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Contrarian and Momentum Investment Strategies in Pakistan Stock Exchange

JALAL SHAH and ATTAULLAH SHAH

This study examines several aspects of the momentum strategies, such as profitability, risk-based explanation, and decomposition of the momentum profits. For this purpose, we use weekly and monthly data of 581 firms listed at the Pakistan Stock Exchange (PSX) for the period 2004-2014. We found the presence of momentum profits over short and long-horizons, while majority of the contrarian profits were observed only in the presence of penny stocks that have share prices of PKR 10 or less. As a robustness check, we computed returns through the weighted relative strength scheme (WRSS) procedure and average cumulative abnormal returns (ACARs). Interestingly, the results reported through WRSS have shown a similar pattern to that obtained through average cumulative abnormal returns (ACARs). Further, to know which factor contributes more to momentum and contrarian profits, we used the model proposed by Lo and MacKinlay (1990). Our findings show that the overreaction effect is the largest contributing factor of contrarian profits in PSX, while cross-sectional risk is the second largest factor and negatively affects the contrarian profits. Moreover, the lead-lag effect contributes positively to the contrarian profits. Similarly, the largest contributing factor for momentum profits is the underreaction effect, whereas cross-sectional risk is the second largest factor that positively affects momentum profits. Unlike contrarian profits, lead-lag effect reduces the momentum profits in the PSX.

1. INTRODUCTION

There is an extensive body of financial literature, which empirically documents the predictability of stock returns from their past data. DeBondt and Thaler (1985) and Jegadeesh and Titman (1993) were the pioneers who for the first time provided evidence about the profitability of momentum and contrarian strategies. The predictability of stock returns from the past data poses serious question about the validity of efficient market hypothesis. DeBondt and Thaler (1985) provided evidence that investors can capitalise on the stock return opportunities in market by predicting the mean reversion in the stock returns through contrarian strategy. Contrarian strategy involves selling winners stock and buying losers stock. After eight years of DeBondt and Thaler study, Jegadeesh and Titman (1993) proved empirically that there exists trends in the market through which investor can earn returns on the stock in short-term. Such strategy is called as momentum strategy which involves buying of winner stocks and selling of loser stocks i.e. opposite of contrarian strategy. Momentum strategy is relatively a short-term strategy which assumes that stocks that perform well in the past will continue to perform well in the

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future. On the other hand, contrarian strategy is a relatively long-term strategy and is based on the hypothesis that stock returns have mean-reversion. It assumes that stocks which have performed well in the past might have an element of investors' overreaction. Once the wave of investors' overreaction ends, prices will gradually adjust to their intrinsic values, leaving behind a pattern of negative returns. So, based on this, contrarian investors generally buy loser stocks (poor performers of market) and sell winner stocks (good performers of the market).

In this study, we attempt to examine several aspects of the momentum investment strategies in the Pakistan Stock Exchange, such as profitability of different momentum strategies, risk-based explanation of the momentum profits (if any), and decomposition of the momentum profits. There are several factors that motivate us to conduct this study. First, in the last fifteen years, Pakistan Stock Exchange received considerable amount of foreign portfolio investment[1] and delivered remarkable stock returns. The Wall Street Journal termed Pakistan Stock Exchange as one of the top performers in the year 2013.[2] Despite this focus, PSX remains relatively less known to international community in terms of research and empirical findings. Therefore, our study is relevant not only to local investors and managers, but also to international portfolio managers and investors, who are attracted to PSX not just because of higher equity returns but also because of the potential diversification advantages.

More specifically, despite rich empirical literature on this topic elsewhere, studies that investigate the profitability of momentum and contrarian strategies are limited in Pakistan. One reason may be the issue of non-availability of rich data sets i.e. a large sample of firms and for a longer period of time. Another reason might be the extensive labour work involved in developing portfolios on weekly or monthly frequency in overlapping fashion, using conventional software such as MS Excel. Nevertheless, we developed customised Stata program that can flexibly develop momentum portfolios under several constraints [Shah (2015)].[3]

Further, this study contributes to the existing literature by showing how momentum and contrarian profits can change when we construct the sample under a variety of different criteria. Our empirical results show mixed findings under different constraints. For example, using the full sample without any constraint, momentum strategy yields significant returns both in short and intermediate horizons in Pakistan Stock Exchange, while contrarian strategies result in significant returns in short and long horizon (i.e. both in weekly and monthly strategies). However, contrarian profits completely disappear when we exclude penny stocks (with price below PKR 5 and PKR 10) from the sample in weekly strategies, yielding exclusively momentum profits. Therefore, penny stocks, which are mostly illiquid, is the most key factor causing contrarian profits. In the monthly strategies, contrarian profits exist only in long run when we drop penny stocks from the sample. Similarly, we use other constraints to identify the existence of momentum profits. For example, we found that there is a positive relation

[1]The foreign portfolio investors injected around $404 million in the KSE in the year 2013, according to National Clearing Company of Pakistan (NCCPL).

[2]*Wall Street Journal*, "Daring Investors Brave Pakistan Market" Jan. 3, 2014

[3]The programmme is called asm.ado. It can be accessed from the author's website: www.OpenDoors.Pk

between share trading volume and returns of the momentum profits. Higher the trading volume of a stock, higher will be the momentum profits and vice versa. This analysis helps in understanding the key features of Pakistan market while testing momentum strategies.

Rest of the paper is organised as follows. In the next section, we will discuss the theoretical framework and related literature, followed by the methodology section. Section 4 presents and discusses the empirical results and Section 5 concludes the paper.

2. RELATED LITERATURE

In the last decades of 20th century, most of the financial research focused on the stock market anomalies resulting from market inefficiencies. Most of the topics which have been researched in this area come under the predictability of stock prices on the basis of historical data. Investors employ different investment strategies to earn abnormal profits on the basis of past prices. The two well-known strategies are momentum and contrarian investment strategies. Momentum strategy is a short-term strategy and gives abnormal profits when investors buy winners and sell losers stocks. On the other hand, contrarian strategies are relatively long-term strategies and result in the abnormal returns when investors buy past losers and sell winners stocks in their portfolios.

There are various explanations for the existence of momentum phenomenon in asset prices. For example, accelerating revenues and/or increasing profit margins, resulting from increasing sales, cost improvements or overall market expansion (sector momentum) might lead to momentum in stock prices. Similarly, business cycle over an extended period of time might cause continuation in the stock prices in the direction they are already going into. Another explanation for momentum phenomenon comes from the behavioural factors. Due to limited cognitive abilities and attention, investors might not fully incorporate the available information in stock prices in a timely manner. When an economic event occurs, investors might adjust the prices only partially. However, in the subsequent periods when investors have understood the event more clearly, they would adjust the prices further. Such an adjustment process will cause the stock prices to form a pattern, thereby giving rise to momentum effect. And finally, momentum can also occur due to investors' overreaction to news. When investors overact, they would move the prices away from the optimal/fair values. With the passage of time when the overreaction effect diminishes, prices will gradually adjust back to their fair values (price reversals).

The literature review part is divided into four subsections, which shows its systematic way of doing it. The first section generally provides evidence of the previous studies regarding the significance of contrarian and momentum strategies in different stock markets. The second subsection then provides a discussion on explaining the profitability of these strategies. The third subsection discusses that how different researchers have decomposed the contrarian and momentum profits. The last section provides a critical review of the size-based explanation of both contrarian and momentum profits.

2.1. Significance of Contrarian and Momentum Profits

Researches have reported profits on the basis of momentum and contrarian strategies in different stock markets. DeBondt and Thaler (1985) conducted the very first research in which they presented evidence in support of contrarian profits in US market.

Similarly, for the first time, Jegadeesh and Titman (1993) reported momentum profits in US market and stated that a winner portfolio gives positive returns up to 12 months and then lose its momentum in the next 24 months. This shows return continuation in short horizon and return reversal in long-term. Rouwenhorst (1998) also provides evidence of momentum profits in international markets. Schiereck, *et al*. (1999) found excess returns in 5-year ranking period for contrarian portfolios and similar profits were observed for short-term momentum portfolios.

Kang, Liu and Ni (2002) found statistically significant profit for portfolio formed, based on contrarian and momentum strategies in China Stock market. They used Lo and MacKinlay (1990) and Jegadeesh and Titman (1995) methods to test the profitability of both contrarian and momentum strategies in the China Stock market using type "A" shares. Eight different horizons were taken both for the formation and holding periods. So, a total of 64 different investment strategies were formed. Among them, they observed significant profit for 14 contrarian and 10 momentum strategies. Nevertheless, Kang et al. (2002) did not find evidence that whether profits under these strategies will survive after their adjustment for risk and size of the firm. Forner and Marhuenda (2003) also provide evidence for the presence of long-term contrarian and short-term momentum profits in the Spanish stock market. However, they showed that these profits are not due to data snooping. They concluded that profits obtained from both contrarian and momentum strategies are robust both to portfolio size and the formation date choice.

Moreover, Mclnish, *et al*. (2008) tested the profitability of contrarian and momentum strategies in seven Pacific countries. They reported significant contrarian profits from winner portfolios in Japan, while momentum profits from loser portfolios in both Hong Kong and Japan. This was a new finding in the investment literature that momentum profits came from the loser stocks in the portfolio in these countries. However, it is open to test that whether such findings hold in other stock markets. Similarly, Bildik and Gulay (2007) showed compelling evidence of long and short-horizon contrarian profits in Istanbul Stock Exchange (ISE). However, they have not checked it whether such profits hold in intermediate horizon. There is a chance that the behaviour of such profits might completely change or one can say that such profits may not be robust to time horizon. But Demir, Muthuswamy, and Walter (2003) used data of Australian equity market and found that short and intermediate horizon momentum strategies are profitable. They further observed that the magnitude of momentum profits found in Australian market is greater than other international markets. Moreover, his findings make it evident that these returns are robust to risk adjustment and prevail different time horizon.

2.2. Behavioural Aspect of Contrarian and Momentum Profits

Research studies provide different explanations for the profitability of momentum and contrarian strategies. They provide alternative explanations for these profits. Among them, DeBondt and Thaler (1985) proposed that investors' irrational behaviour is responsible for such profits. They suggest that when investors change their prospect, they are likely to give more weight to recent information and underestimate past (historical) information, which obviously results in more optimism towards good news and pessimism towards bad news. This behaviour of investors causes the stock prices to

deviate for a short-period of time from their actual values. This violation of efficient market hypothesis is known as overreaction effect. The observed that asset prices cannot stay away for long from their intrinsic values, thus price movements are followed by price reversals in the long run, thereby making room for contrarian profits. Similarly, momentum profits can be explained from the psychological perspective, which suggests that underreaction of prices to latest information is responsible for this behaviour. It means that the effect of news may be incorporated gradually into the prices, so that it is likely to have positive autocorrelations during such periods.

The theoretical explanation of DeBondt and Thaler (1985) has shortcoming of not explaining why some markets yield abnormal return under these strategies and others do not, though similar investors' cognitions are involved. These explanations have been further confirmed by Barberis, Shleifer, and Vishny (1998), Hong and Stein (1999). They suggested that short-term momentum in stock prices is attributed to the slow reaction or underreaction of investors to the news. On the other hand, contrarian profits are exploited when investor's overreaction is corrected in the long run. It should be noted that both underreaction and overreaction hypothesis are not contradictory. They confirm that short-term momentum and long-term contrarian reversals in stock returns can coexist which is largely attributed to the irrational behaviour of investors.

Daniel, Hirshleifer, and Subrahmayam (1998) presented a continuous overreaction model which was based on two psychological aspects. The first aspect proposed by them is investors' overconfidence which states that investors underestimate their forecast error variance because they believe themselves to be more able to value securities than they (investors) actually are. Biased self-attribution is the second aspect of their model. They argue that the investors' confidence grows when public information is in agreement with their information, but the reverse situation is different. Their confidence does not fall equally when public information opposes the investors' private information. Psychologically, this becomes evident that individuals tend to credit themselves for past success but for failure they blame external factors. Consequently, due to this behaviour investor's overconfidence increases, when it is followed by confirming news and as a result investors overestimate the accuracy of their information. This investors' overconfidence increases the prices of winner stocks over their actual values. In this model, momentum profits are reported to result from the delayed overreaction, which is eventually reversed as prices revert to reflect their fundamentals.

In another study, Barberis, *et al*. (1998) presented a model, which combines conservatism bias and representative heuristic. Conservatism bias states that when people observe new evidence they are slow in updating their belief. But conservative individuals may ignore the full information content regarding stock earnings or some other public announcement and at least partially they are still persistent on their prior estimates of earnings. On the other hand, representative heuristic is a cognitive bias, which states that when making judgment about the probability of an uncertain event or sample, individuals observe it as similar in essential characteristics to its population and it reflects the important features of the process by which it is generated. Representativeness leads to wrong judgments. This is because something that is more representative does not make it more likely to be the best always. In the same way, investors may wrongly estimate the price of a firm which has consistent growth in earnings while in fact this may not always

be the case. As a result, investors using the representativeness heuristic may ignore the fact that past high earnings growth is unlikely to repeat itself, so they overvalue the company. Conservatism bias is responsible for underreaction of stocks to firm specific information which causes momentum effect, while on the other hand representative heuristic bias leads investors to predict future expected returns from the past performance. Reversal effect is reported to have been resulted from the combination of both these effects.

Hong and Stein (1999) proposed a behavioural model that was based on the underreaction of stocks to information and their consequent overreaction. This model was based on the classification of investors in two groups which they named as momentum traders and Newswatchers. These two types of investors are different in the way they process the information. Newswatchers use signals about stock's future fundamental to predict its prices and momentum traders on the other hand based its analysis on the information about past prices trends. Adjustment of prices in response to new information occurs slowly, which is because of the gradual diffusion of private information among the newswatcher population that results in underreaction in short run. Underreaction of stock prices portrays that momentum traders could be profitable by following the price trends, which ultimately lead to overreaction. This effect has also been documented by Lehmann (1990), Dechow and Sloan (1996) and Hong and Stien (1999). The consequent overreaction in long run results in price reversals.

Vlad (2008) investigated the asset pricing process and found that the effect of investors' misconceptions is a long run effect. He found that the effect of good and bad news on share pricing is not the same. Bad news tends to create more fluctuation and volatilities than good news of the same magnitude and this is called as disposition or loss aversion effect. The disposition effect is a negative feedback strategy, which is caused because of the investors' tendency to realise profits but not losses and this ultimately results in price reversals. However, Lehman (1990), Park (1995) and Conrad, *et al*. (1997) argued that using bid-ask spread to calculate profits based on short-term contrarian strategy may be spurious. It is due to the use of bid and ask prices that lead to wrong appearance of winners and losers' stocks.

2.3. Components of Contrarian and Momentum Profits

Researchers have tried to split both contrarian and momentum profits into components to find their contributing factors. Conrad and Kaul (1993) have shown that momentum profits are caused by the cross-sectional risk, which is induced due to the portfolio formation procedure. While on the other hand, Chan (1988) explained contrarian and momentum profits as being caused by the time varying market risk. He observed relatively small contrarian profits which he attributed to the fact that losers are more likely to be riskier than winners in the holding period, in the light of time varying common factors.

Chan (1988) was a bit critical in his view and argued that selecting high risk stocks as the winners and relatively low risk stocks as the losers is the correct strategy to earn momentum profits. As a general rule in finance, higher the risk, higher will be the returns, and under momentum strategies, higher returns tend to continue in the next period. Moreover, Lo and MacKinlay (1990) argued that contrarian profits are caused due

to the size related lead lag effect rather than the phenomena described by Chan (1988) i.e. time series pattern exhibit the extreme performers or the Daniel, *et al.* (1988) overreaction effect explanation. They further argued that stocks of large companies' show quick reactions to information than the small companies' stocks which implies that large stocks tend to lead the returns of small stocks. Lo and MacKinlay (1990) called this as the lead lag effect. Moreover, they found that the current returns of the small stocks have large positive cross serial correlation with the lag returns of the large stocks, though this relation is not true in the reverse order.

One of the conspicuous contradictions came from the study of Jegadeesh and Titman (1995) study. They proposed that lead-lag structure is not an important source of contrarian profits in the US stock market. They argue that the tool which Lo and MacKinlay (1990) used to identify the lead- lag structure i.e. the average auto covariance, mislead the results and cannot be used to find the lead-lag contribution to contrarian profits. They further explained it by stating that cross autocovariance work is used as an indicator of lead-lag structure, only when some stocks exhibit instantaneous reaction to common factors and some stocks on the other hand react with lag and do not show contemporaneous reaction. They found that less than 5 percent of contrarian profits are contributed by lead-lag structure while the majority of the profits are attributed to the overreaction of stock returns to firm-specific information. These findings are consistent with DeBondt (1985) and Daniel, *et al*. (1998). Daniel, *et al*. (1998) argued that momentum profits are not due to the lead lag effect and is caused by the stocks' delayed reaction to firm specific information.

2.4. Risk and Size Based Explanation of Contrarian and Momentum Profits

The literature provides enormous evidences about the profitability of the contrarian and momentum investment strategies and their behaviour. Nevertheless, there is much less evidence that whether these abnormal profits could be explained from the risk perspective. De Bondt and Thaler (1985) have used risk-adjusted returns instead of market adjusted returns to account for the riskiness of these strategies. However, they applied the traditional methodology of computing the beta and considered it as stable over a time (i.e. 60 months before the formation period). This has been criticised by Chan (1988) who argued that changes in beta in the formation period would bias the results. Chan (1988) proposed that risk of the portfolios i.e. both winners and losers are not constant over time. Moreover, the risk of the strategy seemingly has correlation with the level of market risk premium. So, the abnormal returns estimation might be sensitive to the way risks are estimated. Chan (1988) adopted the standard Sharpe-Linter Capital Asset Pricing Model (CAPM).

Moreover, Chopra, *et al*. (1992) showed that overreaction effect weakens but does not disappear completely, when we control for size or beta. They showed that small firms exhibit more overreaction effect than larger ones. They hypothesise from these results that the dominant holder of stocks i.e. institutional investors of smaller firms may overreact while that of larger stocks do not. In another study, Baytas and Cakici (1999) showed that higher return results for long-term investment strategies which are based on price and size than those based on past performance. They put forward the argument that as loser tends to be low in price and market value and vice versa for winner, so they argue that most of the long-term price reversals might be due to price and size effect.

The review of the literature provides ample evidences of the contrarian and momentum profits. From the perspective of Pakistan, there is only limited research on the given topic. As mentioned before, there are only two notable studies [Shah and Sha (2015); Rehman and Mohsin (2012)] that investigate momentum strategies. Although, researchers have paid attention to study other anomalies in the Pakistan Stock Exchange in recent years.[4] Therefore, our study will provide a more convincing evidence of profitability of both strategies which in turn will provide evidence against the efficient market hypothesis too that states that investors cannot beat the market. Moreover, overreaction of stock prices to firm specific information may be a factor that generates contrarian profit while for momentum profit it might be the underreaction of stock prices to firm specific information. Thus, there is need of exploring possible behavioural explanation of contrarian and momentum profits in Pakistan Stock Exchange.

2.5. Research Hypotheses

Based on the arguments and evidences in the literature review section, following hypotheses could be derived.

(1) H_1: Momentum strategies generate significant returns in short horizon.
(2) H_1: Contrarian strategies generate significant returns in long horizon.
(3) H_1: Contrarian and momentum return are explained from systematic risk perspective.
(4) H_1: Lead lag effect, cross sectional risk and time series pattern contribute to contrarian and momentum profits.

3. METHODOLOGY

This section discusses the research strategy, research choice and sample of the study, the data used and the time span considered in this study. Moreover, it presents the models that have been used for analysis.

3.1. Data Sources and Sample Size

The study uses share prices of all the companies listed on the PSX. Most recent data of stock prices for all the companies listed on PSX used in this study is from the period 2004 to 2014. Data of closing prices of all the stocks has been taken from www.opendoors.pk. KSE-100 value weighted index is used as market index.

3.2. Portfolio Construction

3.2.1. *Average Cumulative Returns Model*

To test the hypothesis that whether contrarian and momentum strategies result in significant profits in PSX, the study employs the method used by DeBondt and Thaler (1985) which is widely used in this area. Profitability of the two strategies is

[4]For example, researchers have studied day of the week effect [Shah and Abdullah (2015)], cross-autocorrelations in portfolio returns [Ishtiaq and Abdullah (2015)], market efficiency [Khan and Khan (2016)] and capital structure and abnormal stock returns [Ullah and Shah (2014)].

analysed, using two periods called as formation period, also called as ranking period (R-period) and testing period, which is also known by holding period (H-period). First, simple returns on stocks are computed through log return formula which is given below:

$$R_{j,t} = LN\left(\frac{P_f}{P_i}\right) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Where LN is the natural logarithm, P_f is the closing price and P_i is the initial price. In ranking period, returns of the stocks included in the sample are determined. To compute cumulative market adjusted excess return, following equation is used:

$$CU_j = \sum_{t=-12}^{0} \left(\mathrm{R_{j,t}} - \mathrm{R_{M,t}}\right) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

Where CU_j is the cumulative market adjusted return, R_j is the return of the stock j for the month t and R_M is the market index return at time t. Equation 2 is used to sort the stocks in the ranking period. In R-period, then 10 equal size portfolios are formed from the sorted stocks. The portfolio with the highest cumulative returns is the winner portfolio and the one with the lowest stock returns is the loser portfolio. The top three portfolios are taken as winner portfolio and the bottom three are taken as loser portfolio, so that each winner and loser portfolio comprises of thirty percent of all the stocks. After this, equal weighted average return for winner and loser portfolios are computed in holding period (H-period), then the difference between the returns of winners and losers is calculated. If the difference between the average returns of winners and losers is positive then return continuation (momentum profits) is declared, on contrary if it gives negative returns then it will show return reversal (contrarian profits).

Selecting formation and holding period is purely subjective [Ismail (2012)]. Nevertheless, this study has used two types of data, i.e. weekly and monthly to check the robustness of the profitability of these strategies. The study used eight different horizons in weeks (1, 2, 3… 8 weeks) and forty-eight (48) different horizons in months (1, 2, 3….48 months) both for formation and holding period. We have developed methodology for 12 months. The same methodology will be applied to other time horizons as well. Cumulative abnormal return (CAR) for each of the nine, 1 year overlapping periods for winner and loser portfolio is calculated through:

$$CAR_{p,i,t} = \sum_{T=1}^{t} \mathrm{AR_{p,i,t}} = \sum_{T=1}^{t}\sum_{j=1}^{n} \frac{1}{n}\left(\mathrm{R_{j,i,t}} - \mathrm{R_{M,i,t}}\right) \quad \ldots \quad \ldots \quad (3)$$

t:1, 2, 3….12 months, p: L, W

Where n denotes the number of stocks that are included in each portfolio, 'i' is the period under consideration and AR_p is the abnormal return on a portfolio. In case when return of a stock is not present in any given month after the' formation of stocks the portfolio, then the study computes average of the available stocks returns. This is because that in time when a stock stopped trading, there is an implicit readjustment in the stock returns by liquidating those stock which disappeared and investing the money in the remaining stocks of the portfolio so that it is equally weighted. After this, average of the CAR across different holding periods is computed for each portfolio and for each month of the holding period:

$$ACAR_{p,t} = \frac{1}{N}\sum_{i=1}^{N} \mathrm{CAR}_{\mathrm{p,i,t}} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Here N represents the number of test periods, i.e. 10 in our case. When an overreaction exists, the following result in holding period will be obtained.

$$ACAR_{C,t} = ACAR_{L,t} - ACAR_{W,t} > 0, \qquad t=1, 2, 3 \ldots 12 \quad \ldots \quad \ldots \quad (5)$$

The above equation shows the average cumulative abnormal return of the zero investment portfolios (Portfolio having net value zero because it's achieved by simultaneously purchasing the loser securities and selling equivalent winner securities) for contrarian strategy and vice versa for momentum strategy. So, when the above condition is observed, it will show the overreaction of the stock returns and when the opposite of it is obtained then that will be the underreaction of the stock returns. Consequently, this paves the way for the testing of hypothesis of underreaction and overreaction.

