformed form would perform weaker. Therefore, in order to remove the dynamic panel bias and to be the estimators more efficient, Blundell-Bond (1998) transformed the instruments instead of transforming the regressors, so that the instruments would become exogenous to the fixed effects. In sum, the Arellano-Bond estimator, uses level instruments for transformed variables, while the Blundell-Bond (1998), uses differenced instruments for level variables. Further, it is also worth mentioning, that past changes in fact may carry more information about current levels, as compared to the past levels for current changes. Moreover, it is not recommended to use deeper lags in GMM technique, as it may not

reveal extra sufficient information, and using additional instruments will cause the problem of “many instruments” relative to the sample size, which will lead to the weakening of the power of over-identification test (Roodman, 2009).

It is the beauty of system GMM that time-invariant variables could also be incorporated in the model, which is not possible in differenced GMM, as through differencing, all the time invariant regressors and fixed effect is purged out from the model. The incorporation of time invariant regressors would not affect the coefficient estimates of the remaining regressors, as all the instruments are orthogonal to fixed effects and to time invariant regressors as well.

However, due to the existence of autocorrelation in the disturbance term, sometimes using lags as instruments would become invalid. Therefore, researchers are required to check for the validity of instruments and for autocorrelation. The standard test for checking autocorrelation is the Sargan/Hansen test after GMM estimation. In addition to this, Arellano-Bond developed another test, applied for the residuals in differences. For example, to check the autocorrelation for order 1 in levels, we are required to look for 1+1 order correlation in differences. For the validity of the instruments, we will employ the  $J$  test of Hansen (1982). We will also apply the Arellano-Bond AR (2) test to observe the presence of second-order correlation in the residuals.

### **5.5 Concluding Remarks**

To conclude, we can say that OLS estimator is not suitable for estimating dynamic panel data models, as there exists correlation between regressors and error term, which is against the assumptions required for the consistency of OLS. Hence, the OLS estimator will result in upward biasness in its coefficient estimates. In addition, using fixed effect estimator would also be biased and will make the regressors potentially

endogenous to the error term after transformation. Although, individual fixed effects are purged out, but lagged dependent variable is still correlated with error term and the estimates are biased downward.

Coming to differenced GMM estimator, in which fixed effects are removed, and beside this, there does not exist correlation between regressors and error term, as the endogenous regressors are instrumented. However, Blundell-Bond (1998) confirmed that difference GMM performs poorly if the dependent variable is close to random walk, as untransformed lags are not capable enough to predict future changes in the transformed regressors. Thus, Blundell-Bond (1998) suggests that, in order to be the estimation more efficient, instead, the transformed lags should be used as instruments for the levels variables, as the differenced lags provide enough information for current changes in level variables. Further, it is also essential to note that first difference of instruments should be orthogonal to the fixed effects in error term. Therefore, we will use system GMM for estimation of the model in our study. The system GMM consists of two equations, one is the level equation and another is the differenced one, as the level variables in second equations are instrumented with their first differences.

## Chapter 6

### Results and Discussion

This chapter presents the empirical results for the impact of exchange rate changes and its volatility on export performance of firms for a panel of manufacturing firms in Pakistan. The empirical analysis is carried out by using Blundell-Bond (1998) GMM dynamic panel data estimator (System GMM), as mentioned earlier in Chapter 5 of the current study. We begin our empirical analysis by estimating equation (1) to examine the impact of exchange rate changes and its volatility on firms' export performance. We next estimate equation (2) and equation (3), in which we have incorporated firm-specific and country-level control variables into our specification, respectively. Finally, we estimate equation (4) to analyze the role of firm-size in determining the effects of exchange rate changes and its volatility on export performance.

#### 6.1 The effects of exchange rate changes and its volatility on firms' export performance

The results for equation (1) are given in Table 6.1. The table shows the results of two models, namely, Model 1 and Model 2. Model 1 shows the results for equation (1) without incorporating year dummies into the specification, while Model 2 shows the results for the same equation incorporating year dummies into the model. For each model the first and second columns show the coefficient estimates and the corresponding standard errors, respectively. In Table 6.1, we see that changes in REER index emerged with a coefficient of 0.011 points, having a positive sign and appearing significant at one percent level of significance. This indicates that an increase in REER (depreciation of domestic currency) will cause the export performance of manufacturing firms to be increased.