As mentioned above, the study has used two types of data with respect to time. One is weekly data that computes returns of the stocks' weekly cumulative and second is monthly data that computes monthly cumulative stock returns. Time periods of 1 to 8 weeks and 1 to 48 months have been used both for formation and holding. Using 8 different periods in weekly data and 48 periods in monthly data for each formation and holding period, strategies of corresponding time periods will be obtained. Here, it should be noted that the study is not following the procedure of Jegadeesh and Titman (1990) that have considered different time horizons for formation and holding period. In this study, an equal time is considered for formation and holding period. The reason is that similar results are observed for each formation period under different holding periods. Moreover, both long and short-time periods are covered to account for momentum and contrarian strategies, so there is no need to calculate different holding periods' cumulative returns for the same formation period. For example, if formation is of 1 week, so holding period is also 1 week, if formation period is 2 weeks, holding period is also 2 weeks and so on for other time periods. Similar procedure has been applied in the monthly data as well.

To avoid bias that arise from bid ask spread, price pressure due to illiquid markets and non-synchronous data, the study also provide a case in which one trading period is being skipped between portfolio formation and holding periods for all investments strategies [Chan, *et al*. (1999); Lehman (1990)].

Buy-and-hold method is used to calculate the long-term return. DeBondt and Thaler (1985) methodology is applied again, however, we substitute Equation 2 and 3 by:

$$CU_j^{B\&H} = \left[\prod_{\mathrm{t=-12}}^{0}\left(1+\mathrm{R_{j,t}}\right)-1\right] - \left[\prod_{\mathrm{t=-12}}^{0}\left(1+\mathrm{R_{M,t}}\right)-1\right] \quad \ldots \quad \ldots \quad (6)$$

$$CAR_{P,i,t}^{B\&H} = \frac{1}{\mathrm{n}}\sum_{\mathrm{j=1}}^{\mathrm{n}}\left[\prod_{\mathrm{T=1}}^{\mathrm{t}}\left(1+\mathrm{R_{j,T}}\right)-1\right] - \left[\prod_{\mathrm{T=1}}^{\mathrm{t}}\left(1+\mathrm{R_{M,T}}\right)-1\right] \quad \ldots \quad (7)$$

t: 1, 2, 3…12. i: 1, 2, 3…. 9. p: L, W

$CU_j^{B\&H}$ is the buy-and-hold cumulative return of stock j, $CAR_{P,i,t}^{B\&H}$ is buy-and-hold cumulative abnormal return of portfolio 'p' for the period 't' and ranking-holding period 'i', while Π is the sign of product.

Previously, most of the researchers have preferred to use non-overlapping time periods to ensure independence in calculating different statistics. Nevertheless, this restriction greatly reduces the number of holding periods and consequently the reliability of statistics obtained is also reduced. To avoid this problem, Ball and Kothari (1989) proposed a method that allows an overlapping among ranking and holding periods. According to their proposed method, at the beginning of each calendar year from 2004 to 2014 (we have a total of 10 ranking periods) the stocks are ranked on the basis of their buy-and-hold cumulative returns (Equation 6) of previous 12 months in descending order and portfolios are constructed as described previously. Then the significance of returns obtained in the holding period has been checked through simple t-test. Whenever a stock is missing in the holding period i.e. following the portfolio formation period then that stock is permanently dropped from the portfolio and the cumulative abnormal return is calculated by taking average of the available stocks with same procedure as used before.

3.3. Risk Adjusted Abnormal Returns Model

Chan (1988) presented a method that could analyse the abnormal risk adjusted returns of the momentum and contrarian strategy without the issue of beta instability. Doing so, he proposed to run the following regression in each of the formation-holding periods:

$$R_{p,t} - R_{f,t} = \alpha_{p,F}(1 - D_t) + \alpha_{p,T} D + \beta_{p,F} (R_{m,t} - R_{f,t}) + \beta_{p,D}(R_{m,t} - R_{f,t})D_t + \varepsilon_{p,t}$$

t: -12….0….12, p: L, W … … … … (8.1)

R_p is the returns on either losers' or winners' portfolio during the month t, $R_{m,t}$ and $R_{f,t}$ are returns of the market index and risk free rate respectively in the month t, D_t is a dummy variable whose value is 0 during the formation period ($t \leq 0$) and 1 in the testing period ($t>0$),which allows to estimate different intercepts and betas during both the periods; $\alpha_{p,F}$ and $\alpha_{p,T}$, representing risk adjusted abnormal returns or the Jensen's alpha during the formation and test period respectively; systematic risk of the portfolio p is estimated by $\beta_{p,F}$ during the formation period; $\beta_{p,D}$ shows the change observed in the systematic risk between formation and test period of portfolio p, therefore the test period beta will be ($\beta_{p,F} + \beta_{p,D}$); $\varepsilon_{p,t}$ is the error term and is assumed to have normal distribution with variance of $\sigma^2_{p,F}$ and $\sigma^2_{p,T}$, during the formation and testing period respectively.

The null hypothesis $\alpha_{p,T} = 0$ will show the absence of overreaction or underreaction from the investors. A significant $\alpha_{p,T} > 0$ or $\alpha_{p,T} < 0$ for any strategy will show continuation (momentum profit) or change (contrarian profits) respectively. Furthermore, the returns of only momentum strategies have been regressed in the following manner:

$$R_{W,t} - R_{L,t} = \alpha_{WL,F}(1 - D_t) + \alpha_{WL,T} D_t + \beta_{WL,F} (R_{m,t} - R_{f,t}) + \beta_{WL,D}$$

$(R_{m,t} - R_{f,t)\,Dt} + \varepsilon_{p,t}$ … … … … … … (8.2)

3.3.1. *Weighted Relative Strength Scheme (WRSS) Methodology*

The study employs the methodology developed by Lo and MacKinlay (1990) for the formation of contrarian and momentum portfolios. As the name implies, WRSS is the investment strategy that buys stocks in proportion to their returns over the formation period. In case of momentum strategy, investor would take long position in stocks that

yields positive returns, with higher weight being assigned to top performers. Similarly, investors take short positions in stocks that yield negative returns with higher weight on bottom performers. The winner stocks are the stocks that outperform the market ($R_{i,\ t-1} - R_{m,\ t-1} > 0$), where $R_{i,\ t-1}$ is the returns of the stocks and $R_{m,\ t-1}$ is the returns on the market index during the formation period t-1. On the other hand, loser stocks are those that underperform the market i.e. $R_{i,\ t-1} - R_{m,\ t-1} < 0$. During each formation period t-1, the weight $w_{i,\ t}$ assigned to each stock is:

$$w_{i,\ t} = 1/N\ (R_{i,\ t-1} - R_{m,\ t-1}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

Where N is the number of stocks in the sample in each time period. The profit denoted by π_t in the testing period is computed through the following equation:

$$\pi_t = \frac{1}{N}\sum_{i=1}^{N} R_{i,t} * w_{i,t} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

$w_{i,\ t}$ is the weight assigned to each stock in the formation period and $R_{i,\ t}$ is the returns of each stock during the testing period. The profit for the momentum portfolio in each period is the average of weighted returns of all stocks in the sample. So, the positive value of Equation 10 will show momentum profits while the negative value will indicate contrarian profits.

4. ANALYTICAL MODELS

4.1. *t*-tests

To check whether the contrarian and momentum profits in holding period are significantly different from zero, the study employs simple *t*-test. By running the test, when the average return of the holding periods on winner-loser portfolio is significantly positive (negative), different from zero, the evidence of momentum (contrarian) profit would be obtained, assuming that the transaction cost does not affect winner-loser returns.

4.2 Lo and MacKinlay Model

Contrarian and momentum profits are also explained from behavioural point of view. The psychological explanation to the behaviour of contrarian and momentum profit gives a deep insight into these investment strategies. Researchers suggest that the behaviour may be attributed to underreaction or overreaction of the prices to the latest information. They tend to have autocorrelation during these periods. In the literature, stock market overreaction implies that individual security returns are negatively autocorrelated over some holding period which means that if a stock performs well in one period will be a bad performer in the next. The negativity in auto correlation will show the stock market overreaction for individual stocks. Jegadeesh and Titman (1993) developed a frame work for the regression to analyse the component of contrarian and momentum profits. The model they developed is:

$$r_{i,t} = \mu_i + b_{0,i}^{t} f_t + b_{1,i}^{t} f_{t-1} + e_{i,t} \quad \ldots \quad \ldots \quad .. \quad \ldots \quad \ldots \quad (11)$$

μ_i denotes the expected returns of the stock i, b^t_0 and b^t_1 show the sensitivities of stock i to contemporaneous and lagged factor realisations at time't', while f_t represents the unexpected factor realisation which is proxied by the demeaned market returns (in this

case KSE100 index demeaned returns for the period t and t-1), $e_{i,t}$ is the idiosyncratic or firm specific component of return of stock i at time t, generally called the error term. Jegadeesh and Titman (1993) modified the Lo and MacKinlay Model and decomposed contrarian profits into the above three components. Moreover, the profits reported are obtained through WRSS, so for a contrarian strategy:

$$E(\pi^c) = E\left(\frac{1}{N}\sum_{i=1}^{N} R_{i,t} * w_{i,t}\right) = -\sigma_{\mu}^2 - \Omega - \delta\sigma_f^2 \quad \ldots \quad \ldots \quad \ldots \quad (12)$$

Expected contrarian and momentum profit is decomposed into three components, according to the Equation 12. The first term $-\sigma^2_{\mu,}$ which is also present in Lo and MacKinlay (1990) model, shows the cross-sectional dispersion in expected returns. A stock having higher expected return will tend to exhibit higher than average returns during both the formation and holding periods and will reduce contrarian profit. $-\Omega$ is the second component of the Equation 12, which represents the negative of average auto covariance of the firm specific or idiosyncratic component of returns. This is determined by reactions of stock prices to firm specific information. Jegadeesh and Titman called it as the overreaction component of the contrarian profit. This component contributes to contrarian profit when Ω is negative, in the case when stock prices tend to overreact to firm specific information. The last component $\delta\sigma_f^2$ represents the lead lag effect in the stock prices, rises from the difference in the timeliness of stock price reactions to common factors. In case $\delta\sigma^2_f < 0$, this component will contribute positively to contrarian profit and vice versa for $\delta\sigma^2_f > 0$. Each of the three factors is further defined by the formulas given below:

Cross Sectional Risk

$$\sigma_{\mu}^2 = -\frac{1}{N}\sum_{i=1}^{N}(\mu_i - \bar{\mu})^2 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (13)$$

Lead Lag Effect

$$\delta = \frac{1}{N}\sum_{i=1}^{N}\left(b_{0,i} - \overline{b_0}\right)\left(b_{1,i} - \bar{b_1}\right) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (14)$$

Auto Covariance

$$\Omega = \frac{1}{N}\sum Cov(\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (15)$$

Where μ_i is the regression intercept of stock i, b_o and b_1 are the variables which need to be estimated with the help of regression and $\overline{b_0}$ and $\bar{b_1}$ are the averages of b_o and b_1 respectively. $\varepsilon_{i,t}$ and $\varepsilon_{i,t-1}$ are the error terms of stock i, at time t and t-1 respectively. Running the regression (Equation 11), the above three Equations 13, 14 and 15 are then computed to find the relative contribution of each component in contrarian and momentum profits.

5. RESULTS AND DISCUSSION

This section presents the result of momentum and contrarian portfolios. In the methodology section, we discussed two methods to compute the returns of momentum and contrarian strategies i.e. ACAR and WRSS. Results of each method are shown separately. After this, risk adjusted returns have been computed on the basis of ACARs.

While WRSS returns are used to decompose the profits of momentum and contrarian strategies. Moreover, the study has used six different scenarios for ACARs to examine the effect of these cases on returns of momentum and contrarian strategies.

5.1. Scenarios

The study has used six different scenarios to check the robustness of these strategies.

(i) **Raw data:** We start the analysis using data in its raw form. No treatment has been made to it.

(ii) **Dropping stocks with zero returns:** Stocks that yield zero returns are dropped from the sample to check whether it influences the profitability of the investment strategies or not. Zero returns result from no trading in each stock.

(iii) **Dropping stocks having returns less than –100 percent or greater than +100 percent:** This is done to reduce the influence of extreme values.

(iv) **Dropping stocks having trading volume less than a certain level:** Stocks with trading volume less than 500, 1000 and 5000 shares have been analysed separately, to check whether trading volume of stocks have an effect on the profitability of contrarian and momentum strategies.

(v) **Dropping penny stocks:** Penny stock i.e. stocks having price less than Rs 5 and Rs 10 have been dropped and analysed separately.

(vi) **Skipping a period:** Due to the bias that results from the bid-ask spread, price pressure due to illiquid markets and non-synchronous trading, the study skips one period between formation and testing period for all the investment strategies [Chan, *et al*. (1999); Lehmann (1990)].

5.2. Average Cumulative Abnormal Returns

All the tables in this study were constructed using asdoc package of Shah (2018). Due to limitation of space, we report the results of tests based on monthly data. Tables based on weekly data can be provided by the authors on request. The results obtained on the basis of raw weekly data in the testing period show that the returns of the winner-loser (momentum) portfolio in the first five formation holding periods are significantly negative, showing the presences of contrarian profits. Nevertheless, significant momentum profits are reported in the seventh and eighth week's formation-holding periods. All the returns show significance at 1 percent level. These results are quite strange because momentum in stock returns are expected in the near future and reversion takes relatively longer time. The reason for such results might be the presence of penny stocks that do not trade quite frequently. Even a smaller increase in their prices result in a bigger percentage increase. However, due to illiquidity, they do not trade in the coming period, resulting in the contrarian profits. To control this, such stocks were dropped in the next test.

Similar procedure has been carried out to compute the monthly average cumulative abnormal returns (ACAR), as shown in Table 4.1. The study has taken time period from 1 month to 48 months both for formation and holding periods. Unlike the pattern shown in weekly returns, monthly ACAR show opposite patterns. The first strategy of one-formation

Table 4.1

Monthly ACARs

Average cumulative abnormal (market adjusted) returns (ACAR) are calculated with buy and hold procedure for portfolio. A portfolio with the lowest ACARs during the previous 1, 2, 3, … 48 months ranking period is the *loser* portfolio and the one with the highest ACARs in the same period is called as a *winner* portfolio. Each *winner* and *loser* portfolio consists of 30 percent of the sorted stocks. Stocks in each portfolio are held for the respective 1, 2, 3… 48 months. KSE-100 Index is a value weighted index and is used as a proxy for the market portfolio. T-statistics is depicted with *******, ****** and *****, showing 1 percent, 5 percent and 10 percent level of significance, respectively.

Strategy	Obs.	Raw data ACAR	Drop if ri=0 ACAR	Drop if ri<-1 and ri>1 ACAR	Drop if Volume<500 ACAR	Drop if Volume<1000 ACAR
1 Formation-Holding	117	-0.00685	-0.00871**	-0.00578	0.00161	0.00812*
2 Formation-Holding	115	0.0232***	0.0217***	0.0246***	0.0313***	0.0328***
3 Formation-Holding	113	0.0443***	0.0401***	0.048***	0.054***	0.0528***
4 Formation-Holding	111	0.0739***	0.0686***	0.0773***	0.0849***	0.081***
5 Formation-Holding	109	0.0852***	0.0798***	0.0905***	0.0999***	0.103***
6 Formation-Holding	107	0.0963***	0.0999***	0.108***	0.113***	0.12***
7 Formation-Holding	105	0.107***	0.115***	0.125***	0.126***	0.138***
8 Formation-Holding	103	0.124***	0.131***	0.143***	0.147***	0.151***
9 Formation-Holding	101	0.141***	0.151***	0.162***	0.164***	0.162***
10 Formation-Holding	99	0.158***	0.17***	0.178***	0.181***	0.171***
11 Formation-Holding	97	0.169***	0.184***	0.19***	0.193***	0.181***
12 Formation-Holding	95	0.182***	0.198***	0.199***	0.214***	0.202***
13 Formation-Holding	93	0.198***	0.222***	0.212***	0.234***	0.218***
14 Formation-Holding	91	0.221***	0.242***	0.227***	0.262***	0.241***
15 Formation-Holding	89	0.24***	0.263***	0.243***	0.28***	0.264***
16 Formation-Holding	87	0.252***	0.276***	0.253***	0.296***	0.284***
17 Formation-Holding	85	0.259***	0.29***	0.256***	0.302***	0.306***
18 Formation-Holding	83	0.267***	0.303***	0.267***	0.317***	0.321***
19 Formation-Holding	81	0.281***	0.314***	0.28***	0.329***	0.338***
20 Formation-Holding	79	0.293***	0.328***	0.292***	0.345***	0.357***
21 Formation-Holding	77	0.303***	0.338***	0.305***	0.358***	0.373***
22 Formation-Holding	75	0.303***	0.335***	0.31***	0.366***	0.379***
23 Formation-Holding	73	0.29***	0.322***	0.302***	0.363***	0.381***
24 Formation-Holding	71	0.274***	0.3***	0.296***	0.361***	0.378***
25 Formation-Holding	69	0.255***	0.273***	0.287***	0.354***	0.376***
26 Formation-Holding	67	0.223***	0.242***	0.265***	0.344***	0.368***
27 Formation-Holding	65	0.198***	0.222***	0.254***	0.333***	0.365***
28 Formation-Holding	63	0.179***	0.203***	0.245***	0.31***	0.363***
29 Formation-Holding	61	0.15***	0.176***	0.233***	0.292***	0.343***
30 Formation-Holding	59	0.146***	0.155***	0.218***	0.287***	0.331***
31 Formation-Holding	57	0.139***	0.143***	0.204***	0.279***	0.318***
32 Formation-Holding	55	0.139***	0.133***	0.189***	0.279***	0.314***
33 Formation-Holding	53	0.131***	0.126***	0.178***	0.27***	0.315***
34 Formation-Holding	51	0.121***	0.116***	0.16***	0.252***	0.328***
35 Formation-Holding	49	0.101***	0.105***	0.143***	0.23***	0.331***
36 Formation-Holding	47	0.0851***	0.0939***	0.13***	0.224***	0.326***
37 Formation-Holding	45	0.0743***	0.0774***	0.115***	0.214***	0.321***
38 Formation-Holding	43	0.0556**	0.0547*	0.0993***	0.212***	0.324***
39 Formation-Holding	41	0.0348	0.0311	0.0774***	0.212***	0.319***
40 Formation-Holding	39	0.0081	-0.00758	0.0495	0.21***	0.31***
41 Formation-Holding	37	-0.0376	-0.0443	0.00277	0.193***	0.295***
42 Formation-Holding	35	-0.0655	-0.0875	-0.0252	0.19***	0.292***
43 Formation-Holding	33	-0.111	-0.12	-0.0725	0.21***	0.302***
44 Formation-Holding	31	-0.131	-0.143	-0.0999	0.245***	0.332***
45 Formation-Holding	29	-0.125	-0.139	-0.106	0.28***	0.36***
46 Formation-Holding	27	-0.11	-0.0863	-0.11	0.311***	0.389***
47 Formation-Holding	25	-0.107	-0.0505	-0.106	0.298***	0.393***
48 Formation-Holding	23	-0.052	-0.0299	-0.051	0.297***	0.405***

Strategy	Obs.	Drop if Volume<5000 ACAR	Drop if Price<5 ACAR	Drop if Price<10 ACAR	Skip 1 Month ACAR
1 Formation-Holding	117	0.0112***	0.00176	0.00321	0.0172***
2 Formation-Holding	115	0.0309***	0.0126***	0.00887***	0.0346***
3 Formation-Holding	113	0.0448***	0.0254***	0.0172***	0.0543***
4 Formation-Holding	111	0.065***	0.0379***	0.0214***	0.0785***
5 Formation-Holding	109	0.0832***	0.04***	0.0177***	0.0873***
6 Formation-Holding	107	0.0986***	0.0409***	0.0186***	0.0954***
7 Formation-Holding	105	0.117***	0.0462***	0.0197***	0.11***
8 Formation-Holding	103	0.131***	0.0553***	0.0256***	0.13***
9 Formation-Holding	101	0.148***	0.0657***	0.0303***	0.149***
10 Formation-Holding	99	0.159***	0.0663***	0.0314***	0.162***
11 Formation-Holding	97	0.17***	0.0804***	0.0348***	0.174***
12 Formation-Holding	95	0.188***	0.0843***	0.0299***	0.187***
13 Formation-Holding	93	0.206***	0.085***	0.0251***	0.204***
14 Formation-Holding	91	0.218***	0.0972***	0.0251**	0.228***
15 Formation-Holding	89	0.234***	0.106***	0.0224*	0.244***
16 Formation-Holding	87	0.228***	0.11***	0.0198	0.253***
17 Formation-Holding	85	0.216***	0.114***	0.0232*	0.257***
18 Formation-Holding	83	0.218***	0.126***	0.029**	0.268***
19 Formation-Holding	81	0.224***	0.14***	0.0292**	0.282***
20 Formation-Holding	79	0.24***	0.151***	0.0363***	0.293***
21 Formation-Holding	77	0.263***	0.169***	0.0549***	0.299***
22 Formation-Holding	75	0.28***	0.181***	0.0587***	0.292***
23 Formation-Holding	73	0.304***	0.178***	0.0659***	0.284***
24 Formation-Holding	71	0.315***	0.183***	0.074***	0.26***
25 Formation-Holding	69	0.311***	0.182***	0.0782***	0.238***
26 Formation-Holding	67	0.314***	0.184***	0.0738***	0.208***
27 Formation-Holding	65	0.307***	0.187***	0.0745***	0.185***
28 Formation-Holding	63	0.32***	0.191***	0.071***	0.161***
29 Formation-Holding	61	0.335***	0.19***	0.0667***	0.141***
30 Formation-Holding	59	0.339***	0.195***	0.0611***	0.138***
31 Formation-Holding	57	0.34***	0.194***	0.0602***	0.133***
32 Formation-Holding	55	0.356***	0.197***	0.0545***	0.128***
33 Formation-Holding	53	0.38***	0.196***	0.0518***	0.128***
34 Formation-Holding	51	0.389***	0.196***	0.047***	0.111***
35 Formation-Holding	49	0.418***	0.199***	0.048***	0.0932***
36 Formation-Holding	47	0.423***	0.214***	0.0454***	0.081***
37 Formation-Holding	45	0.454***	0.21***	0.0457***	0.0682***
38 Formation-Holding	43	0.468***	0.207***	0.0359**	0.0578**
39 Formation-Holding	41	0.467***	0.206***	0.0178	0.0332
40 Formation-Holding	39	0.466***	0.195***	0.00583	-0.00078
41 Formation-Holding	37	0.47***	0.193***	-0.00387	-0.0505
42 Formation-Holding	35	0.481***	0.206***	-0.00045	-0.0762
43 Formation-Holding	33	0.492***	0.217***	-0.00061	-0.116
44 Formation-Holding	31	0.51***	0.228***	-0.0114	-0.128
45 Formation-Holding	29	0.539***	0.236***	-0.00812	-0.112
46 Formation-Holding	27	0.59***	0.272***	-0.0274*	-0.114
47 Formation-Holding	25	0.645***	0.292***	-0.0421***	-0.101
48 Formation-Holding	23	0.666***	0.338***	-0.0555***	-0.0292

and one-holding results in the contrarian profit but is insignificant. However, returns of other strategies (from month 2 till month 38) are positive and significant, which means that momentum strategy yields significant profits, in relatively medium horizon and long horizon. Nevertheless, strategies after 41 months and onwards till 48 months yield contrarian profits but all of them are insignificant. In PSX, the data in its raw form has shown that contrarian strategy yields insignificant profits in relatively longer time horizon.

Moreover, considering the second scenario, we dropped those stocks from the sample that have zero returns, to check whether the elimination of such stocks effects the performance of portfolios in the testing period. The patterns of returns for strategies in weekly ACARs are similar to the raw data. However, there is a slight difference in the amounts of the returns. In the first five weeks, returns that result in the contrarian profits are slightly less than that of the raw data. However, the last two strategies, based on 7 and 8 weeks of formation and holding, result in the momentum profits and are slightly greater than the similar strategies of the raw data.

On the other hand, monthly returns also show the same patterns of returns as were observed in the raw data in the second scenario. However, the first strategy has shown significant contrarian profits unlike the first strategy in raw data that yielded insignificant profit. Moreover, significant momentum profits have been reported for 2 months formation-holding strategy and beyond that till 38 months. However, the momentum profits reported are greater than those reported for the raw data for the similar strategies. Moreover, insignificant contrarian profits result in the strategies of 40 months till 48 months formation-holding.

In the next scenario, stocks having returns less than –100 percent or greater than +100 percent have been dropped from the dataset. Computing the ACARs of momentum strategies have been shown in Table 4.1 in the third column. Interestingly, the patterns of ACARs remain the same as was observed previously in the case of raw data and dropping the zero returns. Similarly, monthly ACARs of strategies are also similar to the previously observed patterns. However, the contrarian profits of the 1-1 formation-holding strategy are insignificant like those obtained for the raw data. Moreover, momentum is also observed for the month 39 formation-holding as well, unlike the previous two cases which yielded momentum profits till 38 months formation-holding.

Furthermore, the effect of trading volume on the performance of momentum and contrarian strategies has also been observed. To this end, the study has used three different thresholds of trading volume to include those stocks that have decent traded volume in the stock market. First, stocks that have trading volume less than 500 are dropped from the sample. The results are shown in Table 4.1. The ACARs reported are somehow different from the previous cases. Contrarian profits are observed for 1, 2 and 3 weeks formation-holding strategies while momentum profits exist for the weeks 6, 7 and 8 formation-holding strategies.

Second, stocks that have trading volume less than 1000 are dropped from the sample and ACARs of the rest of the stocks are calculated. Now, only first two strategies result in the contrarian profits while the strategies from 4 weeks to 8 weeks formation-holding yield significant momentum profits. Third, stocks with trading volume less than 5000 have been dropped to get the frequently traded stocks on the PSX. ACARs of the

stocks have been computed. Interestingly, just one portfolio yields contrarian profits, which is for the first strategy i.e. one-week formation-holding, and the rest of the strategies from 2 weeks to 8 weeks formation-holdings result in significant momentum profits. It shows that investing in the frequently traded stocks will yield significant momentum returns in a relatively short horizon.

Similar procedure is adopted for the monthly data to compute the ACARs, after dropping three different trading volumes. When we drop stocks having trading volume less than 500 shares, it results in momentum profits for all the strategies starting from 2 months to 48 months formation-holding strategies. The first strategy i.e. one-month formation-holding result in insignificant momentum profits. Applying the second condition of dropping stocks, having trading volume less than 1000 shares, all the strategies exclusively result in significant momentum profits. Similarly, significant momentum profits are observed for all strategies in case of dropping stocks having trading volume less than 5000 shares.

It has been observed that the returns for respective strategies in the second case (dropping stocks having trading volume less than 1000 shares) have greater returns than the first case (dropping stocks having trading volume less than 500 shares). Moreover, the returns for the respective strategies in the third case (dropping stocks having trading volume less than 5000) are greater than those of the second case. Therefore, it can be inferred from the results (trading volume scenarios) in Tables 4.1 and 4.2 that there is a positive relation between trading volume of stocks and the profits of the momentum strategy. So, higher the trading volume, higher will be the momentum profits.

Moreover, the study attempted to see the effect of penny stocks on the strategies performance in the testing period. Penny stocks are common stocks of small companies that trade at lower price per share in the market. It is relatively risky and volatile and is subject to manipulation by stock promoters. In the first case, stocks having prices less than Rs 5 have been removed and ACARs of the remaining stocks have been computed. The results are shown in Table 4. For the weekly data, all the strategies yield momentum profits. However, momentum profits for the strategies 6, 7 and 8 weeks formation-holding periods are significant. Moreover, in case of removing stocks having prices less than Rs 10 yielded significant momentum profits for all the strategies exclusively. It should be noted that without penny stocks removed, most of the strategies yielded significant contrarian profits. Therefore, it was the presence of penny stocks that caused those contrarian profits, which disappear once these stocks are dropped.

For the monthly returns, when stocks having prices less than Rs 5 are dropped, significant momentum profits are reported for all the strategies except the first one 1-month formation-holding which is insignificant. However, the pattern of returns is different in case of removing the stocks having prices less than Rs 10. Profits of the 1-month formation-holding strategy are positive and insignificant. Strategies after that, from 2 to 15 months formation-holding and from 17 to 38 months formation-holding result in significant momentum returns. Furthermore, significant contrarian profits are reported for the last three strategies 46, 47 and 48 months formation-holding period, which gives support to the notion that contrarian strategies yield significant returns in long term.

Lehman (1990) controls for bias due to bid-ask spread, by skipping one trading period between portfolio formation and holding periods. The results obtained are shown in Table 4.1. Contrarian profits result for the first three strategies 1, 2 and 3 weeks formation-holding periods but are insignificant. While momentum profits are reported for the last four strategies 5, 6, 7 and 8 weeks formation-holding periods. For the monthly data, the study skipped one month between formation and holding period. The results obtained are similar to the previous cases. It yields significant momentum profits for most of the strategies from 1-month formation-holding period till 38-month formation-holding periods. Insignificant contrarian profits are reported for the last eight strategies from 40 months to 48 months formation-holding periods.

It can be concluded from these results that in the PSX, the most successful investment strategy is momentum that can generate significant returns in short, intermediate and long horizons. Nevertheless, contrarian profits are reported mostly for weekly strategies and few of the contrarian strategies that yield significant profits were reported in long-term (46, 47 and 48th months formation-holding), only in the case when penny stocks having prices less than Rs 10 have been dropped. So, contrarian strategies yield significant profits in short-term and slightly in long-term.

In view of these results, it is evident that the hypothesis that contrarian and momentum strategies do not generate statistically significant returns can safely be rejected. Evidence for different short-term and long-term contrarian and momentum strategies has been reported. The study provided evidence that strategies based on the previous returns could generate statistically significant returns in PSX both in short-term and long-term. Furthermore, it has been observed that the average cumulative abnormal returns exist for both the contrarian and momentum strategies in different time horizons, so the profits could be attributed to the overreaction and underreaction of stock prices. Furthermore, the profits reported for these strategies vary with the reconstruction of sample and the time period considered. For example, contrarian profits disappear for the strategies once we drop penny stocks from the sample.

5.3. Trading Strategies based on Non-Cumulative Returns

The returns of portfolios in Table 4.2 are different from the cumulative returns depicted in Table 4.1. The procedure for computing the ranking/formation period returns is same in this case as used for cumulative returns (ACARs), however, returns in holding/testing period is computed for the last designated month only and not cumulative of all the inclusive months. This is a more pragmatic method of calculation of returns for momentum and contrarian strategies as it can pinpoint marginal returns of each holding period returns.

The results of the weekly strategies (available on request) show that all the strategies yield momentum profits. Most of the strategies are significant. However, strategies of 9 weeks formation with 3 and 6-weeks holding result in the insignificant returns. We also check the results by skipping one week in formation and holding period to control for bid-ask spread or non-synchronous trading. The results show that few strategies yield insignificant returns e.g. 6 weeks formation with 3 and 6 weeks holding and 12 weeks formation with 3 weeks holding strategies yield insignificant returns. Moreover, the strategy yielding the highest significant returns is 9 weeks formation and 12 weeks holding strategy.

Comparing these results with average cumulative abnormal returns, it is evident that ACARs are larger in percentage than the above average returns, which is obviously due to the cumulative factor. The pattern of returns by investment strategies is different in ACARs. Most of the strategies in weekly ACARs yield contrarian strategies, even when one week is skipped in between formation and holding periods. The reason diagnosed was the presence of penny stocks in the winner and loser portfolios, whose smaller change in prices result in significant reversals in returns.

Table 4.2

Non-Cumulative Holding Period Returns—Monthly Data

The portfolios are formed on the basis of *J*-months lagged returns and then held for *K*-months. The values of J and K for different strategies are indicated in the first column and row, respectively. The stocks are ranked in ascending order on the basis of *J*-months lagged returns. The equally weighted portfolio comprising 30 percent of the lowest past return stocks is the loser portfolio while the equally weighted portfolio comprising 30 percent of the highest past return stocks is the winner portfolio. The average monthly returns of these portfolios are presented in this table. The returns shown in the Panel A are formed immediately after the lagged return are computed for formation/ranking of stocks while the portfolios shown in Panel B are formed one (01) month after the computation of lagged returns for formation/ranking of stocks. The t-statistics are reported in parentheses for *winner-loser* portfolios with 1, 2 and 3 stars, showing significance at 10 percent, 5 percent and 1 percent level respectively. The sample period is June 2004 to March 2014.

Months	Panel A				Panel B			
J(F) / K(H)	6	12	24	36	6	12	24	36
6 *loser*	-0.02512	-0.02618	-0.025	-0.02418	-0.0260	-0.0258	-0.02284	-0.02422
6 *winner*	-0.0141	-0.01516	-0.01826	-0.01666	-0.0226	-0.02103	-0.01969	-0.02171
6 *winner-loser*	0.011	0.011	0.00674	0.00752	0.003428	0.004836	0.00315	0.002507
	(4.06)***	(3.28)***	(2.08)**	(1.88)*	(2.25)**	(3.42)***	(1.96)*	(1.23)
12 *loser*	-0.02809	-0.02419	-0.02749	-0.02052	-0.02832	-0.02639	-0.02791	-0.01701
12 *winner*	-0.01259	-0.01444	-0.01875	-0.00879	-0.02261	-0.02039	-0.02247	-0.01271
12 *winner-loser*	0.0155	0.00975	0.00874	0.0117	0.005704	0.005998	0.005438	0.004301
	(5.28)***	(2.95)***	(2.04)**	(3.1) ***	(3.52)***	(3.61)***	(2.39)**	(1.58)
24 *loser*	-0.0291	-0.03117	-0.01866	0.01143	-0.02981	-0.03	-0.01537	0.008236
24 *winner*	-0.01489	-0.02057	-0.00767	0.010014	-0.02437	-0.02534	-0.01014	0.01135
24 *winner-loser*	0.0142	0.0106	0.011	-0.00142	0.005437	0.004656	0.005224	0.003114
	(3.53)***	(2.31)**	(1.94)*	(-0.227)	(2.79)***	(2.12)**	(1.89)*	(0.89)
36 *loser*	-0.03091	-0.01986	0.00704	0.011287	-0.02764	-0.01817	0.010318	-0.00331
36 *winner*	-0.01521	-0.00962	0.01276	0.011381	-0.02219	-0.01277	0.01473	0.00404
36 *winner-loser*	0.0157	0.01024	0.00572	9.39E-05	0.005457	0.005402	0.004413	0.007346
	(2.79)***	(1.7)*	(0.71)	(0.00751)	(2.18)**	(1.93)*	(1.03)	(1.05)

Similarly, all the monthly strategies generate momentum profits except one strategy i.e. 36 months formation, 24 months holding strategy, which yields contrarian profit, however insignificant. The largest significant momentum profit resulted from 6 months formation and 36 months holding strategy. In Panel B, all the strategies for 36 months formation yield insignificant returns. The most profitable strategy in Panel B is 12 months formation and 12 months holding strategy, which generates 0.599 percent returns. It is also observed that in case of controlling for the bid-ask spread/non-synchronous trading, returns for most of the strategies are being reduced.

5.4. Risk Adjusted Abnormal Returns

After analysing the behaviour of average cumulative returns, resulting from momentum and contrarian strategies for different time horizons, there is now a need to

explain whether the positive returns reported for momentum and contrarian strategies are due to their levels of risks or not. To accomplish this task, we use the method proposed by Chan (1988). The results of the regression of excess returns of the *winner-loser* portfolios are shown in Table 4.3. As shown in the table, risk-adjusted abnormal returns $\alpha_{p,\,F}$ of zero-investment portfolio (*winner-loser*) are significant and positive, regardless of the length of the formation period and weekly or monthly frequencies.

Table 4.3

Monthly Risk Adjusted Abnormal Returns

Risk-adjusted abnormal weekly returns for the zero investment portfolios formed with the highest Cumulative Risk Adjusted Returns ACARs during the previous 1, 2, 3….36 months. Risk-adjusted abnormal returns in each of the formation (F) and test (T) periods, for the winner (loser) portfolio with the 30 percent sorted stocks that have had the highest (lowest) ACARs in the formation periods of 1, 2, 3…36 months as well as for the zero-investment portfolio. Period analysed: 2004-2014. KSE-100 index, a value weighted index is used as a proxy of the market portfolio. ***, ** and * shows 1 percent, 5 percent and 10 percent level of significance respectively. The risk adjustment is made with the following regression:

$$R_{p,t} - R_{f,t} = \alpha_{p,\,F}\,(1 - D_t) + \alpha_{p,\,T}\,D_t + \beta_{p,\,F}\,(R_{m,\,t} - R_{f,\,t}) + \beta_{p,\,D}\,(R_{m,\,t} - R_{f,\,t})D_t + \varepsilon_{p,\,t}$$

		Raw data				
Strategy	Obs.	$\alpha_{p,\,F}$	$\alpha_{p,\,T}$	$\beta_{p,\,F}$	$\beta_{p,\,D}$	R-squared
1 Formation-Holding	232	0.343***	-0.0135*	0.274***	-0.521***	0.915
2 Formation-Holding	226	0.473***	0.0108	0.0884	-0.220*	0.922
3 Formation-Holding	220	0.576***	0.0250**	0.0592	-0.181*	0.929
4 Formation-Holding	214	0.657***	0.0464***	0.0154	-0.142	0.938
5 Formation-Holding	208	0.725***	0.0452***	-0.0172	-0.0435	0.942
6 Formation-Holding	202	0.783***	0.0447***	-0.033	0.0272	0.948
7 Formation-Holding	196	0.830***	0.0458***	-0.0815	0.0883	0.952
8 Formation-Holding	190	0.870***	0.0505***	-0.133**	0.161**	0.954
9 Formation-Holding	184	0.898***	0.0520***	-0.185***	0.212***	0.957
10 Formation-Holding	178	0.921***	0.0620***	-0.241***	0.302***	0.962
11 Formation-Holding	172	0.943***	0.0709***	-0.277***	0.326***	0.965
12 Formation-Holding	166	0.964***	0.0829***	-0.299***	0.341***	0.967
13 Formation-Holding	160	0.991***	0.0930***	-0.306***	0.338***	0.969
14 Formation-Holding	154	1.012***	0.108***	-0.328***	0.375***	0.974
15 Formation-Holding	148	1.029***	0.116***	-0.337***	0.360***	0.973
16 Formation-Holding	142	1.042***	0.117***	-0.349***	0.351***	0.972
17 Formation-Holding	136	1.057***	0.109***	-0.354***	0.354***	0.971
18 Formation-Holding	130	1.070***	0.108***	-0.354***	0.378***	0.97
19 Formation-Holding	124	1.083***	0.103***	-0.360***	0.373***	0.968
20 Formation-Holding	118	1.092***	0.0928***	-0.358***	0.358***	0.964
21 Formation-Holding	112	1.097***	0.0779***	-0.348***	0.349***	0.961
22 Formation-Holding	106	1.114***	0.0559**	-0.346***	0.341***	0.962
23 Formation-Holding	100	1.137***	0.0305	-0.352***	0.365***	0.964
24 Formation-Holding	94	1.159***	-0.00192	-0.385***	0.358***	0.972
25 Formation-Holding	88	1.186***	-0.0266	-0.421***	0.376***	0.976
26 Formation-Holding	82	1.211***	-0.0585**	-0.455***	0.408***	0.979
27 Formation-Holding	76	1.235***	-0.103***	-0.482***	0.420***	0.982
28 Formation-Holding	70	1.257***	-0.139***	-0.494***	0.448***	0.986
29 Formation-Holding	64	1.263***	-0.175***	-0.460***	0.453***	0.987
30 Formation-Holding	58	1.245***	-0.192***	-0.388***	0.354***	0.988
31 Formation-Holding	52	1.261***	-0.216***	-0.379***	0.319***	0.988
32 Formation-Holding	46	1.299***	-0.255***	-0.413***	0.296***	0.99
33 Formation-Holding	40	1.321***	-0.290***	-0.420***	0.291**	0.988
34 Formation-Holding	34	1.406***	-0.311**	-0.512***	0.377*	0.989
35 Formation-Holding	28	1.342***	-0.377*	-0.415***	0.238	0.991
36 Formation-Holding	22	1.259***	-0.39	-0.317***	0.134	0.994

The abnormal returns in the testing period $\alpha_{p,\,T}$ are negative and significant for the first six weeks (1 to 6 weeks) formation-holding strategies for the raw data. The abnormal returns of the 8 weeks formation-holding are positive but insignificant. These results are consistent with the simple ACARs computed on weekly basis. Nevertheless, risk-adjusted abnormal returns for the monthly data are somewhat similar. The abnormal returns of the 1-week formation-holding strategies are negative and significant at 10 percent level.

This regression uses the returns for the zero-investment portfolio obtained previously i.e. ACARs. However, in the monthly data, observations have been significantly reduced for long-time periods, which affect the results of the estimates. Therefore, we limit the regression to 36 months formation-holding period instead of 48 months which has been used in ACARs. For the raw data case, the returns for strategies from 3 months to 22 months formation-holding has positive and significant returns, while strategies from 26 to 35 months formation-holdings are negative and significant.

The negative returns shown for the strategies 26 to 35 months formation-holding was previously positive in simple ACARs. However, when the risk is considered, it results in the negative returns. The results show contrarian profits in the short horizon (1 to 6 weeks) as well as in the long-term (26 to 35 months), however, this time more strategies yield significant contrarian profits in the long-term as compared in the case of simple ACAR. Strangely, this effect is even more pronounced in case of dropping the penny stocks from the sample. When penny stocks are dropped, all the strategies yield negative risk adjusted returns and most of the returns are significant in case of dropping the stocks having prices less than Rs 10. So the negative returns might be due to the presence of penny stocks which are mostly illiquid.

On the other hand, momentum profits are reported in the short and intermediate (3 to 22 months) horizon, while in the simple ACAR, momentum profits were observed till 38 months formation-holding.

Furthermore, the $\beta_{p,\,F}$ reported for all the strategies in the weekly data is insignificant, implying that the systematic risk for momentum portfolios in the formation period is not larger enough to be considered. However, $\beta_{p,\,D}$ reported is significant and on the other hand most of the strategies yield significant profits. So even when the risk is considered, these strategies result in significant profits except for few strategies. For example, in the monthly data, the abnormal returns for the strategies 23, 24 and 25 months formation-holding are insignificant, which is however significant in ACARs reported in Table 4.1. Moreover, the values of beta for these strategies are significant. So once the risk is considered, the behaviour of these three strategies can be significantly explained. Furthermore, if we look at the returns in the testing period, they have decreased from that in the formation period but generally the values of beta are not big enough to explain the profits fully, to a greater extent. It can be inferred that risk of portfolios could partially explain the returns under these strategies.

The difference in the systematic risk $\beta_{p,\,D}$ between formation period and testing period is highest for the one-month formation-holding strategy that yields significant contrarian profits. Therefore, it can be stated that the reversion observed in the returns of loser-winner portfolio (contrarian strategy) is due to the difference in risk of the portfolio in the formation and testing period. The $\beta_{p,\,F}$ of the ranking period is negative on average i.e. 29 out of 36 strategies have shown negative beta which are

reliably different from zero. The beta in the testing period has been increased from that in the formation period with an average gain of 0.243(mean value of $\beta_{p,D}$). Although, the beta can explain the returns to the momentum and contrarian strategies, however, the values of beta of these strategies is very small when compared to their returns to be explained. So $\beta_{p,\,D}$ is still not large enough to account for the profitability of the momentum and contrarian strategies.

Similar summary can be developed for other scenarios both in the monthly and weekly data. The $\beta_{p,\,F}$ in the weekly data has become significant when stocks with trading volume is less than 1000 and 5000, and in the case of dropping the stock having price less than Rs 5 and Rs 10. Moreover, the abnormal returns in the testing period of the 3, 4 and 5 weeks formation-holding strategies (in case of dropping stocks having trading volume less than 1000 shares) become insignificant, which is otherwise significant previously in computation of simple ACARs. So, risk can have a role in explaining the returns of these strategies. It is also evident from the betas in the testing period, which on average are high compared to those in the formation period. Similar results are observed in the case of dropping stocks of trading volume, less than 5000 shares are dropped.

Considering the results, it can be concluded that both short and long horizon contrarian strategies and short and intermediate horizon momentum strategies yield significant profits even after their adjustments for risk. So, one can speak of an overreaction effect in short and long horizon and underreaction effect in short and intermediate horizon. Moreover, explanation of these profits on the basis of risk is limited to very few strategies both in the monthly and weekly data, which is in line with the previous studies [Forner and Marhuenda (2003)]. Even after adjusting for the risk, most of the strategies yield significant positive and negative returns though the magnitude of these returns in the testing period has been reduced than that of the formation period. So, risk partially explains the return of these strategies.

Moreover, in unreported results, we found that the pattern of risk adjusted abnormal returns, observed in the testing period $\alpha_{p,\,T}$ is similar to that obtained for ACARs.

5.5. Weight Relative Strength Scheme (WRSS)

Weighted relative strength scheme (WRSS) is another method of computing returns, proposed by Lo and MacKinlay (1990). WRSS is the investment strategy of buying stocks in proportion to their returns in the formation period. Moreover, stocks that outperform the market are designated as winners and those that underperform the market in the formation period are the loser stocks. The weighted relative profits of these winner and loser stocks are observed in the testing period, which are reported in Table 4.6. This method has been employed to check whether the profits of the investment strategies, reported previously through other procedures, are robust to the method used to compute their returns. Results in Table 4.4 show that the patterns of returns for the different formation-holding strategies are surprisingly similar to those obtained through ACARs in Table 4.2. Nevertheless, it is different from the risk-adjusted abnormal returns reported earlier.

The profits reported for the 1-month formation-holding, just like the ACARs, are negative, which means that they result in contrarian profits but are insignificant.

Nevertheless, Mclnish, *et al*. (2008) reported that results of the strategy, immediately following the formation period, should be interpreted with caution because it might depict the price patterns resulted from the non-synchronous trading. All other strategies, from 2 months to 36 months formation-holding periods result in momentum profits i.e. they yield positive returns. Furthermore, when all the returns are annualised, both the methods WRSS and ACARs show that the 4 and 5 months formation-holding strategies yield highest significant momentum returns. 4 and 5 months formation-holding strategies yield 38.4 percent and 36.24 percent annual returns through WRSS procedure while 22.17 percent and 20.44 percent annualised returns are reported through ACARs procedure. The next highest returns strategies are different for both the strategies. The annualised returns computed through WRSS and ACARs are shown in Table 4.5.

Table 4.5

Comparison of Annualised ACARs and WRSS Returns

The table provides the annualised returns of the strategies reported in Tables 4.2 and 4.6 for ACARs and WRSS. The returns are sorted, based on the absolute values, irrespective of the signs of the profits reported.