**Table 6.1: Results for the effects of exchange rate changes and its volatility**

| Regressors                   | Model 1      |          | Model 2      |          |
|------------------------------|--------------|----------|--------------|----------|
|                              | Coefficients | St. Err. | Coefficients | St. Err. |
| Lagged dependent variable    | 0.156***     | (0.047)  | 0.415*       | (0.290)  |
| Change in REER               | 0.011***     | (0.003)  | 0.013***     | (0.005)  |
| REER_vol                     | -0.009**     | (0.008)  | -0.017**     | (0.024)  |
| Change in foreign income (I) | 0.064**      | (0.136)  | 0.082**      | (0.148)  |
| Constant                     | 0.060***     | (0.176)  | 0.073*       | (0.059)  |
| Year Dummies                 | No           |          | Yes          |          |
| <b>Diagnostic tests</b>      |              |          |              |          |
|                              | Statistics   | P-value  | Statistics   | P-value  |
| AR(2)                        | 1.31         | 0.250    | 1.19         | 0.250    |
| J- Statistics                | 56.13        | 0.196    | 16.55        | 0.221    |

Notes: J-statistics used for testing the over identification of the restrictions with a null of instrument validity, while AR (2) is a test of the existence of the second order correlation in first differenced residuals.

\*indicates 10% significance, \*\* indicates 5% significance, \*\*\* indicates 1% significance. Standard errors are shown in parenthesis.

However, the volatility of exchange rate (REER\_vol) appears with a negative sign and having coefficient of 0.009 and is statistically significant at five percent. This shows that exchange rate volatility adversely affects the export performance of firms. The changes in foreign income emerged with the significant coefficient estimate of 0.064, implying that improvements in foreign income causes the export performance of firms to be increased. The J-statistics show that instruments used in system GMM are valid, and satisfy orthogonality condition. Similarly, AR (2) statistics does not provide any indication for the existence of second order serial correlation in residuals. These results are in accordance with our anticipation as per hypothesis 1 and hypothesis 2, in which a positive and negative association of the exchange rate changes and its volatility was predicted with firms' export performance, respectively. It is also in agreement with the existing literature, particularly that of Cheung and Sengupta (2012) and Kneller and Zhang (2007), which found similar results for India and the UK, respectively. However,

Table 6.1 further shows that the lagged dependent variable has a notable effect on export performance of firms, suggesting that the stronger the export performance of the firms are in last year, the higher will be their current export performance.

### **6.2 The effects of exchange rate changes and its volatility on firms' export performance (controlling for firm-specific effects)**

Table 6.2 presents the results for equation (2). Similar to the previous table, Table 6.2 also shows the results of the two estimated models, with and without year dummies.

Table 6.2 shows that changes in the REER index has a significant coefficient of 0.009, with a positive sign, indicating that an improvement in REER index (depreciation of domestic currency) affects firms' export performance positively. However, the exchange rate volatility is observed with a negative sign, having coefficient estimate of 0.022, statistically significant at one percent level of significance, suggesting that exchange rate volatility has adverse effects on export performance of firms. Further, firm size, firm efficiency, and firm ability to borrow externally have emerged with significant positive coefficients, implying that all of them positively affect export performance of firms. However, the effects of the firm efficiency and firm ability to borrow externally are lesser as compared to the effects of firm size. Moreover, the results in Table 6.2 reveal that foreign income significantly positively affect the export performance of firms'. Finally, the AR (2) and J-statistics indicate that there does not exist second serial autocorrelation in residuals and the instruments used in the model are valid.



**Table 6.2: Exchange rate changes and its volatility effects: controlling for only firm-specific effects**

| Regressors                   | Model 1           |                | Model 2           |                |
|------------------------------|-------------------|----------------|-------------------|----------------|
|                              | Coefficients      | St. Err.       | Coefficients      | St. Err.       |
| Lagged dependent variable    | 0.018***          | (0.008)        | 0.023**           | (0.009)        |
| Change in REER               | 0.009***          | (0.001)        | 0.009***          | (0.001)        |
| REER_vol                     | -0.024**          | (0.003)        | -0.022**          | (0.005)        |
| Change in foreign income (I) | 0.095*            | (0.058)        | 0.089**           | (0.169)        |
| Firm size                    | 0.105***          | (0.013)        | 0.101***          | (0.014)        |
| Firm efficiency              | 0.004***          | (0.001)        | 0.004***          | (0.001)        |
| Firm ability to bor. Extern. | 0.001***          | (0.001)        | 0.001***          | (0.002)        |
| Constant                     | 0.640***          | (0.080)        | 0.406***          | (0.062)        |
| *Year Dummies                | No                |                | Yes               |                |
| <b>Diagnostic tests</b>      |                   |                |                   |                |
|                              | <b>Statistics</b> | <b>P-value</b> | <b>Statistics</b> | <b>P-value</b> |
| AR(2)                        | 0.990             | 0.321          | 0.980             | 0.326          |
| J- Statistics                | 124.530           | 0.300          | 112.58            | 0.467          |

Notes: J-statistics used for testing the over identification of the restrictions with a null of instrument validity, while AR (2) is a test of the existence of the second order correlation in first differenced residuals.

\*indicates 10% significance, \*\* indicates 5% significance, \*\*\* indicates 1% significance. Standard errors are shown in parenthesis.

### **6.3 The impact of exchange rate changes and its volatility on export performance: (controlling for both firm specific and country-specific variables)**

To examine the impact of exchange rate changes and its volatility after controlling for both firm-specific and country-level control variables, we estimate equation (3). The results of equation (3) are reported in Table 6.3. In the table, Model 1 and Model 2 represent the results of the equation (3) by removing and adding the year dummies, respectively.

**Table 6.3: Exchange rate changes and its volatility effects: controlling for both firm-specific and country-level effects**

| Regressors                   | Model 1      |          | Model 2      |          |
|------------------------------|--------------|----------|--------------|----------|
|                              | Coefficients | St. Err. | Coefficients | St. Err. |
| Lagged dependent variable    | 0.017***     | (0.001)  | 0.023***     | (0.001)  |
| Change in REER               | 0.008***     | (0.001)  | 0.009***     | (0.001)  |
| REER_vol                     | -0.003**     | (0.007)  | -0.008**     | (0.005)  |
| Change in foreign income (I) | 0.326**      | (0.169)  | 0.299**      | (0.058)  |
| Firm size                    | 0.115***     | (0.014)  | 0.101***     | (0.014)  |
| Firm efficiency              | 0.004***     | (0.001)  | 0.004***     | (0.001)  |
| Firm ability to bor. Extern. | 0.001***     | (0.002)  | 0.001***     | (0.001)  |
| Changes in GDP               | -0.078***    | (0.027)  | -0.070*      | (0.027)  |
| Changes in nominal wage      | -0.006***    | (0.002)  | -0.002*      | (0.004)  |
| Constant                     | 0.406***     | (0.062)  | 0.640***     | (0.080)  |
| Year dummies                 | No           |          | Yes          |          |
| <b>Diagnostic tests</b>      |              |          |              |          |
|                              | Statistics   | P-value  | Statistics   | P-value  |
| AR(2)                        | 0.960        | 0.338    | 0.980        | 0.326    |
| J- Statistics                | 120.160      | 0.352    | 112.580      | 0.467    |

Notes: J-statistics used for testing the over identification of the restrictions with a null of instrument validity, while AR (2) is a test of the existence of the second order correlation in first differenced residuals.

\*indicates 10% significance, \*\* indicates 5% significance, \*\*\* indicates 1% significance. Standard errors are shown in parenthesis.

The estimated coefficient of changes in REER is about 0.009. It has a positive sign and is statistically significant at one percent level of significance, telling us that improvements in REER index directly affect the export performance of firms. In other words, depreciation of the exchange rate affects the export performance of firms positively. However, the exchange rate volatility is observed with a negative sign, having estimate coefficient of 0.008, and is statistically significant at five percent, implying the adverse effects of exchange rate volatility on firms' export performance. Further, foreign income is observed with a significant positive coefficient of 0.326,

indicating that it has an impressive positive effect on the export performance of firms roughly. Moreover, all the firm-specific control variables appeared with significant positive coefficient estimates, showing their positive contribution to firms' export performance.

On the other hand, both the country-level control variables, namely, changes in wage and changes in GDP appeared with negative coefficients of 0.002 and 0.070, respectively, both are significant at ten percent level of significance. This indicates that an increase in annual nominal wage level and in aggregate domestic demand will cause the firms' export performance to be declined. Finally, the lagged dependent variable emerged with positive coefficient estimate of 0.023, having significance level of five percent demonstrating the significant role of the last year's export realization in current year's export performance. The J-statistics show that instruments used in system GMM are valid, and satisfy orthogonality condition. Likewise, AR (2) statistics does not provide any sign for the presence of the second order serial correlation in residuals.

#### **6.4 Indirect and differential effects of exchange rate changes and its volatility on export performance**

In this subsection, in addition to direct effects, we will present the results of the indirect effects of exchange rate changes and its volatility on export performance of firms. Table 6.4 reports the results of the equation (4), which we supplemented with two interaction terms, namely, firm size-exchange rate changes and firm size-exchange rate volatility. Table 6.4 presents the results of the two models without and with year dummies.