Strategy	WRSS	Annualised WRSS Returns	Strategy	ACARs	Annualised ACARs
4 Formation-Holding	0.128	38.40%	4 Formation-Holding	0.0739	22.17%
5 Formation-Holding	0.151	36.24%	5 Formation-Holding	0.0852	20.45%
3 Formation-Holding	0.084	33.60%	6 Formation-Holding	0.0963	19.26%
7 Formation-Holding	0.188	32.23%	15 Formation-Holding	0.24	19.20%
8 Formation-Holding	0.212	31.80%	10 Formation-Holding	0.158	18.96%
6 Formation-Holding	0.158	31.60%	14 Formation-Holding	0.221	18.94%
9 Formation-Holding	0.232	30.93%	16 Formation-Holding	0.252	18.90%
10 Formation-Holding	0.249	29.88%	9 Formation-Holding	0.141	18.80%
11 Formation-Holding	0.258	28.15%	8 Formation-Holding	0.124	18.60%
12 Formation-Holding	0.278	27.80%	11 Formation-Holding	0.169	18.44%
13 Formation-Holding	0.297	27.42%	7 Formation-Holding	0.107	18.34%
14 Formation-Holding	0.317	27.17%	17 Formation-Holding	0.259	18.28%
15 Formation-Holding	0.336	26.88%	13 Formation-Holding	0.198	18.28%
16 Formation-Holding	0.354	26.55%	12 Formation-Holding	0.182	18.20%
17 Formation-Holding	0.371	26.19%	18 Formation-Holding	0.267	17.80%
18 Formation-Holding	0.385	25.67%	19 Formation-Holding	0.281	17.75%
19 Formation-Holding	0.397	25.07%	3 Formation-Holding	0.0443	17.72%
20 Formation-Holding	0.411	24.66%	20 Formation-Holding	0.293	17.58%
21 Formation-Holding	0.426	24.34%	21 Formation-Holding	0.303	17.31%
22 Formation-Holding	0.443	24.16%	22 Formation-Holding	0.303	16.53%
23 Formation-Holding	0.459	23.95%	23 Formation-Holding	0.29	15.13%
2 Formation-Holding	0.0399	23.94%	2 Formation-Holding	0.0232	13.92%
24 Formation-Holding	0.476	23.80%	24 Formation-Holding	0.274	13.70%
25 Formation-Holding	0.492	23.62%	25 Formation-Holding	0.255	12.24%
26 Formation-Holding	0.507	23.40%	26 Formation-Holding	0.223	10.29%
27 Formation-Holding	0.522	23.20%	27 Formation-Holding	0.198	8.80%
28 Formation-Holding	0.535	22.93%	1 Formation-Holding	-0.0069	-8.22%
29 Formation-Holding	0.546	22.59%	28 Formation-Holding	0.179	7.67%
30 Formation-Holding	0.556	22.24%	29 Formation-Holding	0.15	6.21%
31 Formation-Holding	0.565	21.87%	30 Formation-Holding	0.146	5.84%
32 Formation-Holding	0.574	21.53%	31 Formation-Holding	0.139	5.38%
33 Formation-Holding	0.578	21.02%	32 Formation-Holding	0.139	5.21%
34 Formation-Holding	0.581	20.51%	33 Formation-Holding	0.131	4.76%
35 Formation-Holding	0.576	19.75%	34 Formation-Holding	0.121	4.27%
36 Formation-Holding	0.569	18.97%	35 Formation-Holding	0.101	3.46%
1 Formation-Holding	-0.0009	-1.13%	36 Formation-Holding	0.0851	2.84%

Comparing the WRSS returns to that obtained through ACARs procedure, it observed that the patterns of returns are similar, however, in absolute terms the WRSS returns are much higher than the ACARs. The reason is the difference in mathematical procedure of WRSS and ACARs. ACARs use the geometric mean of the returns of all the stocks in each winner and loser portfolio, while WRSS takes the simple arithmetic mean. The difference is also due to the use of weights computed in the ranking period. However, both use the market adjusted returns in their procedures.

5.6. Decomposition of Momentum and Contrarian Profits

The profits presented in Table 4.4 through WRSS procedure has been decomposed through Lo and MacKinlay (1990) model with the help of model developed by Jegadeesh and Titman (1995). The three components in the Lo and MacKinlay model are denoted by σ^2_{μ} (cross-sectional risk among stocks), Ω (correlation or time pattern of stocks that exhibit market inefficiency exploitable by trading strategies i.e. momentum or contrarian strategies) and $\sigma^2_f \delta$ (lead-lag effect as analysed by Lo and MacKinlay (1990)). The components of 1 to 5 months formation-holding strategies are shown in Table 4.8.

Results reported in Table 4.5 show that the variance of expected stock returns σ^2_{μ} is positive and results in the decrease in contrarian profits. Moreover, those stocks which have higher expected returns experience higher than average returns both in formation and holding periods. So, it is the reason that this component reduces contrarian profits and increases momentum profits. The second term is Ω, which is the cross-sectional average of serial covariance of the idiosyncratic component of individual stock returns (error terms) and is taken as proxy for the overreaction effect. This component is determined by the overreaction of stock prices to firm specific information or due to the investors' sentiment on a specific stock. If there is overreaction of stock prices to firm specific information and the overreaction corrects in the following period, the value of own-serial covariance will be negative. Thus, it will increase contrarian profits but will decrease the momentum profits.

Table 4.6

Decomposition of Contrarian and Momentum Profits

Profits of the strategies from 1 to 5 months formation periods are decomposed according to Lo and MacKinlay Model. The percentages in the parenthesis show the relative contribution of each factor to the contrarian and momentum profits.

Strategy	σ^2_{μ}	Ω	$\delta \sigma^2_f$
Expected profit of the contrarian strategy = $-\sigma^2_{\mu} - \Omega - \sigma^2_f \delta$			
1 Formation-Holding (Contrarian)	0.00211 (-42%)	-0.00278 (55%)	-0.00018 (4%)
Expected profit of the momentum strategy = $\sigma^2_{\mu} + \Omega + \sigma^2_f \delta$			
2 Formation-Holding (Momentum)	0.00722 (15%)	0.03829 (81%)	-0.0019 (-4%)
3 Formation-Holding (Momentum)	0.01579 (14%)	0.08584 (76%)	-0.01119 (-10%)
4 Formation-Holding (Momentum)	0.03039 (16%)	0.13942 (72%)	-0.02506 (-13%)
5 Formation-Holding (Momentum)	0.04434 (19%)	0.17012 (74%)	-0.01632 (-7%)

Moreover, if there is underreaction of stock prices to firm-specific information or if noise trading cancels each other and there is no creation of sentiments, the own-serial covariance will be positive. In this scenario, it will contribute to the momentum profits. Their values for one-month formation-holding strategy are negative, which will increase the contrarian profits. The positive impact is also evident when its value is being put in the equation given in the table.

The last term $\sigma^2_f\delta$ is the proxy for lead-lag structure of returns proposed by Jegadeesh and Titman (1995). It is the cross-sectional variance of common factors' unexpected realisation times the cross-sectional average of individual stocks cross-serial covariance of contemporaneous and lagged sensitivities to common factor realisation. If $\sigma^2_f\delta$ is negative (i.e. if cross-serial covariance between contemporaneous and lagged betas is negative), it means that case lead-lag structure contributes positively to contrarian profits and negatively to momentum profits and vice versa if $\sigma^2_f\delta$ is positive. For example, it is negative for one-month formation-holding, so it means it contributes positively to the contrarian profits.

Relative contribution of each component is also given in Table 4.6 in percentages. However, the first component, which instead of contributing to the contrarian profits, decreases it by 42 percent. So, the cross-sectional risk among stocks is one of the most important key factors, according to Lo and MacKinlay model that accounts for the decrease in contrarian profits in PSX. The second term which is proxy for the overreaction effect is the biggest contributing factor (55 percent) to the contrarian profits. It shows that stock prices reaction to information in the stock market is significant factor that yields contrarian profits in the one-month formation-holding strategy. Moreover, it also accounts for the market inefficiency. The third component which is proxy for the lead-lag effect contributes positively but in relatively very less amount (4 percent).

Similarly, four momentum strategies are decomposed, given in Table 4.6. The first factor, i.e. cross-sectional risk reported for all the momentum profits is positive and so is contributing positively to the momentum profits. The second term which is the own-serial covariance of error term is positive for all the four momentum strategies. It means that stock prices underreact to firm specific information. Surprisingly, it is negative for all the momentum profits in PSX and so is causing it to reduce.

The relative contribution of each factor is highest for the underreaction effect. In PSX, investors do not seem to associate sentiments with the stock prices and it becomes consistent over a period of time, giving rise to momentum profits. The first component, i.e. variance of expected returns is the second highest contributing factor to momentum profits. The lead lag structure is the only factor that reduces the momentum profits in PSX. However, the percentage by which it reduces the momentum profits is relatively less than the percentage of the other two factors that contribute positively to the momentum profits.

6. CONCLUSION

In this paper, we sought (i) to check the presence of contrarian and momentum investment strategies in the PSX, (ii) to provide risk-based explanation for momentum and contrarian profits obtained, and (iii) to split contrarian and momentum profits into its components on the basis of Lo and MacKinlay model. We accomplished these objectives

by analysing the data of 581 firms listed at the PSX, for 11 years' time period from 2004-2014. We analysed the significance of contrarian and momentum strategies through three different methods i.e. Average cumulative abnormal returns, risk-adjusted abnormal returns and weighted relative strength scheme returns. In computing average cumulative abnormal returns, we used six different cases for weekly and monthly formation-holding periods separately, to examine whether the profits obtained through the investments strategies differ with the changes in the data or not. The pattern of returns in these different scenarios is generally the same with minor difference. For example, dropping stocks, having trading volume less than 500, 100 and 5000 (highly traded stocks) in the monthly data, all the strategies yield significant momentum profits. The most significant variable that changed the results from momentum to contrarian camp is the presence of small or penny stocks. When we drop penny stocks in the monthly data (stocks having prices less than Rs. 10), three significant contrarian profits are reported (46, 47 and 48 months formation-holding periods). Moreover, dropping penny stocks in the weekly data yielded significant momentum profits which were previously contrarian. Our tests indicate that if investors use raw data, without removing penny stocks, they will observe significant contrarian profits in short-run. One reason for this finding might be that penny stocks are usually illiquid. When they show profit or loss in one period, they remain inactive in the next.

Generally, the patterns of returns obtained for weekly and monthly formation-holding strategies are different. Comparing the results of the weekly raw data, we get significant contrarian profits (1 to 5 weeks formation-holding strategies) and significant momentum profits (7 and 8 weeks formation-holding strategies). So interestingly, contrarian and momentum strategy yield significant returns in short-term. The result of contrarian profits in such a short term is due to the penny stocks that do not trade quite frequently. For the monthly data, significant momentum profits are reported for 2 to 38 formation-holding strategies. Although contrarian profits also exist in long-term for 41 to 48 months formation-holding strategies but they are insignificant. However, variation in these patterns has been observed in different scenarios both for weekly and monthly formation-holding strategies, as discussed in the above paragraph. Therefore, the significance of momentum and contrarian profits is the evidence that stock prices show underreaction and overreaction in PSX.

Moreover, the profits reported through ACARs have been used to examine that whether such profits could be explained on the basis of risk. However, we fail to provide much evidence for explaining these profits, based on systematic risk. Furthermore, the pattern of the returns of the strategies obtained through WRSS is interestingly similar to those obtained for ACARs (compared with the ACARs of only raw data). All the strategies (2 to 36 months formation-holding strategies) yield significant momentum profits. Although the pattern observed in WRSS is similar to that of ACARs, nevertheless, the returns obtained through WRSS are much higher than computed through ACARs. Moreover, we also converted the portfolios' returns to annualised form. Both WRSS and ACARs have shown that the 4 and 5 months formation-holding strategy will yield highest significant momentum profits. Nevertheless, after that, the ranking of portfolios in WRSS and ACARs, based on annualised returns, differs. Further, our results indicate that cross-sectional risk decreases the contrarian profits. While the time series

pattern (overreaction effect) and lead-lag structure contribute positively to the contrarian profits. Relatively, the overreaction effect is the largest contributing factor of the one-month contrarian profits in PSX.

Our findings show that penny stocks significantly impact the performance (i.e. reverses especially in case of weekly strategies) of momentum portfolios. Future researches might enquire about the reasons and channels through which penny stocks exert influence on momentum portfolios. Furthermore, we found that share trading volume has positive relation with the momentum profits in the weekly data. So, there is a need to find that whether such relation exists in other stock markets or not?

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Differing Impact of Liberalisation: The Case of Vertically Integrated Clothing Firms

ZARA LIAQAT

This paper compares the productivity and other characteristics of vertically integrated and non-integrated firms to investigate whether efficiency gains associated with a given liberalisation episode vary across firms, depending on their organisation. A theoretical setting of vertical integration in the textile and clothing industry is developed, to reveal that trade expansion triggers a change in the relative factor cost of these two types of firms, and consequently, a change in product range produced by them. The results are further backed by using a sample of clothing firms in Pakistan for the years 1992-2010 to analyse the effect of the phasing out of U.S. textile and clothing quotas on firm-level efficiency. The empirical findings illustrate that an increase in the level of quotas brings about a significant growth in the mean productivity of vertically integrated clothing firms. The diminishing efficiency of non-integrated firms points to the lack of ability of these firms to benefit from tighter quality control, timely revision of production policies and guarantee of supplies.

JEL Classification: F13, F14, D24, L23
Keywords: Trade Liberalisation, Productivity, Vertical Integration, Firm Heterogeneity, Multi-Fibre Arrangement

1. INTRODUCTION

Do efficiency gains associated with a given liberalisation episode vary across firms depending on their organisation? There are a large number of both theoretical as well as empirical studies which attempt to measure the effect of a greater exposure to international markets on firm and industry productivities. In the context of trade liberalisation and its impact on firm efficiency, what has still remained a relatively understudied subject is the diverging outcome of a given liberalisation regime on different types of firms. If a certain trade policy change creates contrasting outcomes across different groups of firms, empirical methodologies based on aggregated data or assuming homogeneity in the effect of a liberalising episode are highly likely to produce ineffectual results. In this paper, we strive to tackle this weakness in the existing literature. In particular, we compare the productivity of vertically integrated and non-integrated firms within a country, allowing both types of firms to engage in international trade, and analyse how trade liberalisation affects the efficiency of these firms differently.

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By making use of detailed data, available for an industry which usually comprises of both vertically integrated and non-integrated companies, we analyse the experience of clothing firms in Pakistan under the U.S. Textile and Clothing (T&C) quotas and the subsequent end of the Multi-Fibre Arrangement (MFA). Our paper utilises data on the amount of quotas under the MFA and the succeeding Agreement on Textile and Clothing (ATC), along with the company-level data set of a representative sample of T&C companies in Pakistan, and thus, provides an excellent context of trade liberalisation in a developing country, which heavily relies on the export of textile products.

Vertical integration is the configuration of production under which one business unit carries on sequential stages in processing/distribution of a manufactured good which is sold by other firms without additional processing [Blois (1972)]. In line with the Transaction Cost Economics (TCE) theory, founded by Williamson (1975), internal organisation of a firm needs to be designed in such a way so as to improve incentives and control agency costs. The literature has identified a range of factors associated with integration [Acemoglu, *et al*. (2005)]. Firms integrate vertically to erect entry barriers, maintain product quality, assist investments in specialised assets and develop coordination [Williamson (1975)]. Companies often vertically integrate to ensure that the supply of key inputs is readily available. Most of these companies often produce more inputs than they need and sell the remainder [Hortaçsu and Syverson (2012)]. Managerial oversight, customer contacts and marketing know-how are just some of the many benefits enjoyed by vertically integrated firms.

The advantages must be weighed against disadvantages, which usually consist of disparities between productive capacities at different stages of production, lack of specialisation and lack of direct competitive pressure on costs of products [Blois (1972)]. Nevertheless, there is modest micro-level evidence on productivity-integration relationship and on how production differs in vertically integrated firms compared to non-integrated firms. There is an even lesser evidence on the impact of trade liberalisation on productivity of vertically integrated firms. There is a growing literature on international specialisation of production and its impact on firm efficiency. Expansion of international specialisation and disintegration of production has been an important characteristic of the international economy [Antràs and Helpman (2004)].[1] However, the focus of this literature has been on productivity gains associated with disintegration of production across different countries.

In this paper, we analyse the effect of trade liberalisation on the productivity of firms exporting T&C products. The way we define liberalisation in this paper is by a gradual lifting of trade quotas on the exports of textile and clothing products from developing to developed countries, characterised by the MFA. The MFA enforced restrictions on T & C exporters, and the Uruguay Round (1994) ended the MFA by signing the ATC. ATC commenced the practice of integrating T&C products into General Agreement on Tariffs and Trade (GATT) and World Trade Organisation (WTO). Integration occurred across four phases. In Phase I, countries were to incorporate products, representing 16 percent of their 1990 import volumes. At the start of Phases II and III on January 1st, 1998 and January 1st, 2002, respectively, further 17 and 18

[1]Hummels, *et al*. (2001) demonstrate that international trade has grown faster in components than in final goods.

percent of 1990 export volumes were integrated. Lastly, on January 1st, 2005, Phase IV of the ATC integrated the outstanding 49 percent of export volumes, with all quotas abolished. Other than removing quotas, the ATC enhanced developing countries' access to the developed countries, by speeding up quota growth over the four phases through the "growth-on-growth" provision [Brambilla, *et al.* (2007)]. Expiration of these quotas was expected to bring about considerable reallocation of production and exports across countries, including Pakistan, for which the T&C sector is an imperative industry. Although there are a number of studies which investigate the efficiency of vertically integrated firms relative to non-integrated firms, none of these in particular consider the influence of trade liberalisation caused by phasing out of quotas on firm-level efficiency of these two types of firms. We explain how trade liberalisation generates a greater incentive for vertical integration in the production of clothing goods.

The most important contribution of this study is the theoretical setup, created to generate the differential outcomes for the two types of firms. The theoretical background to vertical integration in clothing industry shows that liberalisation causes a change in relative factor cost of the two types of firms, and therefore, a change in product range produced by each of them. Liberalisation in home country results in an increase in product range, produced by vertically integrated firms. Moreover, the theory is further substantiated by the empirical models used in the following sections. The empirical findings demonstrate that an upsurge in the level of quotas generates a significant decrease in mean productivity of clothing firms that are not vertically integrated. This is in contrast to the conventional wisdom, according to which the T&C industry of Pakistan would perform much better in the quota free regime, given that it was apparently constrained by the MFA quotas. The result is also intriguing because it corroborates the argument in favour of vertical integration of production, at least in the T&C industry.

The paper is organised as follows: In Section 2, we concisely go over the recent literature on vertical integration of production and the influence of trade on firms. Section 3 provides a theoretical background to vertical integration in T&C industry. We will then illustrate our methodology. Empirical results are presented in Section 5 while Section 6 concludes.

2. LITERATURE REVIEW

In order to motivate the diverse outcomes in terms of distinct firm performance as a result of liberalisation, it would be appropriate to review the literature on integration choices of firms. Acemoglu, *et al*. (2005) obtain cross-country correlations between vertical integration and financial development, contracting costs and entry barriers. When credit markets are imperfect and when there is lack of financial development, there are more likely to be larger firms in a country [Kumar, *et al*. (1999)]. These firms are prone to produce some of their own inputs. Therefore, improved financial institutions and credit markets may perhaps be associated with not as much of vertical integration [Acemoglu, *et al*. (2005)].

Babe (1981) makes productivity comparisons of integrated and non-integrated Canadian telephone companies, in order to determine the net effect of vertical integration on efficiency of telephone operations. Vertical integration results in lower costs to telephone operations in the form of reduced contracting and selling costs. Conversely,

vertical integration brings about inefficiency on the part of telephone companies, owing to the possibility that desirable technology available only from unaffiliated suppliers may be foreclosed. Atalay, Hortaçsu, and Syverson (2013) point towards an alternative explanation for vertical ownership, namely that it promotes efficient intra-firm transfers of intangible inputs.

Hortaçsu and Syverson (2007) use a rich plant-level data set of cement and ready-mixed concrete producers to reflect on the reasons and results of vertical integration, with particular regard to its effects on market power. Contrasting total factor productivity (TFP) changes among formerly non-integrated plants shows that plants that become integrated, witness approximately 10 percent faster productivity growth. Hortaçsu and Syverson (2009) make use of the Longitudinal Business Database to study the productivity of plants in vertically structured firms. They discover that vertically integrated plants have higher productivity levels than their non-integrated industry cohorts.

In the context of textile industry, an incredibly valuable and applicable study that compares the performance of firms under various management conditions is that by Braguinsky, *et al*. (2015). Using the Japanese cotton spinning industry data, they analyse ties between productivity, profitability and ownership as clear mechanisms to spur the industry's growth. Although the principal objective of their study is to quantify the result of acquisitions and management turnover; numerous findings generated in the paper offer strong empirical support to the ones we display in the present study, for example, the influence on profitability.

Lots of developing countries have initiated programs of trade liberalisation. Hay (2001) investigates effects of the 1990 Brazilian trade liberalisation on the market share, profit and productivity of 318 manufacturing firms. A production function for the period 1986-94 shows sizeable TFP gains in the period up to 1994. The effect of trade liberalisation on the productivity of Pakistani firms is best examined by Liaqat (2013). The study measures productivity, using a technique that deviates from the assumptions of perfect competition and constant returns to scale, and employs numerous specifications using input and output tariff data to compute efficiency. The results imply that not only there is a rise in competition following trade liberalisation but also a reduction in the returns to scale for most industries. Likewise, there is no strong evidence of an improvement in productivity after trade reforms were introduced in the manufacturing sectors of Pakistan.

The effect of quota phase-outs in the form of the end of MFA on firm-level efficiency has recently been analysed by Liaqat (2014). The study uses a sample of textile and clothing companies to display that MFA expiration leads not only to an increase in the average productivity of textile producing firms but a significant reduction in the mean productivity of clothing producers. Liaqat (2014) offers a number of explanations for this outcome, such as, a change in the input and product mix, entry by non-exporters in the clothing sector and sectoral differences in quality ladders, and draws some crucial policy lessons from this study. Despite its remarkable results, Liaqat (2014) makes no distinction between the clothing firms, producing their own inputs as opposed to the ones buying raw materials from other textile companies. In fact, the vertically integrated clothing firms are referred to as *clothing* firms alone, regardless of their production of

T&C industry intermediate goods. As shown in the theoretical and empirical models below, this is a very strong assumption and may produce potentially distorted estimates. In that respect, the current study goes one step further in underscoring the heterogeneity within the textile and clothing firms by distinguishing between vertically integrated and non-integrated clothing firms.

Therefore, none of the contemporary papers considers the effect of trade liberalisation caused by phasing out of quotas on firm-level efficiency of the two types of firms. This paper is the first one to emphasise the variation in the effect of MFA termination, across firms depending on their organisation.

3. THEORETICAL BACKGROUND

Subsequent to the above analysis, it would be useful to compare productivity of clothing producers that buy their raw materials (either from domestic producers or from abroad), and productivity of vertically integrated clothing producers that manufacture their own yarn and fabric. In this section, we describe how trade liberalisation generates an incentive for vertical integration in the T&C industry. We follow the model by Yi (2003). Trade liberalisation triggers a change in relative factor cost of the two types of firms, and consequently, a change in product range produced by each of them. We consider two special cases of free-trade equilibrium which generate complete specialisation in the production of all goods.

Consider three types of firms having the following production functions:

$$y_1^i(z) = A_1^i(z)\, k_1^i(z)^{\alpha}\, l_1^i(z)^{1-\alpha}, \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

$$y_2^i(z) = x_1^i(z)^{\theta}\left[A_2^i(z)\, k_2^i(z)^{\alpha}\, l_2^i(z)^{1-\alpha}\right]^{1-\theta}, \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

$$y_3^i(z) = A_3^i(z)\, k_3^i(z)^{\gamma}\, l_3^i(z)^{1-\gamma}, \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

where $i = H$ or F (H denoting home production and F denoting foreign production), and $z \in [0, 1]$ indicates product z produced by the firm. $A_f^i(z)$ is the TFP of firm f in the production of good z in country i, and $l_f^i(z)$ and $k_f^i(z)$ are labour and capital used by firm f in producing output $y_f^i(z)$. The first type of firm produces raw materials purchased by the second type, i.e. $y_1^i(z) = x_1^i(z)$, where $x_1^i(z)$ is firm 2's use of output produced by firm 1. The second type of firm combines input produced by the first type, labour and capital in a nested Cobb-Douglas production function. In our case, it suggests that the first type produces textile products and the second type buys textile products from type one firm and uses them to produce the final good, for example, ready-made garments. The third type of firm also produces the final good but, unlike the second type of firm, produces its own raw materials.