**Table 6.4: Exchange rate changes and its volatility effects: incorporating interaction terms**

| Regressors                   | Model 1      |          | Model 2      |          |
|------------------------------|--------------|----------|--------------|----------|
|                              | Coefficients | St. Err. | Coefficients | St. Err. |
| Lagged dependent variable    | 0.096***     | (0.015)  | 0.104***     | (0.020)  |
| Change in REER               | 0.143***     | (0.027)  | 0.178***     | (0.020)  |
| REER_vol.                    | -0.215***    | (0.073)  | -0.200***    | (0.061)  |
| Change in foreign income (I) | 0.296***     | (0.130)  | 0.326**      | (0.110)  |
| Firm size                    | 0.066***     | (0.026)  | 0.135***     | (0.022)  |
| Firm efficiency              | 0.005***     | (0.008)  | 0.004***     | (0.006)  |
| Firm ability to bor. Extern. | 0.001***     | (0.001)  | 0.001***     | (0.002)  |
| Changes in GDP               | -0.009*      | (0.027)  | -0.010*      | (0.027)  |
| Changes in nominal wage      | -0.005*      | (0.003)  | -0.009***    | (0.003)  |
| Firm size*REER_changes       | -0.021***    | (0.004)  | -0.026***    | (0.003)  |
| Firm size*REER_vol.          | 0.030***     | (0.011)  | 0.030***     | (0.010)  |
| Constant                     | -0.342**     | (0.161)  | -0.726***    | (0.138)  |
| 'Year dummies                | No           |          | Yes          |          |
| <b>Diagnostic tests</b>      |              |          |              |          |
|                              | Statistics   | P-value  | Statistics   | P-value  |
| AR(2)                        | 1.220        | 0.224    | 1.300        | 0.193    |
| J- Statistics                | 99.780       | 0.272    | 106.230      | 0.245    |

Notes: J-statistics used for testing the over identification of the restrictions with a null of instrument validity, while AR (2) is a test of the existence of the second order correlation in first differenced residuals.

\*indicates 10% significance, \*\* indicates 5% significance, \*\*\* indicates 1% significance. Standard errors are shown in parenthesis.

The results given in Table 6.4 indicate that changes in REER index witnessed a coefficient estimate of 0.178, with a positive sign and statistically significant at one percent level of significance, implying that firms' export performance affected significantly positively. In other words, a depreciation of domestic currency enables firms to enhance their export performance. Our results for the influences of exchange rate changes on firms' export performance are consistent with our anticipations as per hypothesis one of the current study, in which it was predicted that firms' exports are

going to be increased as a result of depreciation of the exchange rate. In addition, it is also supporting the findings of the existing literature, particularly that of Cheung and Sengupta (2012) and Kneller and Zhang (2007), which found similar results for India and the UK, respectively. However, the exchange rate volatility appeared with a significant negative coefficient of 0.200, providing an evidence for its adverse effect on firms' export performance. Our findings for the effect of exchange rate volatility are generally consistent with previous empirical work including Sana and Saqib (2012), Aqeel and Nishat (2006), Arize, Osand and Slotge (2008), and Asahi and Yamaguchi (2012). Moreover, the results shown in Table 6.4 reveals that foreign income has a significant positive coefficient estimate of 0.326, representing its vital role in the determination of firms' export performance. Regarding the effects of foreign income on export performance of firms, our findings are in accordance to the findings of Funk and Ruhwedel (2001), Akal (2010), Burment, Dincer and Mustafaoglu (2014), and Shane, Roe and Somwaru (2008).

Our results further illustrate that the coefficient estimates of all the three firm-specific control variables appeared with positive signs and statistically significant at one percent level of significance. However, among them, firm size is the one which contributes to firms' export performance relatively more as compared to other firm-specific control variables. This shows that improvements and enhancements in firm-specific control variables boost the export performance of firms. Our study confirms the results of Moini (1995), Wagner (1995), Verwall and Donkers (2001), and Calof (1994). We found that the effects of country-level control variables are relatively lesser. In particular, we found that changes in wage and changes in GDP both perceived with negative coefficients of 0.009 and 0.010, respectively. The former is significant at one percent and the latter is significant at five percent level of significance. Finally, the

lagged dependent variable emerged with positive coefficient estimate of 0.104, having significance level of one percent. The J-statistics indicate that instruments used in system GMM are valid, and satisfy the condition of orthogonality. Similarly, AR (2) statistics does not provide any evidence for the existence of the second order serial correlation in residuals.

When we turn to the indirect effects of exchange rate changes and its volatility, we observe that the estimated coefficient of the interaction term for firm size and changes in exchange rate is negative and statistically significant at one percent level of significance. This indicates that an increase in firm size weakens the positive impact of changes in exchange rate on firms' export performance. That is, the larger the firm, the lower will be the impact of exchange rate changes on firm export performance.