Firms and Technology

Let us only consider the home industry. Firms maximise profits taking prices as given. The profit maximisation problem for type 1 firm is given by:

$$\text{Max}\,\{p_1(z)y_1(z) - wl_1(z) - rk_1(z)\}\ \text{w.r.t.}\ k_1 \text{ and } l_1,$$

and that for type 2 firm:

$$\text{Max}\,\{p_2(z)y_2(z) - p_1(z)x_1(z) - wl_2(z) - rk_2(z)\}\ \text{w.r.t.}\ x_1, k_2 \text{ and } l_2,$$

if the firm buys only domestically produced raw materials from type one firms. $p_1(z)$ is the world price of textile raw materials, $p_2(z)$ is price of the final good, and w and r are the wage and rental rates. If firm 2 buys imported raw materials, profit maximisation problem is given by:

$$\text{Max}\,\{p_2(z)y_2(z) - p_1(z)\,(1+\tau)x_1(z) - wl_2(z) - rk_2(z)\}\ \text{w.r.t.}\ x_1, k_2 \text{ and } l_2,$$

where τ is a measure of trade liberalisation, for example, tariff rate or price of quota license. Since firms 2 and 3 both produce the same final good, the market price for their output will be identical ($p_2(z) = p_3(z)$). Therefore, profit maximisation problem for type 3 firm is given by:

$$\text{Max}\,\{p_2(z)y_3(z) - wl_3(z) - rk_3(z)\}\ \text{w.r.t.}\ k_3 \text{ and } l_3.$$

Households

The utility maximisation problem of households is specified as:

$$\text{Max}\ \sum_{t=0}^{\infty}\beta^t \ln\left(C_t^i\right),$$

$$\text{w.r.t.}\ \ P_t^i C_t^i + P_t^i\left[K_{t+1}^i - (1-\delta)K_t^i\right] = w_t^i L_t^i + r_t^i K_t^i + T_t^i \equiv P_t^i Y_t^i,$$

$$K_{t+1}^i = (1-\delta)K_t^i + I_t^i,\ \ \forall\, t \geq 1,$$

where P_t^i and Y_t^i are the price and output of the final good in country *i* at time *t*. C_t^i is consumption, K_t^i and L_t^i are total capital and labour, I_t^i is investment, and T_t^i is the lump-sum transfer of quota license revenue, expressed in terms of the home final good. Households own the capital and rent it to firms period by period.

Market Clearing

The market clearing condition for good 1 (textile – raw material) is:

$$y_1(z) = y_1^H(z) + y_1^F(z) = x_1^H(z) + x_1^F(z),$$

and market clearing condition for good 2 (apparel – finished good) is:

$$y_2(z) + y_3(z) = y_2^H(z) + y_2^F(z) + y_3^H(z) + y_3^F(z),$$
$$y_{2t}(z) + y_{3t}(z) = C_t^i + \left[K_{t+1}^i - (1-\delta)K_t^i\right] = Y_t^i,\ \ \forall\, t \geq 1 \text{ and } i = H, F.$$

This is because both firms 2 and 3 provide an identical finished good to the market. Market clearing conditions for labour and capital markets, respectively, are given by:

$$L^i = \int_0^1 l_1^i(z)dz + \int_0^1 l_2^i(z)dz + \int_0^1 l_3^i(z)dz,$$

$$K^i = \int_0^1 k_1^i(z)dz + \int_0^1 k_2^i(z)dz + \int_0^1 k_3^i(z)dz.$$

Let the textile raw materials (good 1) be the numeraire, i.e. $p_{1t}(z) = 1$, and $p_{2t}(z) = P_t(z)$.

Definition of Equilibrium

An equilibrium is a sequence of goods and factor prices, $\{p_{1t}(z),\ p_{2t}(z),\ P_t^i, w_t^i$ and $r_t^i\}$, and quantities $\{k_{1t}^i(z),\ k_{2t}^i(z),\ k_{3t}^i(z),\ l_{1t}^i(z),\ l_{2t}^i(z),\ l_{3t}^i(z),\ y_{1t}^i(z),\ y_{2t}^i(z),\ y_{3t}^i(z),\ x_{1t}^i(z),$ and $Y_t^i\}\ \forall\ t \geq 1,\ z\ \epsilon\ [0,1]$ for $i = H, F$ such that the first order conditions of firm's and household's maximisation problems given above, as well as market clearing conditions, are satisfied.

For the sake of simplicity, let us remove the time subscript. The profit maximisation problem of first type of firm can be written as:

$$\text{Max}\ \{A_1(\tau,\varphi)k_1^{\alpha}\ l_1^{1-\alpha} - wl_1 - rk_1\}\ \text{w.r.t.}\ k_1\ \text{and}\ l_1.$$

The productivity, $A_1(z)$, is a function of τ plus all other factors that influence firm productivity, denoted by φ. Productivity is affected by a number of factors, such as, worker skills, energy outages, off-balance sheet transaction costs, corruption, security and infrastructure. The profit maximisation problem for type 2 firm is:

$$\text{Max}\left\{p\left({x_1}^{\theta}[A_2\ (\tau,\varphi)k_2^{\alpha}\ l_2^{1-\alpha}]^{1-\theta}\right) - x_1 - wl_2 - rk_2\right\}\ \text{w.r.t.}\ x_1, k_2\ \text{and}\ l_2,$$

if the firm buys only domestically produced raw materials. Alternatively, if the firm buys imported raw materials, profit maximisation is given by:

$$\text{Max}\left\{p\left({x_1}^{\theta}[A_2\ (\tau,\varphi)k_2^{\alpha}\ l_2^{1-\alpha}]^{1-\theta}\right) - (1+\tau)x_1 - wl_2 - rk_2\right\}\ \text{w.r.t.}\ x_1, k_2\ \text{and}\ l_2.$$

Similarly, we obtain the profit maximisation problem for type 3 firm. We can derive an expression for relative productivity, $\frac{A_3(\tau,\varphi)}{A_2(\tau,\varphi)}$, by using the first order conditions for type 2 and type 3 firms (see Appendix 1):

$$A(z)\ \equiv\ \frac{A_3(z)}{A_2(z)}\ \equiv \frac{A_3(\tau,\varphi)}{A_2(\tau,\varphi)} \cong\ \frac{(1+\tau)(1-\alpha)}{p(z)(1-\gamma)} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Hence, relative productivity is a function of τ as well as all other factors that affect firm productivity. Let us consider two different cases as examples of free-trade equilibrium which generate complete specialisation in the production of all goods. Trade liberalisation in the form of a reduction in price of quota license causes a reduction in relative factor cost of firm 2 compared to firm 3. In other words, the relative factor cost of firm 3 will go up. This is shown in Figure 1. The vertical axis measures relative productivity and relative factor cost of firm 3 relative to firm 2. On the horizontal axis, with no loss of generality, the [0, 1] continuum can be arranged so that it is diminishing in productivity of firm 3 relative to firm 2 in the home country; $z = 0$ is the good in which firm 3's productivity (relative to that of firm 2) is the highest. The "cutoff" z_3 defines the pattern of production. The arbitrage condition that determines the cutoff separating production between firms 2 and 3 can be found by equating relative factor cost to relative productivity. The condition essentially says that vertically integrated firm (i.e. firm 3) produces and exports up to the point where its cost advantage (disadvantage) relative to non-integrated firm (i.e. firm 2) equals its productivity disadvantage (advantage). An upward shift in relative factor cost line will lead to a reduction product range, produced by firm 3 and an increase in product range produced by firm 2, if there is no change in relative productivity of the two firms. However, there might be other factors φ which will

affect relative productivity. As a result, the relative productivity function may shift up or down. Figure 1 shows what happens if relative productivity function, *A(z)*, shifts up. In this case, there is an increase in product range produced by firm 3 since the cut-off goes up from z_3 to z_3''.

Hence, what happens to the product range would depend on not just the tariff change but also on all other factors affecting relative productivity of firms. In Figure 2, relative productivity function shifts in the downward direction. A reduction in relative productivity of firm 3 for all values of *z*, as well as a rise in relative factor cost (compared to firm 2) will result in an enormous reduction in product range of finished goods produced by firm 3. In Figure 3, the *y*-axis denotes relative factor costs (home/foreign) and relative productivities for firm 2 (home/foreign) and for firm 3 (home/foreign). On the horizontal axis, the continuum is arranged so that it is diminishing in home country's comparative advantage in goods produced by firm 3. Let us also assume that comparative advantage ordering of firm 2 productivity at home is the same as it is for firm 3. The cut-offs z_2 and z_3 now define the pattern of production. The middle region of the continuum engenders the need for vertical integration. In this region, firm 3 in home country produces the finished good and exports it to the foreign country. Trade affects the pattern of specialisation because it changes the cost of imported inputs. The range of vertical integration, or goods produced by firm 3, goes up as a result of a reduction in τ. This is accompanied by an increase in product range produced by firm 2. Thus, trade liberalisation in home country results in an increase in product range produced by vertically integrated firms as well as an increase in country-wide product range produced.

4. EMPIRICAL METHODOLOGY

Before we begin to explain the methodology, it would be motivating to explore how different these firms are in terms of key firm characteristics, such as output, number of physical inputs used, net profit, etc. This is imperative because if the two types of firms are not significantly different from each other with respect to these characteristics, then the difference in our estimation results could be the upshot of other factors, not directly measurable in the data. To investigate how different these firms are in terms of firm characteristics, we run the following regression:

$$y_{ijt} = \beta_0 + \beta_1 \mathrm{VI}_{ijt} + \delta_t + \delta_j + \varepsilon_{ijt}, \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

where VI is an indicator variable denoting a vertically integrated firm, and y_{ijt} are the different firm characteristics of firm *i* in year *t* in industry *j* at six-digit level, such as, measures of productivity used, fixed assets, size of the firm, capital intensity, net profit, etc. The coefficient β_1 reports the difference across integrated and non-integrated clothing producers. δ_t and δ_j are time and industry fixed effects, respectively, and ε_{jt} is the error term. Robust standard errors are corrected for clustering at the firm level. Since we are interested in estimating change in productivity after the end of MFA, our main objective is to test if the *change* in these dependent and independent variables is significant, and whether or not it is related to vertical structure of the firm per se. Therefore, we replace y_{ijt} in Equation (5) by Δy_{ijt} :

$$\Delta y_{ijt} = \beta_0 + \beta_1 \mathrm{VI}_{ijt} + \delta_t + \delta_j + \varepsilon_{ijt}. \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

Lastly, we run the same regressions but after controlling for firm's sales:

$$y_{ijt} = \beta_0 + \beta_1 \mathrm{VI}_{ijt} + \beta_2 \log(sales)_{ijt} + \delta_t + \delta_j + \varepsilon_{ijt}, \quad \ldots \quad \ldots \quad (7)$$

$$\Delta y_{ijt} = \beta_0 + \beta_1 \mathrm{VI}_{ijt} + \beta_2 \log(sales)_{ijt} + \delta_t + \delta_j + \varepsilon_{ijt}. \quad \ldots \quad \ldots \quad (8)$$

We use structural techniques introduced by Olley and Pakes (1996), and Levinsohn and Petrin (2003) to find a measure of productivity for the firms in our sample. There are quite a few ways of measuring productivity change in response to a change in policy. The key econometric issue in the estimation of production functions is the likelihood that some of these inputs are unobserved, and if the observed inputs are chosen as a function of these unobserved inputs, then there is a possible endogeneity problem [Ackerberg, Caves, and Frazer (2015)]. Another source of endogeneity is sample selection bias; firms often exit the market when productivity drops below a specific threshold. Therefore, we do not rely on the OLS estimates of the observed inputs coefficients and instead use the methods introduced by Olley and Pakes (1996) (OP), and Levinsohn and Petrin (2003) (LP) in the dynamic panel data literature. The OP methodology allows for the error term to have two components, a white noise component and a time-varying productivity shock.[2] Profit maximisation generates an investment demand function that is determined by two state variables, capital and productivity. If the investment demand function is monotonically increasing in productivity, it is feasible to invert the investment function and get an expression for productivity as a function of capital and investment [Pakes (1994)].

In the actual data, however, investment is often very lumpy. This may not be in line with the strict monotonicity assumption regarding investment. Also, OP procedure can cause an efficiency loss in a data with zero investment. Instead of using an investment demand equation, LP uses an intermediate input demand function. Given that the intermediate input demands normally exhibit a lesser tendency to have zeros, the strict monotonicity condition is expected to hold in the LP methodology. Figure 4 shows mean productivity of the two types of firms computed, using three different productivity measures. We notice that over the entire sample period, vertically integrated clothing producers are much more productive than the non-integrated clothing producers, if productivity is computed using Levinsohn and Petrin (LP), and Olley and Pakes (OP) productivity measures. Whereas the average productivity of vertically-integrated clothing firms exhibits an upward trend, we do not see an analogous pattern for non-integrated clothing firms. Instead, the average productivity of non-integrated clothing firms remains roughly at the same level as at the start of the period.

Figure 4 also illustrates mean productivity computed from parametric estimation of production functions of the two types of firms. Although estimation of production function coefficients may yield biased estimates of productivity, we do observe an upward trend in average productivity of vertically integrated clothing firms. This is again not true for non-integrated firms. The variation in productivity is subsequently regressed on the level of quotas:

[2]It is derived from dynamic optimisation of firms, whereby it is assumed that unobserved productivity follows a first order Markov process and capital is accumulated by means of a deterministic dynamic investment process.

$$\Delta tfp_{ijt} = \beta_0 + \beta_1 \Delta \log(AdjQuota)_{jt} + \beta_2 \text{VI} \times \Delta \log(AdjQuota)_{jt} + X_{ijt} + \delta_t + \delta_j + \varepsilon_{ijt}, \quad \ldots \quad (9)$$

where $\log(AdjQuota)_{jt}$ is the logarithm of post-MFA level of quotas of product *j* at time *t*. X_{ijt} includes other control variables: size, age and capital intensity of the firm, whether or not the firm is ISO Certified, dummy variables for the city in which the firm is located and whether or not the firm is multinational, and herfindahl index of the industry. We expect β_1 to be positive if an increase in the level of quotas leads to an increase in mean productivity of non-integrated clothing firms. Also, a negative β_2 would signify that gain in productivity of vertically integrated firms is less than that in productivity of non-integrated firms (if β_1 is positive and $|\beta_1| > |\beta_2|$), or there is a significant reduction in mean productivity of vertically integrated firms (if β_1 is positive and $|\beta_1| < |\beta_2|$). Industry and year fixed effects are included in all specifications. Equation (9) is run separately for the different measures of productivity used.

In addition, to test if our results differ for more capital intensive vertically integrated firms or firms that are bigger in size, we run analogous regressions including interaction terms, i.e. interaction of VI with size and capital intensity of the firm:

$$\Delta tfp_{ijt} = \beta_0 + \beta_1 \Delta \log(AdjQuota)_{jt} + \beta_2 \text{VI} + \beta_3 \text{VI} \times \Delta \log(l)_{ijt-1} + X_{ijt} + \delta_t + \delta_j + \varepsilon_{ijt}, \quad \ldots \quad (10)$$

$$\Delta tfp_{ijt} = \beta_0 + \beta_1 \Delta \log(AdjQuota)_{jt} + \beta_2 \text{VI} + \beta_3 \text{VI} \times \Delta \log(k/l)_{ijt-1} + X_{ijt} + \delta_t + \delta_j + \varepsilon_{ijt}. \quad \ldots \quad (11)$$

Let us look at few other key variables. Vertically integrated firms produce, on average, a slightly higher output than non-integrated producers. There is an upward trend in the output of vertically integrated firms but we do not notice a comparable trend for non-integrated firms. As far as labour, raw materials and other factors are concerned, we do not observe much difference between the two types of firms. To test whether or not vertically integrated clothing firms fared better than non-integrated firms in terms of other key measures of performance, such as output and net profit, we replace productivity by firms' output and net profit in Equation (9):

$$\Delta \log(output)_{ijt} = \beta_0 + \beta_1 \Delta \log(AdjQuota)_{jt} + \beta_2 \text{VI} \times \Delta \log(AdjQuota)_{jt} + X_{ijt} + \delta_t + \delta_j + \varepsilon_{ijt}, \quad \ldots \quad (12)$$

$$\Delta \log(net\ profit)_{ijt} = \beta_0 + \beta_1 \Delta \log(AdjQuota)_{jt} + \beta_2 \text{VI} \times \Delta \log(AdjQuota)_{jt} + X_{ijt} + \delta_t + \delta_j + \varepsilon_{ijt}. \quad \ldots \quad (13)$$

Control variables now also include fixed assets, raw materials and trade costs. Following Bernard, *et al*. (2006), we define industry level variable trade costs ($Cost_{jt}$) for six-digit NAICS industry *j* in year *t* as the sum of ad valorem duty and ad valorem freight and insurance rates.

Data

This paper uses balance sheet data collected in the form of a survey. The Balance Sheet Data of Pakistani Listed and Non-Listed Companies (BSDPC) is a

survey of a representative sample of 90 clothing companies in Pakistan for the years 1992-93 to 2002-2003.[3] The surveys are conducted by the Centre for Management and Economic Research (CMER) and they encompass a wide range of topics. The dataset covers almost all large and medium-sized formal manufacturing enterprises. However, coverage of the industrial sector is not complete since the informal enterprises are excluded and small formal firms are under-represented. The core survey is organised into four parts: Balance Sheet, Profit and Loss Account, Cash Flow Statement and Accounts Section. For each company and year, we observe the sales revenue, input use, investment, wage bill and all other costs, as well as industry codes and firm identity codes that allow us to track establishments over time. To estimate Equation (9) using the panel of firms, we need data on real output, capital stock, labour, raw materials and their respective shares in real output. Nominal output deflated by sectoral price deflators gives the real output.[4] Real labour was found by deflating total wage bill by the industry wage rate.[5] Materials were also deflated using two-digit sectoral price deflators. Real capital stock was calculated by deflating net fixed assets by sectoral investment deflators. Table 1 provides summary statistics for the balance sheet data used. This paper tracks a single country through time, eliminating obscuring country-specific effects. There is a notable variation in trade regimes between sample years which gives the analysis a laboratory-like flavor.

We utilise the data initially used by Brambilla, *et al.* (2007) that traces U.S. trading partners' performance under the quota regimes determined by MFA and the succeeding ATC. The database is assembled from U.S. trading partners' Expired Performance Reports, which were used by the U.S. Office of Textile and Apparel (OTEXA) to supervise trading partners' fulfillment with the MFA/ATC quotas. Provided by Ron Foote of the U.S. Census Bureau, they record imports, base quotas and quota adjustments by OTEXA category and year for all countries with which the U.S. negotiated a bilateral quota arrangement.[6] The data on trade costs is taken from Bernard, *et al.* (2006) which provides data on free-on-board customs value of imports, ad valorem duty and ad valorem freight and insurance rates for the underlying four-digit product-level US import data. Obtained directly from product-level trade data collected at the border, these trade costs take account of information about both trade policy and transportation costs, and they vary across industries and time. The next section discusses estimation results.

[3]The data compiled by CMER only covers the period 1992 to 2003. We updated the dataset to add seven more years of data on sales revenue, input use, investment, etc. The paper, therefore, uses data from 1992 to 2010. This was done in order to compute firms' productivity during the final phase of MFA expiration as well, since we know that the initial phases of the ATC were not very severe for producers in developed countries; the U.S. postponed removal of quotas on sensitive products until Phase III.

[4]The Economic Survey of Pakistan, which is published annually by the Federal Bureau of Statistics, Pakistan, provides industry price indices for output and intermediate inputs, which are used as deflators.

[5]Real labour is taken to be the total number of employees, and not the number of hours worked, since hourly wage rate is not known. Many firms list the number of employees directly so there is no need to deflate the wage bill by the industry wage rate.

[6]Base quota is the initially negotiated quota level decided at the beginning of an agreement term. Adjusted base quotas indicate the use of "flexibilities," which allowed countries to go over their base quota in a particular period by borrowing unexploited base quota, across categories within a year and across years within a category, up to a specified percentage of the receiving category.

5. ESTIMATION RESULTS

5.1. Difference between Integrated and Non-integrated Clothing Producers

Let us first examine the differences between these two types of firms in terms of output, capital stock, labour, intermediate inputs, capital intensity and net profit. This can be seen by looking at the firm-level relationship between these variables and integration status of a firm by regressing each variable on an indicator for firm's vertical integration status (denoted by VI = 1 if a clothing firm is vertically integrated; VI = 0 otherwise), and a series of industry-year fixed effects. Consequently, the vertical integration dummy coefficient captures mean difference across integrated and non-integrated producers in the same industry and time period. This specification is helpful because it compares producers facing identical industry-level demand and supply conditions [Hortaçsu and Syverson (2006)].

The results are shown in Tables 2 and 3. They report differences in key dependent and independent variables across integrated and non-integrated clothing producers. The reported coefficients are for the indicator variable. On average, vertically integrated producers have higher sales, capital stock, labour and capital intensity than non-integrated firms but a lower level of raw materials and net profit. On the contrary, none of these results are statistically significant. On the other hand, coefficients for productivity measures (both OP as well as LP) are positive and significant in both tables. Although the coefficient for parametric estimate of productivity is positive but not significant, as shown in Table 2, it is positive and significant when the *change* in productivity is regressed on VI (look at column (3) in Table 2). We include firm's sales as a control variable to prove the robustness of these results. The growth in productivity for vertically integrated firms is higher on average than non-integrated firms having equally sized sales, and the coefficients are statistically significant.

5.2. Production Function Estimates—Levinsohn and Petrin

Table 4 reports production function estimation results for vertically integrated and non-integrated clothing firms using LP productivity measure. These estimates are employed to calculate measured TFP of a plant. The change in firm productivity is thenceforth regressed on the change in quotas for both types of firms (i.e. firm 2 and firm 3 in the model above), allowing for time and industry fixed effects. This procedure is then repeated using OP as well as parametric estimate of productivity. The results are illustrated in Table 5.

5.3. Productivity and Vertical Integration

Table 5 exhibits the effect of elimination of quota on productivity of clothing firms. A rise in the level of quotas brings about a drop in the productivity of non-integrated clothing firms. This can be deduced from the negative coefficient of adjusted quota base in almost all specifications shown in Table 5. On the other hand, the coefficient for interaction term, i.e. the interaction of VI dummy with adjusted level of quota is positive and statistically significant: the magnitude of change in productivity for vertically integrated clothing producers is positive and bigger than non-integrated clothing firms, as there is an increase in adjusted level of quotas.

These results persist even when other methodologies are used to compute productivity, such as, running the same regression using OP semi-parametric productivity measure and parametric estimation of productivity.[7] This shows that a trade liberalisation episode causes not just a significant change in productivity of these firms, but also that the results immensely differ for the two types of firms. Vertically integrated firms, equipped with latest machinery, supply most of the higher-quality market segments. An increase in adjusted level of quotas causes their productivity to go up. Quotas weaken the motivation to advance technologically in order to capture market share because market shares are predetermined, and thus, hinder productivity growth.

Let us analyse the implications of these results in terms of the model described above. Figure 1 shows what happens if relative productivity function, *A(z),* shifts up. In this case, there is an increase in product range produced by firm 3 since the cut-off goes up from z_3 to z_3''. Trade liberalisation in the form of a reduction in price of quota license will cause a reduction in relative factor cost of firm 2 compared to firm 3. If other factors, which affect relative productivity, cause relative productivity function to shift up, then the product range produced by vertically integrated clothing producers rises.

We now concisely look at other control variables. For all specifications shown in the table, the coefficient of size is positive and statistically significant. Although capital intensity does not have a significant impact on productivity of clothing producers, nevertheless higher capital intensity is associated with higher productivity level. Furthermore, older firms are more productive on average. The coefficient for multinational dummy takes both positive and negative values and is never significant. The sign of herfindahl index coefficient is negative but generally insignificant. Alternatively, ISO Certification does affect firm efficiency significantly, when using OLS to compute productivity. We have taken into account the fact that some firms are located in more developed areas and that there may be differences in infrastructural facilities in different parts of the country by controlling for regional fixed effects.

Table 6 demonstrates the effect of abolition of quotas across phases. Although a majority of the results described above stand across individual phases as well, some of the findings differ across phases and for the two types of firms. One reason is that there is a significant decline in the number of observations. A rise in quotas brings about a decrease in productivity of clothing firms that are not vertically integrated. This is true for all phases under LP but only for Phase IV under OP. In Phases I, II and III, the sign of the coefficient for level of quotas under OP is positive but insignificant. On the other hand, productivity of vertically integrated firms actually goes up as there is growth in adjusted level of quotas in all four phases, and the coefficients are statistically significant; we observe that the magnitude of change is positive for vertically integrated producers of clothing products.[8]

[7]The OP and OLS results are not reported in the paper but can be made available on request.

[8]The coefficients for firm characteristics are not reported in the table since most of these turned out to be insignificant due to a small number of observations across phases. The sign of herfindahl index coefficient is negative and significant in the specification for Phases I and II. This means that higher concentration in the industry leads to lower productivity of firms. One would normally expect that a greater degree of concentration in an industry leads to greater market power for firms in that industry and, hence, lower their productivity growth. This is the case here.