On the other hand, the estimated coefficient of the interaction term between firm size and the exchange rate volatility is positive and is statistically significant at one percent level of significance. This finding indicates that an increase in firm size offsets the negative impact of exchange rate volatility on export performance. Thus, the overall impact of exchange rate volatility also decreases. In other words, the findings of interactions suggest that the direct impact of changes in exchange rate is positive while the indirect impact via firm size is negative. This implies that total impact of exchange rate changes declines with firm size. Similarly, the estimates reveal that the direct impact of the exchange rate volatility is negative, whereas, the indirect impact through firm size is positive. This means that the total impact of the exchange rate volatility be weaker as firm size increases. However, to examine the differential impact of exchange rate changes and its volatility, one should estimate the total impact of exchange rate changes and its volatility at different levels of firm size.

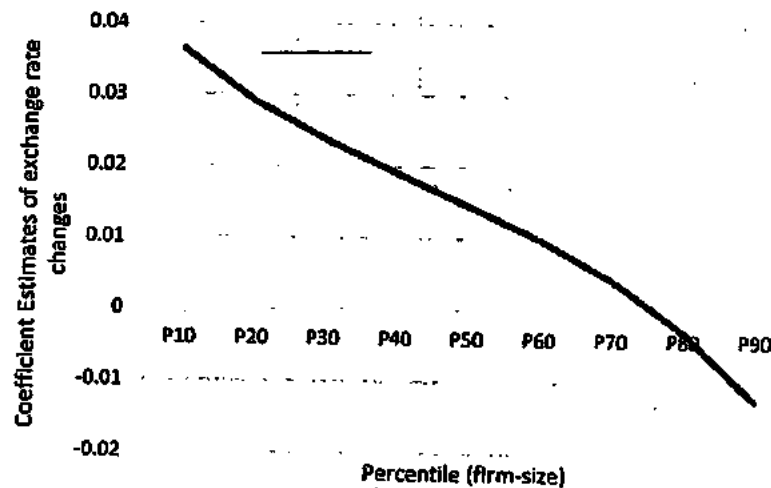
To see whether firm size matters for the effects of exchange rate changes and its volatility, we have estimated equation (I) and equation (II), which are the total derivative of export performance with respect to exchange rate changes and with respect to its volatility, respectively. Table 6.5 below shows the estimates of the total derivative of firms' exports with respect to exchange rate changes. The results indicate that as the size of firms (percentiles) increases the effects of exchange rate changes on export performance decreases. More clearly, larger firms are less likely to be influenced by exchange rate shocks as compared to the smaller ones. The reason might be that larger firms are maintaining higher level of resources and are capable of absorbing unfavorable exchange rate shock, whereas, their smaller counterparts are unable to do so.

**Table 6.5: The results of the derivative of firms' exports with respect to exchange rate changes**

| Percentile | Estimates | Standard Errors | P-value |
|------------|-----------|-----------------|---------|
| P10        | 0.036     | 0.004           | 0.000   |
| P20        | 0.029     | 0.003           | 0.000   |
| P30        | 0.023     | 0.003           | 0.000   |
| P40        | 0.019     | 0.002           | 0.000   |
| P50        | 0.015     | 0.002           | 0.000   |
| P60        | 0.009     | 0.002           | 0.000   |
| P70        | 0.004     | 0.002           | 0.044   |
| P80        | -0.002    | 0.002           | 0.271   |
| P90        | -0.012    | 0.003           | 0.000   |

Our findings regarding different responses of larger and smaller firms against exchange rate changes are consistent with existing literature, particularly that of Berman, Martin and Mayer (2009) and Pessova (2013), who found the similar results for French and Brazilian manufacturing firms, respectively.

**Fig 6.1: Effects of exchange rate changes on firms' exports for different firm-sizes**



In Fig 6.1, the vertical axis shows the coefficient estimates of exchange rate changes and the horizontal axis shows the percentiles (firm size). The figure clearly shows that as the size of the firm (shown here as percentiles) increases, the coefficient estimates of the exchange rate changes decreases, indicating that larger and smaller firms respond differently to exchange rate changes. We have calculated these estimates of derivatives from Table 6.4.