Table 7 displays the results we get by including the interaction of VI with firm's size and capital intensity as right hand side variables. Although there is no strong evidence of more capital intensive integrated firms to perform better than less capital intensive ones, we do observe that bigger vertically integrated firms, on average, outdo smaller integrated firms. The only case in which the coefficients of capital intensity turn out to be significant is when they are positive (see columns 5 and 7). Higher capital intensity is expected to raise efficiency of workers and other inputs in a capital-intensive textile sector, although the effect may be negligible in the clothing sector which is relatively more labour-intensive. Since the vertically integrated firms produce both, it is not surprising that the overall effect is ambiguous. Nonetheless, larger firms surpass smaller firms. This is an interesting result which points towards the benefits of economies of scale enjoyed by larger companies, housing the production of their raw materials along with the finished product. A vertically integrated firm which operates on a smaller scale forgoes the cost savings which may potentially arise as a result of expanding production, not only to serve its own needs but also to supply intermediate goods to the rest of the market.

5.4. Adjusted Quotas and Other Dependent Variables

To test whether or not vertically integrated clothing firms fared better than non-integrated firms, in terms of other key measures of performance, such as output and net profit; we replace productivity by firms' output and net profit in Equation (9). The results are depicted in Table 8. While the growth of quotas does lead to a higher output for integrated firms, the positive coefficient of the interaction term is not significant. This is not the case if we replace output on the left hand side by net profit: the impact on net profit of all clothing firms, both vertically integrated as well as non-integrated, is positive in all specifications used. Moreover, the coefficient of the interaction term (VI x Adjusted Quota) remains highly significant. This analysis makes the interpretation of estimation results, derived earlier, all the more fascinating. The key findings also support the results obtained by Braguinsky, *et al*. (2015), as discussed earlier. Non-integrated firms are often predicted to be much less profitable compared to their vertically integrated counterparts due to their obligation to maintain higher inventory levels and lower capacity utilisation. On the other hand, vertical integration substantially lowers the need to preserve greater inventories, and improves the ability to manage uncertainties in demand, resulting in higher and sustained profits. Thus, these differences merely reflect the management problems likely to arise under a non-integrated production setup. The challenge becomes more acute under growing pressures of rapid trade liberalisation.

6. CONCLUSION

Expansion of international specialisation and disintegration of production has been an important characteristic of the international economy. Although a variety of studies look into productivity gains, associated with disintegration of production across different countries; none of these in particular consider the effect of trade liberalisation on the efficiency of vertically integrated firms relative to non-integrated firms within a country. There is modest micro-level evidence on the productivity-integration relationship and on the way production differs in vertically integrated firms compared to the non-integrated

firms. In this paper, we compare the productivity of these two types of firms, allowing both types of firms to engage in international trade, and analyse how a given liberalisation episode affects their productivity.

A theoretical background to vertical integration in clothing industry illustrates that trade liberalisation causes a change in relative factor cost of the two types of firms, and thus, a change in product range produced by each of them. The change in relative productivity of a vertically specialised firm to that of a non-vertically specialised firm depends, among other factors, on the change in price of the finished good as a result of trade liberalisation. We consider two special cases of free-trade equilibrium which generate complete specialisation in the production of all goods. This simple model shows that what happens to the product range produced by each type of firm depends on the change in relative factor cost and other factors affecting relative productivity of firms. Thus, a growth of trade in the home country results in an increase in the product range produced by the vertically integrated firms as well as a rise in country-wide product range produced. The theoretical findings of the paper are reinforced by a systematic empirical model by analysing the experience of clothing firms in Pakistan under the U.S. textile and clothing quotas and the subsequent end of MFA. This paper shows that a liberalisation episode may engender opposing changes in productivity of various firms even within the clothing industry. The empirical results show that vertical integration of production is linked with an improvement in productivity after trade reforms were introduced.

To sum up, there are a large number of conceivable reasons why these results hold. The most cited benefits to a firm through vertical integration are decreased marketing expenses, stability of operations, tighter quality control, timely revision of production policies, guarantee of supplies, improved inventory control, and the ability to charge lesser prices. Vertically integrated firms respond to competition by upgrading the quality of their clothing products. On the other hand, it is harder to upgrade quality overnight for non-integrated firms. Suppliers usually control new technology in the technologically advanced industries and internalising these technological capabilities through vertical integration, promises access to the knowledge required to build a portfolio of products based on highly developed technology [Afuah (2001)]. Textile quality, product standards, fabric finishing, styles, and patterns are other factors that shape competitiveness. The disparity in results across garment firms may, consequently, be related to the type of raw materials used by garment firms after the end of MFA. Nonetheless, we do not have that information in our data set. The weakening efficiency of non-integrated clothing firms indicates the incapacity of these firms to benefit from stability of operations and investment in specialised assets. Greater exposure to international markets is an opportunity for them to downsize their input usage which can help create a competitive edge over other clothing exporters.

Appendices

Appendix 1

Theoretical Background

From the first order conditions of type 2 firm, we get:

$$r = A_2(\tau,\varphi)(\alpha)\left(\frac{l_2}{k_2}\right)^{1-\alpha} \times p{x_1}^{\theta}(1-\theta)[A_2(\tau,\varphi)k_2^{\alpha}\, l_2^{1-\alpha}]^{-\theta}, \quad \ldots \text{(A.1)}$$

$$w = A_2(\tau,\varphi)(1-\alpha)\left(\frac{k_2}{l_2}\right)^{\alpha} \times p{x_1}^{\theta}(1-\theta)[A_2(\tau,\varphi)k_2^{\alpha}\, l_2^{1-\alpha}]^{-\theta}, \quad \ldots \text{(A.2)}$$

$$1 = p\theta{x_1}^{\theta-1}[A_2(\tau,\varphi)k_2^{\alpha}\, l_2^{1-\alpha}]^{1-\theta}, \quad \ldots \ldots \ldots \text{(A.3a)}$$

or if the firm buys imported raw materials:

$$1+\tau = p\theta{x_1}^{\theta-1}[A_2(\tau,\varphi)k_2^{\alpha}\, l_2^{1-\alpha}]^{1-\theta}. \quad \ldots \ldots \ldots \text{(A.3b)}$$

From the first order conditions of type 3 firm, we obtain:

$$r = pA_3(\tau,\varphi)\gamma\left(\frac{l_3}{k_3}\right)^{1-\gamma}, \quad \ldots \ldots \ldots \ldots \ldots \ldots \text{(A.4)}$$

$$w = pA_3(\tau,\varphi)(1-\gamma)\left(\frac{k_3}{l_3}\right)^{\gamma}. \quad \ldots \ldots \ldots \ldots \ldots \text{(A.5)}$$

We can find an expression for relative productivity, $\frac{A_3(\tau,\varphi)}{A_2(\tau,\varphi)}$, by using Eqs. (17) – (21):

$$w = pA_3(\tau,\varphi)(1-\gamma)\left(\frac{k_3}{l_3}\right)^{\gamma} = A_2(\tau,\varphi)(1-\alpha)\left(\frac{k_2}{l_2}\right)^{\alpha} \times p{x_1}^{\theta}$$
$$(1-\theta)[A_2(\tau,\varphi)k_2^{\alpha}\, l_2^{1-\alpha}]^{-\theta},$$

$$r = pA_3(\tau,\varphi)\gamma\left(\frac{l_3}{k_3}\right)^{1-\gamma} = A_2(\tau,\varphi)(\alpha)\left(\frac{l_2}{k_2}\right)^{1-\alpha}$$
$$\times p{x_1}^{\theta}(1-\theta)[A_2(\tau,\varphi)k_2^{\alpha}\, l_2^{1-\alpha}]^{-\theta},$$
$$1+\tau = p\theta{x_1}^{\theta-1}[A_2(\tau,\varphi)k_2^{\alpha}\, l_2^{1-\alpha}]^{1-\theta}.$$

Let $\omega = \frac{x_1}{A_2(\tau,\varphi)k_2^{\alpha}\, l_2^{1-\alpha}}$ be the ratio of the intermediate inputs purchased from type 1 firm to the other inputs used by type 2 firm. Then the relative productivity can be written as:

$$\frac{A_3(\tau,\varphi)}{A_2(\tau,\varphi)} = \frac{(1-\theta)(1-\alpha)\,\omega^{\theta}}{(1-\gamma)}.$$

Using the above results, we get:

$$\omega = \omega^{\theta} \times \omega^{1-\theta} = \frac{A_3(\tau,\varphi)}{A_2(\tau,\varphi)} \times \frac{(1-\gamma)}{(1-\theta)(1-\alpha)} \times \frac{p\theta}{1+\tau},$$
$$\frac{A_3(\tau,\varphi)}{A_2(\tau,\varphi)} = \frac{\omega(1+\tau)(1-\theta)(1-\alpha)}{p\theta(1-\gamma)}.$$

In Equilibrium, ω can be approximated by $\frac{\theta}{1-\theta}$, the respective factor shares, i.e.

$$\omega = \frac{x_1}{A_2(\tau,\varphi)k_2^{\alpha} l_2^{1-\alpha}} \cong \frac{\theta}{1-\theta}.$$

Therefore,

$$\frac{A_3(\tau,\varphi)}{A_2(\tau,\varphi)} \cong \frac{(1+\tau)(1-\alpha)}{p(1-\gamma)},$$

$$A(z) \equiv \frac{A_3(z)}{A_2(z)} \cong \frac{(1+\tau)(1-\alpha)}{p(z)(1-\gamma)}.$$

Furthermore,

$$\frac{\partial A(\tau,\varphi)}{\partial \tau} = \left(\frac{1-\alpha}{1-\gamma}\right)\left[\frac{p(z) - (1+\tau)\frac{\partial P(z)}{\partial \tau}}{p^2(z)}\right] = \left(\frac{1-\alpha}{1-\gamma}\right)\left[\frac{1}{p(z)} - \frac{(1+\tau)}{p^2(z)} \cdot \frac{\partial P(z)}{\partial \tau}\right],$$

$$\frac{\partial A(\tau,\varphi)}{\partial \tau} \begin{cases} > 0 & \text{if } \frac{\partial P(z)}{\partial \tau} < \frac{p(z)}{1+\tau} \\ = 0 & \text{if } \frac{\partial P(z)}{\partial \tau} = \frac{p(z)}{1+\tau} \\ < 0 & \text{if } \frac{\partial P(z)}{\partial \tau} > \frac{p(z)}{1+\tau} \end{cases}. \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(A.6)}$$

The change in relative productivity of type 3 firm to type 2 firm depends, among other factors, on change in the price of finished good as a result of trade liberalisation.

Appendix 2

Tables and Figures

Fig. 1. Relative Factor Costs and Relative Productivities (Firm 3/Firm 2)

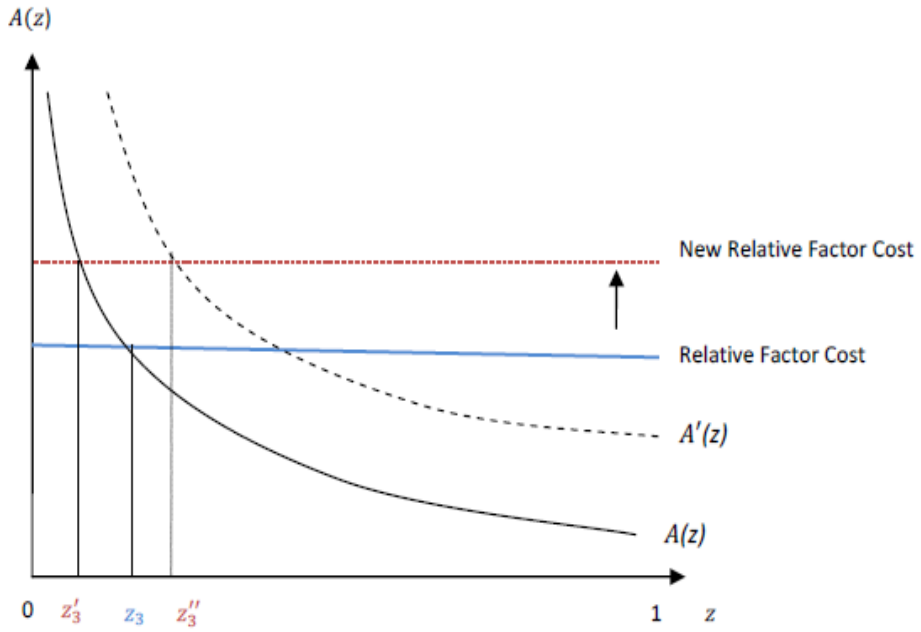


Fig. 2. Relative Factor Costs and Relative Productivities (Firm 3/Firm 2)

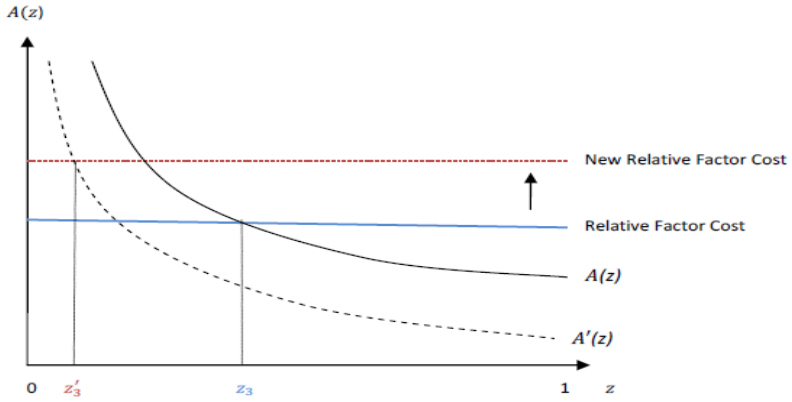


Fig. 3. Relative Factor Costs and Relative Productivities (Home/Foreign)

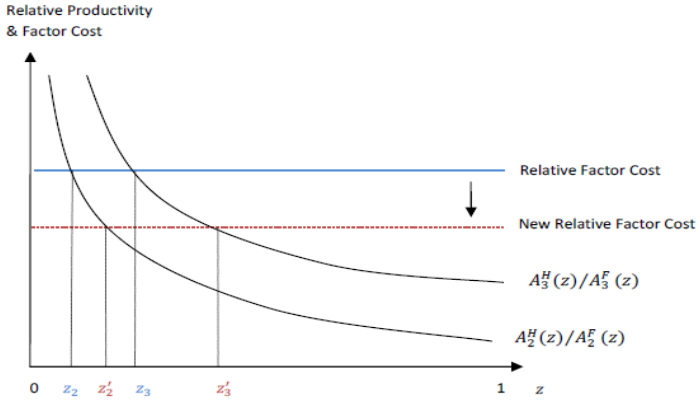
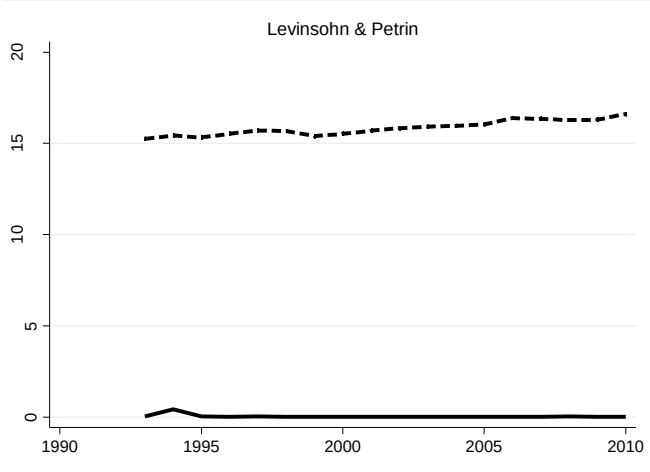
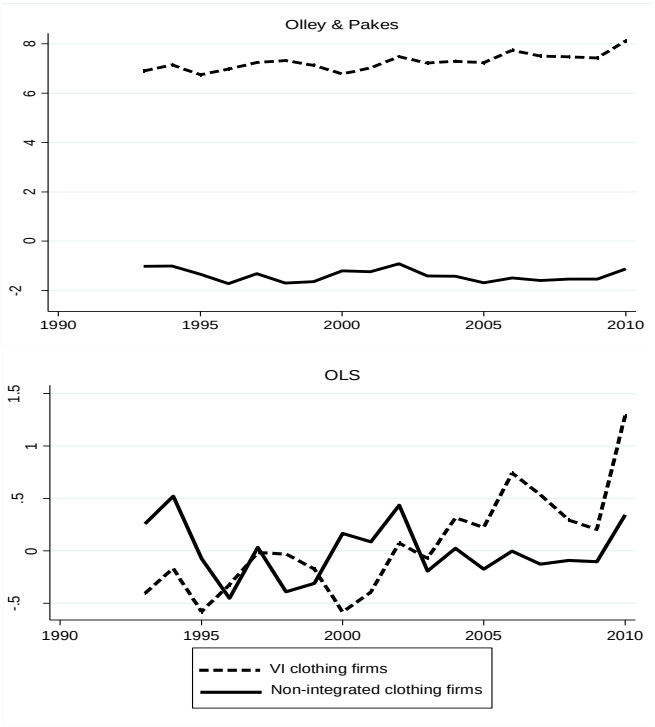


Fig. 4. Vertically Integrated and Non-integrated Clothing Firms Productivity





Source: Author's calculations based on Balance Sheet Data of Pakistani Listed and Non-Listed Companies.

Table 1

Summary Statistics

Variable	Observations	Mean	Standard Deviation
Log (Sales)	4717	19.25	3.73
Log (Fixed Assets)	4718	11.50	9.51
Log (Labour)	4718	16.36	1.93
Log (Raw Materials)	4718	18.71	3.58
Log (Net Profit)	4718	12.99	10.32
Log (Investment)	4813	4.01	7.22
Productivity (Levinsohn and Petrin)	4717	10.55	5.72
Productivity (Olley and Pakes)	4717	1.87	3.04
Productivity (OLS)	4717	-8.85e-10	1.88
Age	2895	23.78	16.10
Log (Age)	2846	2.97	0.82
Log (Capital to Labour ratio)	4407	0.73	0.58
Herfindahl Index	4813	0.82	0.62
ISO Certified	4606	0.67	0.47
Multinational	4606	0.10	0.30
Share of Foreign Ownership	4436	0.22	0.41
Exporting firm	4606	0.88	0.33
Importing firm	4606	0.42	0.49
Log (Cost of Imports)	2385	0.15	0.11
Log (Adjusted Base New)	3980	29.11	16.11
Log (Adjusted Base)	2499	16.73	1.13
Log (Imports)	1544	16.43	2.01
Average Fill Rate	2143	0.81	0.19

Source: Author's calculations based on Balance Sheet Data of Pakistani Listed and Non-Listed Companies.

Table 2

Differences between Integrated and Non-integrated Clothing Producers

Variables	LP	OP	OLS	Fixed Assets	Sales	Raw Materials	Net Profit	Size	Capital Intensity
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VI	15.57***	8.591***	0.0688	2.154	0.00736	-0.505	-0.383	0.0520	0.120
	(0.280)	(0.553)	(0.438)	(1.979)	(1.160)	(1.041)	(2.210)	(0.253)	(0.119)
Constant	0.402**	-1.351***	0.299	2.631*	19.08***	18.40***	21.95***	16.25***	0.140*
	(0.191)	(0.453)	(0.418)	(1.386)	(0.870)	(0.671)	(1.558)	(0.365)	(0.0810)
No. of Observations	1255	1255	1255	1255	1255	1255	1255	1255	1254

Notes: Robust standard errors corrected for clustering at the firm level in parentheses. Industry-year fixed effects are included in all specifications. Coefficients for the industry and year dummies are suppressed. The reported coefficients are those for an indicator variable, VI, denoting that a firm is vertically integrated. *** Significant at, or below, 1 percent. ** Significant at, or below, 5 percent. * Significant at, or below, 10 percent.

Table 3

Differences between Integrated and Non-integrated Clothing Producers—Controlling for Firm's Sales

Variables	Change in LP	Change in OP	Change in OLS	Change in LP	Change in OP	Change in OLS
	(1)	(2)	(3)	(4)	(5)	(6)
VI	0.759**	0.627*	0.602**	0.784**	0.582**	0.572
	(0.374)	(0.358)	(0.235)	(0.370)	(0.271)	(0.419)
Sales				0.154**	0.452***	0.377***
				(0.0788)	(0.0500)	(0.0601)
Constant	-0.403	-0.499	-0.259	-3.304**	-8.872***	-7.263***
	(0.518)	(0.565)	(0.506)	(1.571)	(1.068)	(1.259)
No. of Observations	1237	1237	1237	1237	1237	1237

Notes: Robust standard errors corrected for clustering at the firm level in parentheses. Industry-year fixed effects are included in all specifications. Coefficients for the industry and year dummies are suppressed. The reported coefficients are those for an indicator variable, VI, denoting that a firm is vertically integrated. *** Significant at, or below, 1 percent. ** Significant at, or below, 5 percent. * Significant at, or below, 10 percent.

Table 4

Production Function Estimates for Vertically Integrated and Non-integrated Clothing Firms

	Vertically Integrated Clothing	Non-integrated Clothing
	(1)	(2)
Employment	0.169***	0.355***
	(0.0596)	(0.0362)
Fixed Assets	0.00113	0.00719
	(0.00716)	(0.0142)
Raw Materials	0.0553	0.999***
	(0.310)	(0.313)
No. of Observations	490	953

Notes: Robust standard errors corrected for clustering at the firm level in parentheses. *** Significant at, or below, 1 percent. ** Significant at, or below, 5 percent. * Significant at, or below, 10 percent.

Table 5

Effect of Elimination of Quota-Restrictions on Productivity of Clothing Firms—Levinsohn and Petrin

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Adjusted Quota	-0.155**	-0.159**	-0.155**	-0.155**	-0.155*	-0.172*	-0.144	-0.154
	(0.0779)	(0.0803)	(0.0782)	(0.0782)	(0.0836)	(0.0952)	(0.124)	(0.136)
VI x AdjQuota	0.0261**	0.0273**	0.0269**	0.0269**	0.0271**	0.0297**	0.0266	0.0270
	(0.0119)	(0.0128)	(0.0127)	(0.0127)	(0.0125)	(0.0131)	(0.0182)	(0.0192)
Herfindahl Index		-0.0314	-0.0302	-0.0296	-0.0578	-0.0691	-0.0501	-0.0505
		(0.0557)	(0.0556)	(0.0556)	(0.0572)	(0.0577)	(0.0519)	(0.0527)
Multinational			0.601	0.695	0.682	0.682	1.839	0.390
			(0.599)	(0.647)	(0.654)	(0.646)	(1.753)	(0.661)
ISO Certified				-0.468	-0.506	-0.512	-0.979	-0.513
				(0.799)	(0.794)	(0.790)	(1.289)	(0.453)
K/L (Lagged)					0.136	0.171	0.171	0.176
					(0.131)	(0.137)	(0.176)	(0.183)
Size (Lagged)						0.0393*	0.0570**	0.0575**
						(0.0209)	(0.0249)	(0.0249)
Age							1.117*	1.103**
							(0.590)	(0.507)
Age^2							-0.279	-0.282*
							(0.228)	(0.166)
Constant	0	8.201**	0	0	0	8.658*	0	6.542
	(0)	(3.928)	(0)	(0)	(0)	(4.854)	(0)	(7.022)
City Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*No*
Industry/Time Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
No. of Observations	948	948	948	948	896	896	555	555

Notes: Robust standard errors corrected for clustering at the firm level in parentheses. Coefficients for the industry and year dummies are suppressed. *** Significant at, or below, 1 percent. ** Significant at, or below, 5 percent. * Significant at, or below, 10 percent.

Table 6

Effect of Elimination of Quota-Restrictions on Productivity of Clothing Firms across Phases—Using Levinsohn and Petrin and Olley and Pakes Productivity Measures

Variable	Phase 1		Phase 2		Phase 3		Phase 4	
	LP	*OP*	*LP*	*OP*	*LP*	*OP*	*LP*	*OP*
Adjusted Quota	-0.104	0.275	-0.0474	0.470	-0.0435	0.278	-0.0302	-0.35***
	(0.0960)	(0.938)	(0.0596)	(0.364)	(0.160)	(0.231)	(0.0384)	(0.0545)
VI x AdjQuota	1.002***	0.480***	1.021***	0.519***	0.984***	0.617***	0.346***	0.189***
	(0.0221)	(0.0636)	(0.0269)	(0.0840)	(0.0355)	(0.0532)	(0.0100)	(0.0129)
Industry/Time Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
City Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
No. of Observations	107	107	160	160	66	66	192	192

Notes: Robust standard errors corrected for clustering at the firm level in parentheses. Coefficients for the industry and year dummies are suppressed. The coefficients for firm characteristics are not reported. *** Significant at, or below, 1 percent. ** Significant at, or below, 5 percent. * Significant at, or below, 10 percent.