Similarly, Table 6.6 shows the results of the total derivative of firms' exports performance with respect to exchange rate volatility. We observe that all the coefficient estimates are having negative signs, showing the negative effects of exchange rate volatility on firms' export performance. The results reveal that as the size of firms (percentiles) increases, in the same time, the coefficient estimates of the exchange rate volatility decreases. Again, this suggests that, smaller firms are highly exposed to the significant negative effects of the exchange rate volatility as compared to their larger counterparts. In addition, the coefficient estimates of exchange rate volatility for larger firms are statistically insignificant, implying that larger firms are not being affected much by adverse shocks of exchange rate volatility.



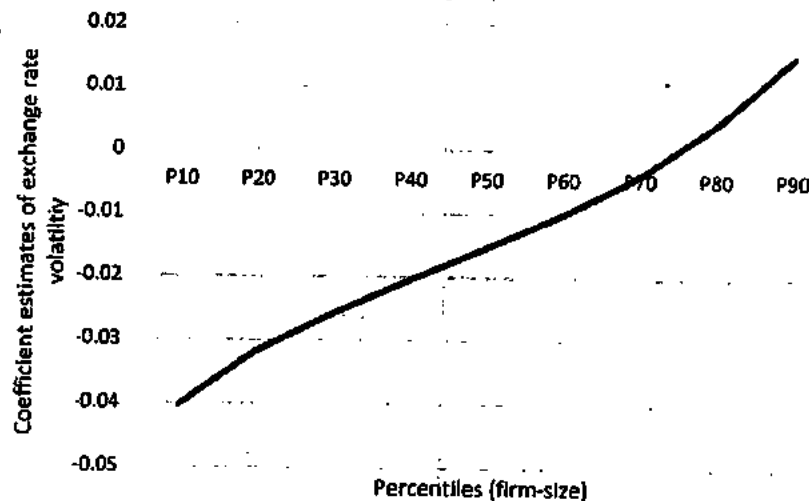
**Table 6.6: The results of the derivative of firms' exports with respect to exchange rate volatility**

| Percentile | Estimates | Standard Errors | P-value |
|------------|-----------|-----------------|---------|
| P10        | -0.040    | 0.012           | 0.001   |
| P20        | -0.032    | 0.010           | 0.003   |
| P30        | -0.026    | 0.009           | 0.006   |
| P40        | -0.020    | 0.008           | 0.017   |
| P50        | -0.015    | 0.008           | 0.057   |
| P60        | -0.010    | 0.008           | 0.203   |
| P70        | -0.004    | 0.008           | 0.637   |
| P80        | 0.004     | 0.009           | 0.641   |
| P90        | 0.015     | 0.011           | 0.186   |

Fig 6.2 below shows that as the size of firm (percentiles) increases, the negative effects of exchange rate volatility is decreasing, suggesting that larger firms are more protected against adverse effects of the exchange rate volatility as compared to the smaller firms.

We have calculated these estimates from Table 6.4.

**Fig 6.2: The effect of exchange rate volatility on export performance of firms' for different firm-sizes**



The above both mentioned results are in line with the hypothesis 3 of the current study, in which it was proposed the larger firms respond differently to exchange rate changes and its volatility as compared to their smaller counterparts. Further, these results are supporting the existing literature, particularly, the findings of Berman, Martin, and Mayer (2009) and Possova (2013), who found different responses of firms' export to exchange rate changes for French and Brazilian firms, respectively.

## **6.5 Robustness**

The results we presented in last section provide evidence that both exchange rate changes and its volatility have significant impact on firms' export. Specifically, we find that changes in exchange rate is related positively with firms' export, while exchange rate volatility is related negatively with firms' export performance. Our other results suggest that both firm specific and country level variables are also playing significant role in explaining firms' exports. In the following section, we present some robustness tests. First, we exclude both firm specific and country level variables from our main model. We do so to ensure that impact of changes in exchange rate and its volatility that we presented here are not driven by any specific firm level or country level variable. We also present another set of results where we consider only firm specific variables and exclude country level variables from the model.

### **6.5.1 The impact of exchange rate changes and its volatility on firms' export performance: including only main variables**

The results of our first robust check are given in the Table 6.7. We can observe from the table that exchange rate changes has a significant positive impact on firms' export performance, while the exchange rate volatility has a significant negative impact on export performance of firms. These findings are consistent with our earlier findings.

The estimates on other main variables, included in the model are also similar to those presented earlier. These results suggest that negative impact of exchange rate changes and its volatility on firms' exports is robust and not driven by any specific firm level or country level variable.

Table 6.7 shows that changes in REER index emerged with a coefficient of 0.184 points, having a positive sign and is significant at one percent level of significance. This shows that exchange rate changes significantly positively affect export performance.

**Table 6.7: The impact of exchange rate changes and its volatility: including firm specific variables**

| Regressors                   | Model 1      |          | Model 2      |          |
|------------------------------|--------------|----------|--------------|----------|
|                              | Coefficients | St. Err. | Coefficients | St. Err. |
| Lagged dependent variable    | 0.100***     | (0.012)  | 0.132***     | (0.014)  |
| Change in REER               | 0.168***     | (0.020)  | 0.184***     | (0.022)  |
| REER_vol                     | -0.438***    | (0.041)  | -0.356**     | (0.047)  |
| Change in foreign income (I) | 0.245***     | (0.067)  | 0.275***     | (0.070)  |
| Firm size*REER_changes       | -0.025***    | (0.003)  | -0.027***    | (0.003)  |
| Firm size*REER_vol.          | 0.030***     | (0.011)  | 0.054***     | (0.010)  |
| Constant                     | 0.073**      | (0.059)  | 0.060***     | (0.176)  |
| *Year Dummies                | No           |          | Yes          |          |
| <b>Diagnostic tests</b>      |              |          |              |          |
|                              | Statistics   | P-value  | Statistics   | P-value  |
| AR(2)                        | 0.970        | 0.390    | 0.982        | 0.580    |
| J- Statistics                | 56.13        | 0.326    | 16.55        | 0.241    |

Notes: J-statistics used for testing the over identification of the restrictions with a null of instrument validity, while AR (2) is a test of the existence of the second order correlation in first differenced residuals.

\*indicates 10% significance, \*\* indicates 5% significance, \*\*\* indicates 1% significance. Standard errors are shown in parenthesis.

However, the volatility of exchange rate (REER\_vol) appeared with negative sign and having coefficient of 0.356, and is also statistically significant at one percent level of significance, indicating that exchange rate volatility significantly and adversely affect

the export performance of firms. Whereas, the foreign income observed with positive coefficient estimate of 0.275, and is statistically significant at one percent level of significance, implying that improvements in the level of foreign income contribute positively to firms' export performance. The exclusion of year dummy, caused the coefficient estimates to be decreased, except the coefficient of the exchange rate volatility. Both the diagnostic tests, AR (2) and J-statistics showing that neither there is any signal for the availability of the second order correlation in residuals, nor there is any evidence for the invalidity of the instruments.

#### **6.5.2 The impact of exchange rate changes and its volatility on firms' export performance: including only firm specific variables**

In the Table 6.8 below, we present the results of the equation (2), which is augmented with two interaction terms. The table shows that REER index has the coefficient of 0.179, with positive sign at one percent significance level, showing it direct effect on export performance of firms at approximately 17.9 percent on the average. However, the exchange rate volatility witnessed a negative sign, having coefficient estimate of 0.214, at one percent significance level. Further, changes in income appeared with coefficient estimate of 0.157, having positive sign and is statistically significant at one percent. Firm size emerged with a positive coefficient of 0.135, having significance level of one percent. In addition, Firm efficiency and firm ability to borrow externally appeared with coefficients of 0.004 and 0.009 respectively, both with positive sign and at one percent level of significance. The results further indicate that exchange rate depreciation has negatively affected the export of firms. In addition, the results reveal that exchange rate volatility affect the export performance at about 21.4 percent on the average, which is not quite different as was shown its effect in Table 6.4.

**Table 6.7: Exchange rate changes and its volatility effects: incorporating interaction terms and controlling for firm-specific effects**

| Regressors                   | Model 1           |                | Model 2           |                |
|------------------------------|-------------------|----------------|-------------------|----------------|
|                              | Coefficients      | St. Err.       | Coefficients      | St. Err.       |
| Lagged dependent variable    | 0.104***          | (0.020)        | 0.068***          | (0.015)        |
| Change in REER               | 0.179***          | (0.020)        | 0.156***          | (0.019)        |
| REER_vol.                    | -0.214***         | (0.016)        | -0.291***         | (0.085)        |
| Change in foreign income (I) | 0.157***          | (0.080)        | 0.148**           | (0.077)        |
| Firm size                    | 0.135***          | (0.022)        | 0.099***          | (0.019)        |
| Firm efficiency              | 0.005***          | (0.008)        | 0.004***          | (0.006)        |
| Firm ability to bor. Extern. | 0.001***          | (0.001)        | 0.001***          | (0.002)        |
| Firm size*REER_changes       | -0.026***         | (0.003)        | -0.023***         | (0.003)        |
| Firm size*REER_vol.          | 0.030***          | (0.009)        | 0.042***          | (0.006)        |
| Constant                     | -0.302***         | (0.161)        | -0.226***         | (0.138)        |
| *Year dummies                | No                |                | Yes               |                |
| <b>Diagnostic tests</b>      |                   |                |                   |                |
|                              | <b>Statistics</b> | <b>P-value</b> | <b>Statistics</b> | <b>P-value</b> |
| AR(2)                        | 0.889             | 0.448          | 0.685             | 0.285          |
| J- Statistics                | 145.325           | 0.472          | 115.365           | 0.386          |

Notes: J-statistics used for testing the over identification of the restrictions with a null of instrument validity, while AR (2) is a test of the existence of the second order correlation in first differenced residuals.