Table 7

Effect of Elimination of Quota-Restrictions on Productivity of Clothing Firms—Interaction of Vertically Integrated Indicator Variable (VI) with Firm's Size and Capital Intensity

	Interaction of VI with Firm's Size				Interaction of VI with Firm's Capital Intensity			
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Adjusted Quota	-0.0163	-0.0104	-0.00304	-0.105	0.0970	-0.0673	-0.0553	-0.203
	(0.0754)	(0.0780)	(0.0792)	(0.122)	(0.0677)	(0.102)	(0.0640)	(0.166)
VI	13.1***	13.2***	13.0***	13.1***	15.3***	14.3***	14.8***	14.3***
	(0.996)	(0.970)	(0.981)	(1.145)	(0.563)	(0.664)	(0.602)	(1.060)
Size (Lagged)	-0.0080	-0.0086	0.00505	-0.00410		0.059**	0.08***	0.0792*
	(0.0165)	(0.0165)	(0.0280)	(0.0456)		(0.0231)	(0.0282)	(0.0437)
VI x Size (Lagged)	0.108**	0.108**	0.118**	0.138**				
	(0.0476)	(0.0472)	(0.0469)	(0.0611)				
K/L (Lagged)			0.293	0.524	0.148**	0.0545	-0.178*	0.0452
			(0.209)	(0.383)	(0.0698)	(0.0559)	(0.0916)	(0.0732)
VI x K/L (Lagged)					0.0479	0.521	0.917**	0.817
					(0.292)	(0.399)	(0.432)	(0.549)
Industry Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Time Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
City Fixed Effects	*Yes*	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*No*
No. of Observations	566	566	565	347	896	565	347	347

Notes: Robust standard errors corrected for clustering at the firm level in parentheses. VI is an indicator variable denoting a vertically integrated clothing firm. The coefficients for firm characteristics are not reported, and coefficients for the industry and year dummies are suppressed. *** Significant at, or below, 1 percent. ** Significant at, or below, 5 percent. * Significant at, or below, 10 percent.

Table 8

Effect of Elimination of Quota-Restrictions on Net Profit and Output of Clothing Firms

	Net Profit			Output		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Raw Materials	0.319***	0.109*	0.127*	0.231***	0.0273	0.0559
	(0.0970)	(0.0592)	(0.0705)	(0.0721)	(0.0308)	(0.0360)
Employment	0.388***	0.162**	0.112	0.121***	0.107*	0.141**
	(0.0599)	(0.0667)	(0.0934)	(0.0359)	(0.0627)	(0.0582)
Fixed Assets	-0.933***	-0.686***	-0.822***	0.0221*	0.0943**	0.116**
	(0.0342)	(0.129)	(0.103)	(0.0122)	(0.0478)	(0.0543)
Adjusted Quota	-0.123	0.409	1.175***	-0.351	1.003**	1.048**
	(0.327)	(0.326)	(0.300)	(0.295)	(0.419)	(0.440)
VI x Adjusted Quota	0.0106	0.161***	0.235***	0.0204	0.0979	0.0335
	(0.0289)	(0.0497)	(0.0530)	(0.0277)	(0.0975)	(0.112)
Industry/Time Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
City Fixed Effects	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*No*
No. of Observations	948	617	374	948	374	374

Notes: Robust standard errors corrected for clustering at the firm level in parentheses. The coefficients for firm characteristics are not reported, and coefficients for the industry and year dummies are suppressed. *** Significant at, or below, 1 percent. ** Significant at, or below, 5 percent. * Significant at, or below, 10 percent.

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Climate Change and Drought: Impact of Food Insecurity on Gender Based Vulnerability in District Tharparkar

MANZOOR HUSSAIN MEMON, NAVEED AAMIR, and NADEEM AHMED

Climate change has now become a reality that has intensified the sufferings of people living in arid ecosystems. Decrease in rainfall, rise in temperature and increase in the frequency of extreme events are some of the changes observed in the semi-arid desert of district Tharparkar. For thousands of years, people of Tharparkar are coping with drought and aridity of the land by using indigenous knowledge. However, global changes in the climatic pattern and deterioration of social and economic conditions have pushed the inhabitants of this arid region into extreme vulnerable situation. This paper investigates the link between climate-induced natural disasters, particularly drought, from the perspective of changing climate patterns which have resulted in food insecurity and water scarcity. The paper analyses the rainfall pattern in the last 38 years—dividing it into two periods i.e. from 1975-1994 and 1995-2014. The findings of the paper have challenged the prevailing notions about aridity and rainfall patterns in Tharparkar district. The research found that there is an increase in average annual precipitation in the district with erratic patterns. Thus, the nature of drought in the district has changed from its historic pattern of less or no rainfall to more but erratic rainfall that is more threatening to livelihoods of the people that in turn have multiplier effect on water and food insecurity. In particularly, women are more vulnerable in the absence of social security and lack of basic necessities for their survival amidst drought. For instance, traditionally the burden of managing water resources falls on women, which leads to an increased work load during the time of drought and also water scarcity.

JEL Classification: Q54, Q56, Q25, I30
Keywords: Climate, Environment and Development, Drought, Water, Poverty

INTRODUCTION

Drought is that natural calamity that has an exceptional detrimental impact on human survival. In terms of the number of affected people by drought, Wilhite (2000b) ranked it first among natural hazards. It develops slowly and does not affect the valuable infrastructure, such as homes, buildings, etc. According to UNCCD (United Nations Convention to Combat Desertification), drought is "the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems."

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Pakistan is one of the least studied countries in terms of socio-economic impacts of climate change—particularly in the context of drought. From the context of drought, the existing literature elsewhere in the world is also found scarce. It is therefore important to identify the impact of climate change in drought prone areas, and the potential influence on the socio-economic indicators of the associated communities. Thar Desert is one of the largest subtropical deserts situated in the northwest of the Indian sub-continent. The ecology of Tharparkar region is characterised by high temperature, low and erratic precipitation, scarcity of water and presence of soluble salt in the soil. Due to long spells of dry weather with little or no rainfall in the region, people have experienced perpetual droughts for longer periods.

The challenge is to identify the climate variability and potential impacts on people and other inhabitants in the drought areas. District Tharparkar, which covers more than 30 percent of the arid zone of Sindh province, has studied to understand the challenges posed by frequent climate induced droughts. The research will explore the patterns of drought with coping and adaptation mechanisms of the local population. However, the research will also examine the changes in the drought pattern due to climate variability with changes (if any) in the coping/adaptation mechanisms. Following subsidiary research questions will also be investigated to analyse the difference between past droughts (30 years before) and present droughts.

(a) Whether the changes in the climate have changed the drought patterns?
(b) How changes in drought pattern have impacted the livelihood resources and quality of life of the local people?
(c) What is the gender differential impact of climate induced drought?
(d) How effective are the indigenous/conventional coping and adaptation measures?

This paper outlined an introduction and a brief background on the study area, followed by a conceptual and theoretical framework. Following this, the section explains the methodological framework of the data collection and analysis. Subsequent section establishes the climate challenges, faced in the study area as well as the changes observed in the drought patterns,instigating higher gender and social vulnerability of the people. Finally, epilogue summarises the key findings of the study with some policy recommendations to cope with the increasing challenges associated with the climate change, food insecurity and water scarcity in the changing drought context.

CONCEPTUAL/THEORETICAL FRAMEWORK

Classification of a hazard as drought and partial drought was first defined by Meteorological Glossary, printed and published by Her Majesty's stationary office, London in 1972.[1] Figure 1 explains the three classifications/stages of drought i.e. meteorological, hydrological and agriculture droughts. The current classifications are:

(1) ***Meteorological Drought,*** normally region specific, can be defined exclusively on the basis of the degree of dryness (often in comparison to normal or

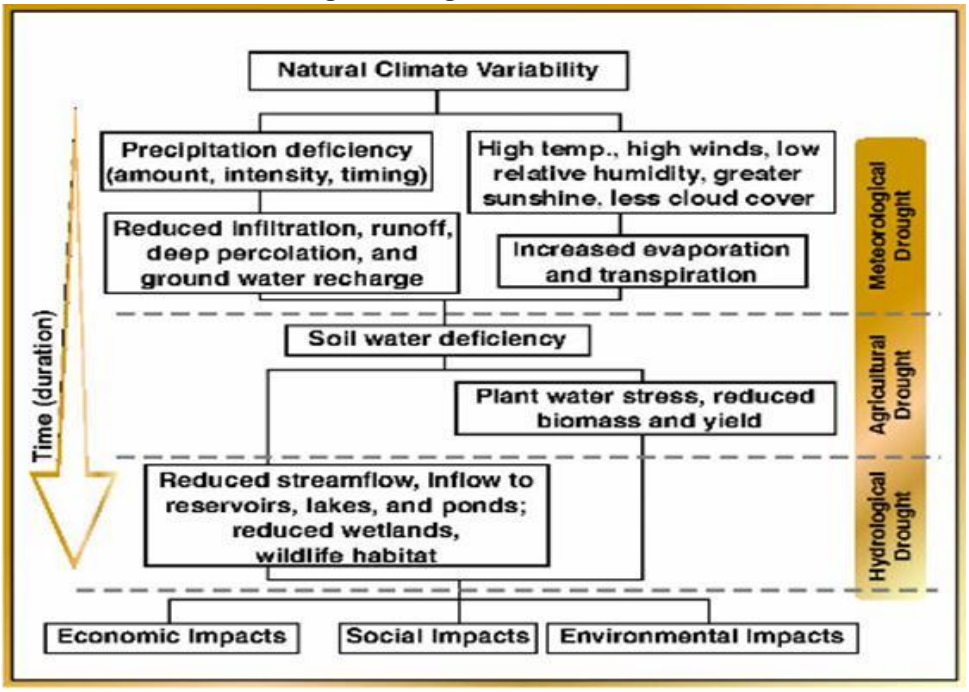
[1]Chaudhry, *et al*., History's Worst Drought Prevailed over Pakistan, Pakistan Meteorological Department, Government of Pakistan.

average amount) and the duration of the dry period. It is explained on the basis of the rainfall frequency and intensity in a particular area.

(2) ***Hydrological drought*** causes a sharp decline in the levels of underground aquifers and has a worst impact on human activities and natural ecosystem**.** Reduction in surface and sub-surface water supplies thus leads to a lack of water availability for human consumption, livestock and other specific water demands.

(3) ***Agricultural drought*** refers to requirements of crops with regard to water in different periods of cultivation. It is related to differences between actual and potential evapo-transpiration and soil water deficit, are crop-specific, dependent on the timings of rain and dry periods relative to crop cycles etc.

Fig. 1. Drought Characteristics



Source: Pakistan Meteorological Department.

Agricultural droughts can occur in the absence of meteorological drought while hydrological drought is linked to meteorological drought. Depending on the ecology, livelihood characteristics, economic base and socio-economic indicators, the spillover effect of the agriculture drought may lead to ecological, environmental, pastoral, economic and socio-economic drought, thus making the people of the specific region more vulnerable. In Tharparkar, the livelihood of the people is primarily dependent on agriculture, livestock and manual labour in other cities. Geophysical aspects of district Tharparkar features various ecological zones that have varied rainfall patterns, vegetation cover, soil quality, underground water level, temperature and topography. Based on different characteristics, the district Tharparkar is divided into seven ecological zones that

are termed in local language as 'Dhat', 'Kha'ur', 'Kantho and Parker', 'Muhrano', 'Samroti', 'Vango' and 'Vat'.[2] Ecological zones are one of the criteria for sampling of villages for primary data collection.

In Sindh province, over the past 20 to 30 years climate change has caused extreme weather events. The frequency and severity of natural disasters such as floods and droughts have increased manifold. The brunt of natural disasters and climate change has fallen on the poorest of the poor. People with low socio-economic status tend to have limited access to monetary and non-monetary resources, are more often renters, have less or no education and inadequate health facilities are more likely to be dependent on public social services [Krokstad (2004), Gulbrandsen and Andersen (2006)]. A higher percentage of population living below the poverty line in the province thus is socially and economically marginalised with higher level of vulnerability to the impact of climate change, impacts manifested in the form of natural disasters.

The Hyogo Framework for Action 2005-2015 underlines the fact that the impacts of disasters on social, economic and environmental conditions should be examined through indicators to assess the vulnerability. The importance of institutions in determining vulnerability to climate change was illustrated in 1991-92 when an 'apocalyptic' drought in southern Africa caused grain yields in ten states to drop 56 percent below normal year and 17 to 20 million people were exposed to starvation [Green (1993)]. Despite the high magnitude of the problem, a combination of national and international policy helped avert diseases and death in countries with functioning governments [Evan, *et al.* (2010)]. Therefore, understanding whether livelihoods are vulnerable to climate change also involves assessing the institutions that are working in society that allows for a collective response to the problem.

The link between climate change and inequality is intense and problematic. Adger and Kelly (2001) have explored direct and indirect causal links between inequality and vulnerability by looking at the patterns of resource allocation and pooling of risk at communal level. They explain that "inequality affects vulnerability directly through constraining the options of households and individuals when faced with external shock; and indirectly through its links to poverty and other factors". Watts (1991) and Davis (1996) have shown that in agricultural societies, both income and wealth are important in coping strategies under conditions of drought. The ownership of land or property, savings, livestock and other fungible assets are critical sources of coping strategies. In the absence of income and disposable capital assets and increasing inequality over time, climate change impacts on vulnerability will further deteriorate the coping capacity of the community/individuals. One of the major causes that enhance vulnerability at community level is the increasing inequality and higher incidence of poverty. Poverty marginalises a large section of the population by putting a barrier (nepotism, corruption) on acquiring benefits from social protection measures. Higher incidence of poverty for longer period produces acute vulnerability. Yamin, *et al.* (2005) explains that "although vulnerability is not defined as poverty, but today poverty is yesterday's unaddressed vulnerability". Further, recurrent droughts are also associated with higher levels of vulnerability to

[2]Mohammad Ali Shaikh, "Water Scarcity in Tharparkar", Seventh International Water Technology Conference Cairo, April 2013.

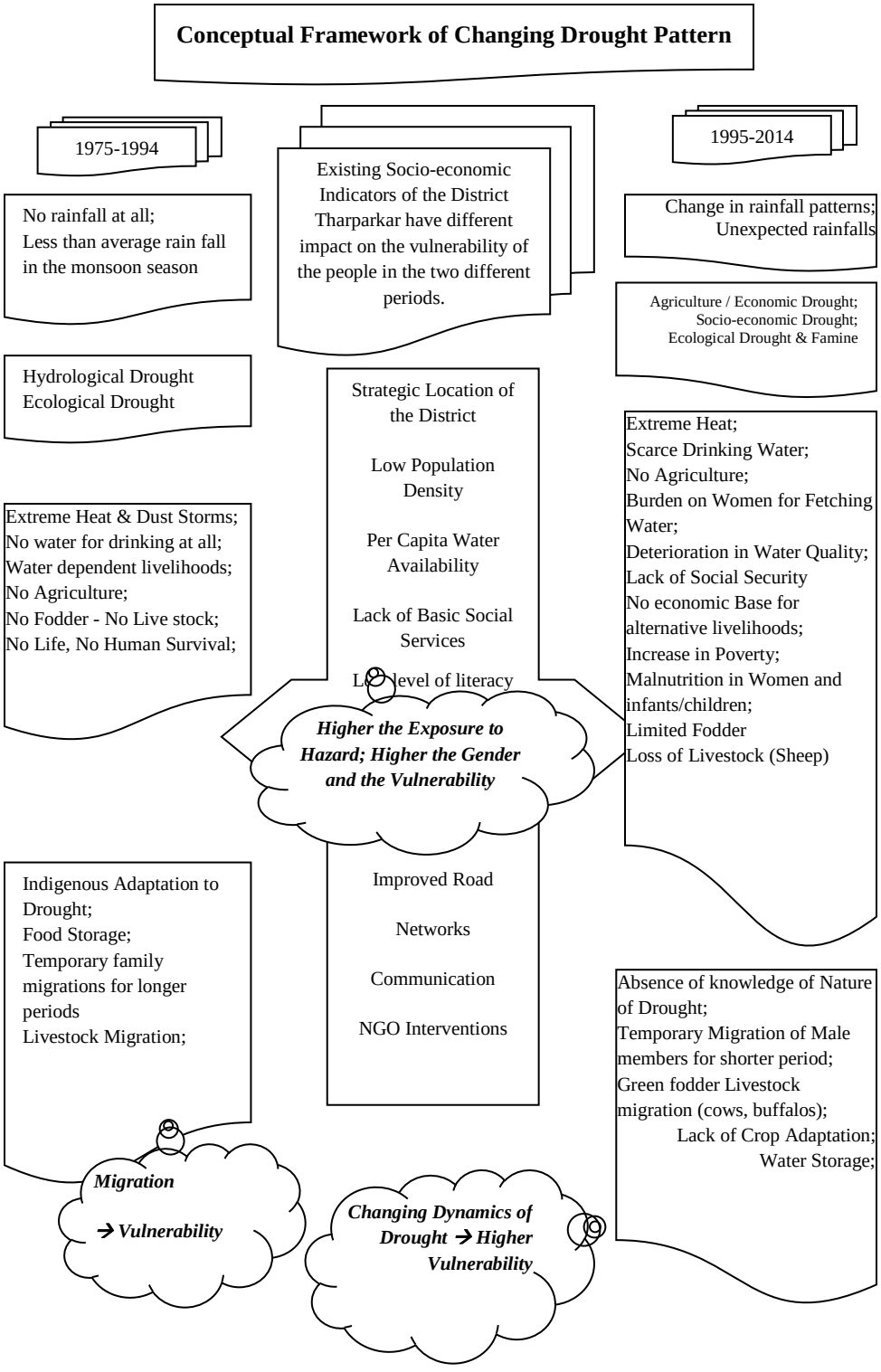
poverty [Donald (2008)]. Dercon, *et al*. (2005) in a study sampled Ethiopian villages found drought as a major disaster amongst others that have impacts on the per capita consumption. According to the key findings of the study, individuals experiencing drought have lower per capita consumption by about 20 percent.

The term 'gender' is a socially constructed phenomenon that defines different roles, identities and attitudes of men and women. Over time, these roles, identities and attitudes shape distinct characteristics of men and women in a society. Many believed that climate change is an unchanging fact for all but has varied impacts, particularly for those who are poor and marginalised [Lambrou and Piana (2006)].

The conceptualisation of climate change impact on gender cannot ignore the existing poverty and inequalities in communities. The analysis of poverty should be broadened to include issues of access, ownership and socio-cultural barriers. For instance, studies have shown that men did not avail health services out of fear of their community that if seen, will be considered as weak or needing support [Esplen (2006)]. Similarly, men are less likely to seek help for stress and mental health issues than women [Masika (2002)]. These attitudes and behaviours demand more specific contextual based climate change adaptation strategies for men and women. John and Kinsey (2000), examine the impact of rainfall shock on adult health in the rural Zimbabwe, have also found that women as compared to men, are adversely affected by drought. They further added that all women are not equally affected by disaster, as apparently poverty is the major cause of their low resilience to shocks.

It is a known fact that women in developing countries as well as in Least Developed Countries (LDCs) have the lowest social status in terms of economic and social empowerment. A vast majority of women are illiterate, poor, marginalised, deprived and have poor health [Mitchell, *et al*. (2007)]. In rural communities, the role of women is critical in organising life at household level. Women not only work as the unpaid family worker in agriculture and other occupations but also hold care-giving responsibilities for children, elderly people and physically or mentally impaired household members [Enarson (2000)]. In addition to this, women are expected to prepare food, fetch water for drinking and make arrangements for garbage disposal. These varied responsibilities of women make them vulnerable to the differential impacts of climate change.

A model/framework has been developed, to systematically investigate the changing dynamics of drought pattern in district Tharparkar. The model explains the impact of climate change on the drought condition and how such drought conditions together with existing deplorable socio-economic conditions affect food insecurity and water scarcity. The analysis is conducted from the viewpoint of vulnerability of the communities with specific focus on gender in the existing social context. The model also explains the transformations and changes in practices, followed by changing drought dynamics and patterns. In addition, it also explores how changing drought pattern is affecting the indigenous knowledge that in turn is hindering the adaptation capabilities of the people. For the analysis of the changing drought pattern, the rainfall pattern of the last 38 years is brought into focus—dividing it into two periods i.e. from 1975-1994 and 1995-2014.


Conceptual Framework of Changing Drought Pattern
1975-1994
No rainfall at all;
Less than average rain fall in the monsoon season
Hydrological Drought
Ecological Drought
Extreme Heat & Dust Storms;
No water for drinking at all;
Water dependent livelihoods;
No Agriculture;
No Fodder - No Live stock;
No Life, No Human Survival;
Indigenous Adaptation to Drought;
Food Storage;
Temporary family migrations for longer periods
Livestock Migration;
Migration → Vulnerability
Existing Socio-economic Indicators of the District Tharparkar have different impact on the vulnerability of the people in the two different periods.
Strategic Location of the District
Low Population Density
Per Capita Water Availability
Lack of Basic Social Services
Low level of literacy
Higher the Exposure to Hazard; Higher the Gender and the Vulnerability
Improved Road
Networks
Communication
NGO Interventions
Changing Dynamics of Drought → Higher Vulnerability
1995-2014
Change in rainfall patterns;
Unexpected rainfalls
Agriculture / Economic Drought;
Socio-economic Drought;
Ecological Drought & Famine
Extreme Heat;
Scarce Drinking Water;
No Agriculture;
Burden on Women for Fetching Water;
Deterioration in Water Quality;
Lack of Social Security
No economic Base for alternative livelihoods;
Increase in Poverty;
Malnutrition in Women and infants/children;
Limited Fodder
Loss of Livestock (Sheep)
Absence of knowledge of Nature of Drought;
Temporary Migration of Male members for shorter period;
Green fodder Livestock migration (cows, buffalos);
Lack of Crop Adaptation;
Water Storage;

METHODOLOGICAL FRAMEWORK

The methodological framework of this paper is based on both qualitative and quantitative techniques. The research methodology includes primary data collection from the field that started with the preliminary understanding of community and farmer's perception dialogues. The key data collection tools were multi-group shared learning dialogues (SLDs) with stakeholders, key informant interviews (KIIs), followed by the primary data collection (both qualitative and quantitative) through a community and household survey questionnaire and focus group discussions (FGDs) in the selected sample villages.

A two-stage stratified random sample selection process was adopted to enumerate households and communities. Selection of villages was based on the following criterion:

(a) For comparative analysis, sample villages are divided into categories i.e. villages located in drought effected area and villages located in non/less drought effected area;
(b) For the representation of all ecological zones of Tharparkar district, at least 2 villages were selected from seven ecological zones;
(c) The sampling of selection of villages was also based on the representation of the five Talukas (sub-division of district) of District Tharparkar. At least 2 villages were selected from each Taluka;
(d) Village selection criterion has at least 50 households and less than 200 households;
(e) Based on all of the above criteria, an appropriate number of rural circles' (PSUs: Primary Sampling Units) list was prepared for each tier (ecological zones, Taluka), randomly selected with the help of statistical software.
(f) Following the criteria of Pakistan Bureau of Statistics, sample PSUs were selected with Probability Proportional to Size (PPS) method of sampling technique.
(g) At the second stage, 20 households (SSUs: Secondary Sampling Units) were targeted from each village. Households were selected by systematic sampling procedure with a random start.

Based on the data collected through various instruments, Vulnerability and Capacity Index (VCI)[3] is constructed at community and household levels. The VCI is a simple tool that informed development practitioners and policy makers about the relative level of vulnerability at community and household levels of the disaster and climate risk regions. The VCI defines and quantifies appropriate criteria, related to material (income, education), institutional (infrastructure, social capital) and attitudinal (sense of empowerment) vulnerability, and can be used to measure differential vulnerability at the household and community level in both rural and urban areas.