\*indicates 10% significance, \*\* indicates 5% significance, \*\*\* indicates 1% significance. Standard errors are shown in parenthesis.

The results further show that firms' exports are being affected significantly positively by foreign income. Coming to the effects of firm size, our results indicate that firm size has a direct impact on export behavior of firms. In particular, we show that it has a notable impact of about 13.5 percent on the average on the export performance of firms, which shows its vital contribution to the export performance of firms. Furthermore, the results show that firm specific variables, particularly firm efficiency and firm external borrowing have lesser impact on export performance of firms as compared to the effects of firm size. The diagnostic tests show the same results as previous that there exists

neither second order serial correlation in residuals, nor any evidence for the invalidity of the instruments, used in system GMM estimator.

## Chapter 7

### Conclusion and policy implications

#### 7.1 Background of the thesis

Exchange rate is considered as one of the important policy variable. Exchange rates play a vital role in balance of payments, the trade growth of the country, and in turn, in process of sustainable economic growth of the economy. Competitive exchange rate is critical to enhance exports of the economy. In this study we are concerned only with export performance of firms. We aim to investigate how changes in currency value affect exports. Export performance of firms contributes significantly to the health of the economy and particularly to the balance of payment of a country. Since the 1970s, exchange rates have been fluctuated extensively throughout the world, which might have an impact on different variables of the economy. For instance, changes in exchange rate and its volatility could affect the export performance, either at micro level or at country level. Therefore, most of the researchers are interested recently to examine the impact of exchange rate changes on export performance. Indeed, a vast number of studies have been carried out to look at the response of the firm's export to exchange rate changes, but their findings are inconclusive. Further, due to political instability, ineffective economic policies, and import dependent economies, a wide range of fluctuations and volatility have been perceived in exchange rates of developing countries, particularly in Pakistan. In addition, firms have different characteristic, which may respond differently to exchange rate changes. In order to explore acutely, it is required that disaggregated data should be used.

Therefore, the main objective of this study is to explore the effects of exchange rate changes and its volatility on exports of a large panel of manufacturing firms in Pakistan, covering the period 2001-2012. The study used the dynamic panel data estimator, the Blundell-Bond (1998) GMM estimator (System GMM) to estimate the model.

## **7.2 Key findings**

The main results of the thesis are as follows. Exchange rate changes have a positive and significant impact on the export performance of firms. This result is in line with Hypothesis 1 of our study, mentioned in Chapter 3. However, we found that the exchange rate volatility has an adverse impact on firms' exports. This result is also in agreement to our second hypothesis. On the other hand, firm size has an extraordinary positive and significant impact on export performance of the firms. Coming to the indirect effects of exchange rate changes and its volatility, we see that the estimated coefficient of the interaction term for firm size and changes in exchange rate is negative and statistically significant. This indicates that an increase in firm size declines the positive impact of changes in exchange rate on firms' export performance. That is, the larger the firm, the lower the impact of exchange rate changes on firms' export performance. Our results further suggest that smaller firms are exposed highly to the negative effects of exchange rate volatility as compared to their larger counterparts. These results are also in line with Hypothesis 3 of the study, in which we anticipated that larger and smaller firms' exports respond differently to exchange rate changes and its volatility.



### **7.3 Policy implications and further extensions**

The government is required to control and regulate the foreign exchange market such that it should not negatively affect the health of the economy, particularly the export performance which is considered as the main pillar of the economic growth.

Since our results suggest that firm size has a vital role in the export performance of the firms, therefore, the government is recommended to provide incentives for firms to be expanded, so that they could increase their exports. In addition, government is required to set the interest rate in such a level, that firms would easily have access to loanable funds, and can increase their investment levels.

Our work can be extended in several directions. We examine the impact of exchange rate changes and its volatility on the exports of listed firms. However, one can work on private firms. Their analysis may provide an interesting comparison of the effects of exchange rate changes and its volatility on exports across privately and publically listed firms. We examine the indirect effects of exchange rate changes and its volatility on exports through firm size. However, one can explore such effects through other channels, such as firm-specific risk and production capacity.

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