The methodology also includes validating primary data with available secondary data of some key variables, such as level of literacy, household size, dependency ratios and poverty incidences, etc. Secondary Data Collection was conducted by reviewing published data at district level from various sources including public documents.

[3]Mustafa, Ahmed, Saroch, and Bell (2011) Pinning Down Vulnerability: From Narratives to Numbers. Disasters 35, 62–86.

Relevant publications from the Sindh Bureau of Statistics, Planning and Development Department, Government of Sindh were also collected. These publications provide district-wise data on various socio-economic variables. Data from Pakistan Meteorological Department on climate variability has also been collected to establish a link and to understand climate variability in the district. Climatic data is based on monthly and yearly averages on temperatures, humidity and rainfall. Monthly data for the period of 40 years i.e. from 1975 to 2014 was collected and analysed. To examine the impact of climate change on rainfall pattern and dynamics of drought, the data was divided into two periods: from 1975-1994 taken as less or no impact of climate change, designated as 1st period and high impact of climate change as 2nd period, taken from 1995 to 2014.

VALIDATING CLIMATE VARIABILITY

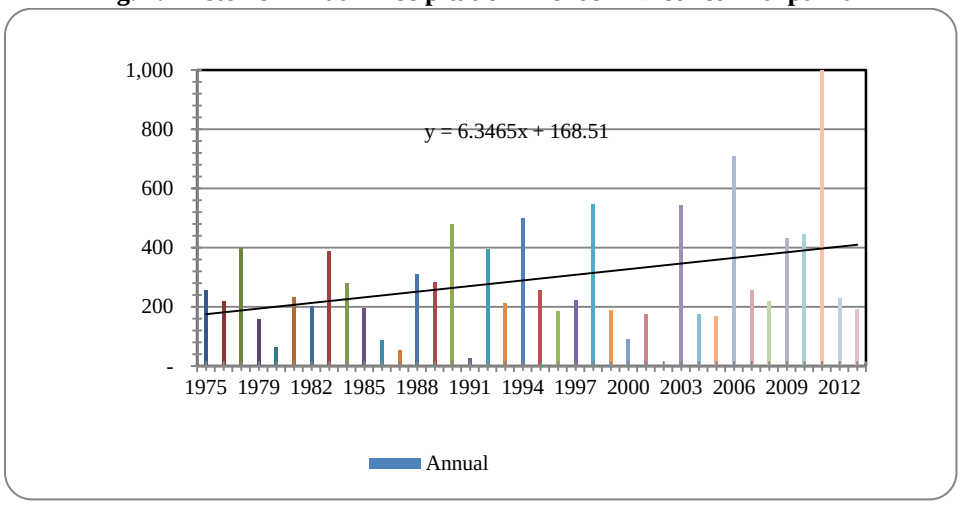
Climate change is a relatively new phenomenon that is not adequately understood in the context of its impact on particular events and disasters. However, there is a strong relationship between the disasters and global warming. The existing literature validated that climatic patterns have changed in some parts of the world and its impact on the population is severe in terms of livelihood loss and water and food insecurity. Similarly, the research on climate data of district Tharparkar has highlighted some key trends over the last 40 years.

According to Pakistan Meteorological Department (March, 2014)"…… *Monsoon rainfall (June-Sep) is the main source of water for Tharparkar region in which 87% of annual rainfall is observed. This rainfall influences the livelihood of the people. Deficit in monsoon rainfall causes a lot of impacts on agro-socio-economic pattern of that area."*[4]

Rainfall patterns and scale of rainfall in the historical framework can be divided in to two main parameters: the intensity and the frequency. Rainfall patterns are far more important among the other climatic variables while assessing the drought patterns. In district Tharparkar, the amount of rainfall varies each year, and historically the monsoon season is spread to four months from June to September each year. Considering the livelihood dependency of rainfall, the mature rain in the first 2 to 3 months i.e. June to August is more important and its frequency of 4 to 5 times is crucial for life in Tharparkar. By analysing the rainfall pattern, it can be concluded that the average annual precipitation over the last 40 years has shown an increasing trend ($y=6.3465x+168.51$) of 6.35mm per annum. As exhibited in Figure 2, the increasing trend is more pronounced in post-1995 period. There was a substantially greater inter-annual variability in the amount of rainfall in Tharparkar district. The year 2002 was the extreme dry year in the 40 years history, while year 2011 was the extreme wet year, with the precipitation level crossing 1000 millimetre (mm) that was first time in the known history of Tharparkar. Having no fresh water from canal system or natural streams, the livelihood of people in the district is solely dependent on monsoon rainfall. Agriculture and livestock are the main economic means of livelihood, and both depend on the amount of rainfall which is now seemingly more erratic and irregular.

[4]Pakistan Meteorological Department, "Meteorological report for Tharparkar", Report No. Dr-4(43)/2011-12/, March 2014.

Fig. 2. Historic Annual Precipitation Trends in District Tharparkar

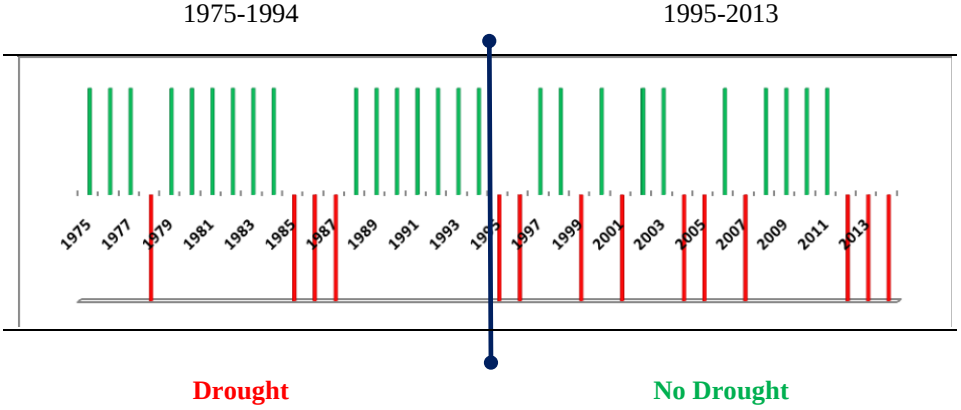


Data Source:
Pakistan Meteorological Department, Government of Pakistan;
District Development Statistics (Various Issues)

Historical normal rainfall is defined as the average annual precipitation between the above mentioned specified time period (Pakistan Meteorological Department) and drought, is defined as the situation where rainfall is lower than the normal. Normal rainfall is estimated for the monsoon season as between 175mm and 200mm and normal annual guide ranges from 200mm to 250mm.[5]

Since 1968, the region has been officially declared 15 times a natural calamity hit area by drought. The recent declaration of drought was the last two years i.e. 2013 and 2014. As appears from Figure 3, occurrence of droughts has been relatively frequent during the last two decades.

Fig. 3. Incidence of Drought in Tharparkar (1968-2014)

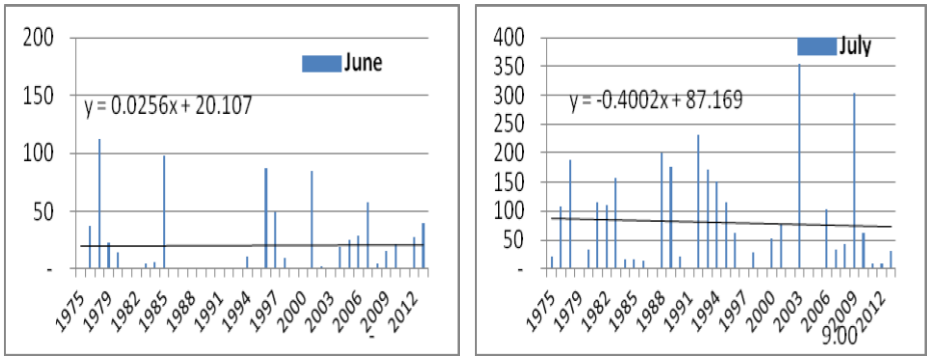


Source: Sindh Relief Department (2012).

[5]Author's calculation; Pakistan Meteorological Department, "Meteorological report for Tharparkar", No.Dr-4(43)/2011-12/, March 2014.

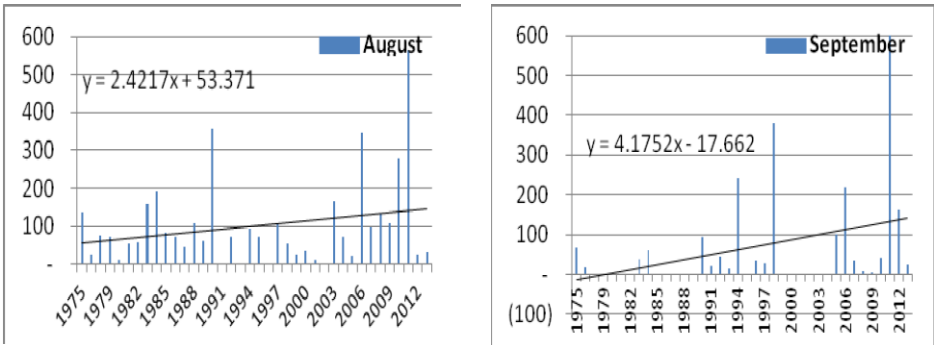
Ironically, district Tharparkar has faced frequent droughts in the last one decade despite having substantial increase in precipitation. A detail investigation is needed to explore the rainfall pattern, particularly in the monsoon period and how the higher frequency and intensity of rainfall impacted the livelihood sources in other periods. Since 2006, the annual rainfall in the district was found to be within the range of normal rainfall guide.

Fig. 4. Change in Monsoon Pattern



The change in the monsoon pattern can also be observed in Figure 4 and Figure 5, by examining the existing rainfall model during the months of June, July, August and September. Increasing rainfall trend is more pronounced in the month of August and September, vis-à-vis June and July. A decline in precipitation is observed in the peak monsoon season i.e. July (*minus [-] 0.4002*) and relatively no change in the month of June (*0.0256*). Average precipitation has decreased in the month of July from an average of 84.32mm in the 1st period (1975-1994) to 67.38mm during 2nd period (1995-2013).

Fig. 5. Change in Monsoon Pattern



By analysing the late seasonal and off-peak monsoon rainfall pattern, it has been revealed that frequency and volume of rainfall increased in the 2nd period. The rate of increase was as higher as 4.17mm per annum in the month of September, with an exceptional highest ever rainfall of over 1300 mm in any month that was not witnessed in the history of Tharparkar.

Table 1

Non-Seasonal, High Rainfall Incidence

1975-1994	No Incidence of Non-seasonal Rainfall
October 1995	60mm
October 1998	52.4mm
May 1999	128.2 mm
October 2004	82.90mm
September 2011	778 mm
October 2013	49mm

Source: Pakistan Meteorological Department, Government of Pakistan; District Development Statistics (Various Issues).

'April to May' and 'October to November' are the climate transition periods.[6] Normally there are no substantial rainfalls in the transition periods. However, during the last two decades there have been some noteworthy observations explaining the climate change uncertainties (Table 1). In 1999, the month of May has experienced high precipitation of 128.2mm that was highest ever precipitation in the month of May in district Tharparkar. The previous average was recorded as 26.10 in year the 1982 for the same month. The increased precipitation was mainly because of the worst cyclone in the entire coastal region of Sindh that burst into heavy rains in the area and surroundings.

While in the month of October, average precipitation recorded an increase from 4.58mm during 1975-1994 to 15.78mm during the post-1995 period. There were almost three incidences of rainfall above normal precipitation in the month of October in the 2nd period. The highest precipitation was recorded at 82.90mm in 2004, *vis-à-vis* highest previous record of 25.65mm in 1975. Detailed month wise averages and maximum rainfall indicators are provided in the annexure.

FACTORS THAT AGGRAVATE THE GENDER AND SOCIAL VULNERABILITY

The following discussion highlights the factors and drivers that aggravate the existing gender and social vulnerability in the area. While such factors and drivers have existed historically in the region; however, their impacts in the two periods are considerably different. In the context of model, it is important to examine that whether the existing socio-economic factors further aggravate the gender and social vulnerability in the high climate change impact period (1995-2014), as compared to the 1st period (1975-1994).

According to Pakistan Meteorological Department (March, 2014), *"In the wake of recent disaster confronting Tharparkar district, the analysed meteorological data depicts that current disaster may be termed as "socio-economic disaster" rather than simply drought because seasonal and annual rainfall was moderately below the climatic averages. The disaster may have occurred due to moderately below average rains, coupled with some epidemic and weak socio-economic settings of the area. …….. Deficit in monsoon rainfall causes a lot of impacts on agro-socio-economic pattern of that area."*[7]

[6]Chahudary, Sheikh, Bari, 'History's Worst Drought Conditions Prevailed Over Pakistan', Pakistan Meteorological Department, Government of Pakistan.

[7]Pakistan Meteorological Department, "Meteorological report for Tharparkar", Report No.Dr-4(43)/2011-12/, March 2014.

Dependency Ratio, Employment and Education Profile

According to the District Census Report 1998, average household size in Tharparkar was 5.6. The average household size of selected villages is 1.1 higher than the district average. The number of dependents for every 100 working age (15-59 years) persons is 113. The ratio is well above the national average that is 97 [SPDC (2012-13)]. Higher dependency ratios indicate an economic and social burden on the working age population and on the economy, as an economically non-active population requires additional resources and support systems.

As far as food insecurity is concerned, the entire Tharparkar region is agro-based. Due to lack of industrial base and fragile economic conditions, over the years the livelihood opportunities are not diversified and depend completely on water availability for agriculture and livestock. Out of the total employed men, 42.7 percent are associated with the agriculture sector, followed by 16.9 percent as self-employed. A significant feature of the female labour force is the prevalence of unpaid family contributors who work without pay in cash or kind. In the case of Tharparkar, 72 percent of employed women participate in labour force as unpaid family helpers. They usually work in agriculture sector. This trend is counter-productive as women play a specific role in farming activities but their contribution is not recognised. A sizeable proportion of female labour force is self-employed. They are mostly engaged in home-based work.

The continuous droughts in the last decade have forced people to search alternative livelihood source for survival. With high illiteracy and no skills, they are working as unskilled labour within as well as outside district. Years have passed and the conditions of the local communities have not shown any improvement. Their deplorable situation is the outcome of twin factors; they are suffering due to natural calamities, but the man-made hazards are further aggravating their miseries.

The overall literacy rate in the selected communities is 31.4 percent, which is well below the literacy rate of 38.6 percent in Sindh [PSLM (2012-13)]. Huge gender gap exists in the literacy, as 44.4 percent of the adult males are reported to be literate as compared to 17.2 percent of literate females. The enrolment ratios for boys and girls depicted an alarming state, as only 47.4 percent of boys and 30.7 percent of girls are enrolled at primary level. Secondary schools are either not available or not at an accessible distance from villages—a fact that restricts a large percentage of grade 5 girls to move into the next class. Socio-cultural taboos also impede girls from going outside villages for education.

Incidence of Poverty

Poverty incidence at household level is estimated from per capita consumption expenditures. The estimation of poverty incidence from household data is conducted, by using the poverty line of Rs 1,928 per adult equivalent per month from Jamal (2013) study. The estimates show a very high incidence of poverty in the sample villages as 54.4 percent of people are living below the poverty line (Table 2). The mean VCI score of poor households was 68 in comparison with mean VCI score of 63 in non-poor that reflected a strong correlation between poverty incidence and vulnerability. As discussed and revealed earlier, the high dependency ratio further aggravates the vulnerability of the households below poverty line.

Table 2

Poverty Incidence and Vulnerability

Category	MHHs	FHHs	Total	VCI
Below Poverty Line	148	19	167	68
	54.4%	54.3%	54.4%	
Non-Poor	124	16	140	63
	45.6%	45.7%	45.6%	

Source: SPDC Household Survey, 2014.

The poverty index of Sindh province has shown a higher poverty incidence in rural areas as compared to urban areas. This is mainly due to the dual nature of the province's economy[8] and problems with the development priorities and resources allocation. District Tharparkar is the only district in Sindh province that is fairly above in the 'low human development' category. According to Human Development Indices (HDI), District Tharparkar has improved slightly from HDI 0.3317 in 1998 to HDI 0.3137 in 2005. However, there has been a decline of 1 percent per annum in the HDI of District Tharparkar.[9] According to rural poverty indices, 28.4 percent of the rural population of the district lives below the poverty line.[10]

The socio-economic profile substantiated *a priori* assumption of a higher level of social vulnerability in the selected sample households because economic and social indicators of Tharparkar have not improved much over the last two decades. In the overall ranking of the most deprived districts in Sindh, District Tharparkar had been ranked highest in the deprivation index among all other districts of the province [Jamal (2003)]. The incidence of multi-dimensional poverty in the district is also high at 93.3 [Jamal (2012a)]. About 55 percent of the population is deprived in terms of selected indicators i.e. education, health, housing services and economic base [Jamal (2012)]. The deplorable social indicators i.e., large household size, poor literacy level, inadequate infrastructure, with poor access to education and health facilities reflect upon the higher level of poverty and deprivation in the district [Rehman (2013)].

Inadequate and poor social service delivery has also compounded the existing level of vulnerabilities that may or may not be temporal in nature. The discussion on socio-economic profiles of the selected villages helps in the conceptualisation of the broad contours of an analytical framework of a social vulnerability assessment. It also identifies those stressors of the human system that are closely linked with the sources and drivers of social vulnerability.

Empirical Test Validating Poverty and Inequality in District Tharparkar

An independent sample t-test was also conducted to compare VCI scores at household level (VCIHH) for both poor and non-poor households. T-test of equality of

[8]Social Policy and Development Centre, "Combating Poverty: Is Growth Sufficient?", Social Development in Pakistan, Annual Review 2004, p. 59.

[9]Haroon Jamal and Amir Jahan Khan, "Trends in Regional Human Development Indices", Research Report No. 73, Social Policy and Development Centre (2007).

[10]Haroon Jamal, "In Search of Poverty Predictions: The Case of Urban and Rural Pakistan", Research Report No. 59, Social Policy and Development Centre (2004), p. 20.

mean between VCIHH and CPLINE (consumption based poverty line) suggests that there is a significant statistical difference in mean values between two groups. The result implies that households that fall in the category of non-poor that have statistically significant lower vulnerability in comparison with household above the poverty line. In the case of district Tharparkar, these results pointed out low level of household consumption because the economic base of the district is extremely weak. Social vulnerability in district Tharparkar has largely stemmed from inaccessibility to water, perpetual disasters, particularly drought, absence of public social service delivery, poor governance, absence of social capital, lack of adaptive capacity and fragile economic base. An independent sample t-test highlighted the fact that poverty has an effect on household vulnerability. Households having higher incidence of poverty have a higher level of social vulnerability (see Table 3).

Table 3

Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
VCIHHN Thar VCI HH all	Equal variances assumed	.884	.348	3.52	305	.001	4.183	1.189	1.843	6.522
	Equal variances not assumed			3.48	280.83	.001	4.183	1.201	1.818	6.548

In the district of Tharparkar, there is a statistically significant correlation between VCIHH and consumption poverty at household level. The result shows that 0.197 value share 3.88 percent of the variability in VCI. It also implies that poverty at household level cannot fully explain the household vulnerability (see Table 4).

Table 4

Correlation between VCI and Consumption Poverty at Household Level

		VCIHH Thar VCI HH	cpline consumption poverty line
VCIHH Thar VCI HH	Pearson Correlation	1	-.197**
	Sig. (2-tailed)		.001
	N	307	307
cpline consumption poverty line	Pearson Correlation	-.197**	1
	Sig. (2-tailed)	.001	
	N	307	307

**Correlation is significant at the 0.01 level (2-tailed).

Vulnerability and Capacity Index

From the sample of 307 households and community survey in 15 villages, VCI is calculated at household and village levels respectively. As discussed earlier, the architecture of VCI encompasses quantitative and qualitative aspects of social vulnerability, by assigning a value (positive or negative) to each characteristic of household or village in three broad categories of material, institutional and attitudinal vulnerability. From the community VCI it is revealed that higher the exposure to hazard by a community, higher is the vulnerability of that community.

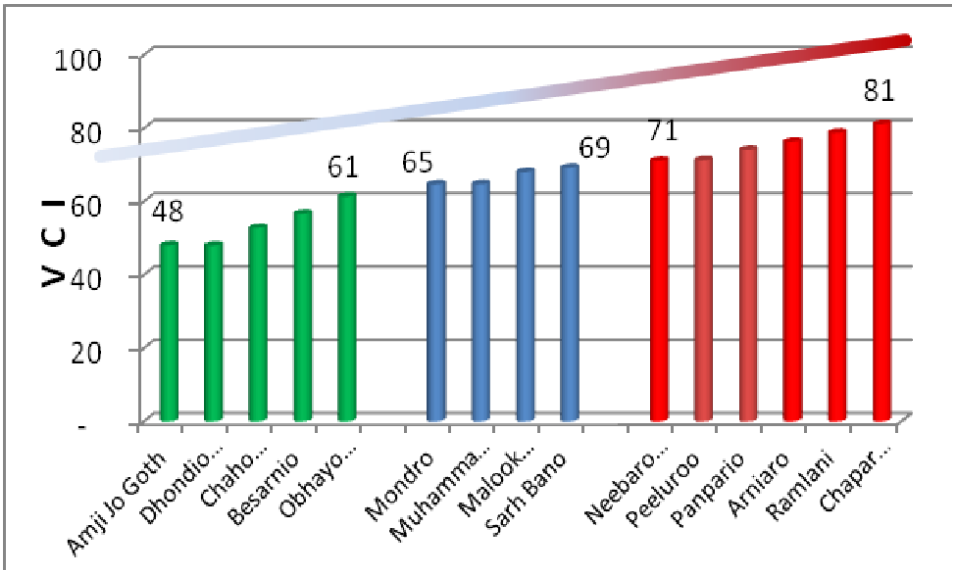
Table 5

Categorisation of VCI Scores

Vulnerability	Lower Limit of VCI Score	Upper Limit of VCI Score	No. of Villages	Number of Households	Percentage of Households
Low	48	61	5	103	33.5%
Moderate	65	69	4	97	31.5%
High	71	81	6	107	35.0%
Total	-	-	15	307	100.0

Source: SPDC Household and Community Survey, 2014.

Fig. 6. Vulnerability Scores of Selected Villages



Source: SPDC Household Survey, 2014.

Based on the VCI scores of community and household, categorisation (Table 5), five villages fall in the low vulnerable category, four in the moderate category and six villages are categorised as highly vulnerable. The categorisation revealed the significant differentials among the selected villages, based on their exposure to hazards and material and institutional vulnerability. The lower and upper limit of average mean values determined the category of each village from its village mean score as exhibited in Table

5. From the sample of 307 villages, the households are almost equally distributed in each vulnerable category with a slight higher percentage of households in high vulnerable category. Figure 5 shows the vulnerability scores of all selected villages, which range from 48 to 81. There appears to be an increasing trend of VCI score with increase in physical exposure to hazard. Also there is no overlap in all the three categories indicating a distinct difference amongst the categories. The most vulnerable group comprises 40 percent of the sample, about 6 villages.

In contrast to differentials, similarity in several factors is also observed in almost all the villages, which tend to place them on a higher intercept of vulnerability. For example, there are no collective assets owned by the community in any of the villages. Self help groups are not found in any of the villages. The sense of empowerment was observed to be very low and in most of the villages people do not access local or national leadership except two villages. Similarly, livelihood sources are mostly unstable.

Due to lack of opportunities and prevalence of illiteracy alternative livelihoods have become limited for these communities. Thus, the most common alternate livelihoods are the locals who work on daily wages are unskilled labourers, have unstable income which is a source of a fragile economic system.

Food Insecurity and Water Scarcity: A Social and Gender Context

In the arid and semi-arid regions, the effect of climate change is severe in particular for food insecurity and water scarcity. The monsoon season is characterised by harvesting in the region, feeding of animals with grazing land and recharge of underground aquifers. Normal rainfall in monsoon season allows the living organisms to secure their subsistence level of food for the rest of the year. Thus, monsoon brings back life and hope in the region.

The normal monsoon season is considered very crucial amidst the existing socio-economic conditions, absence of social services delivery and fragile economic base. Historically, the region relied on underground aquifers for drinking purposes that recharge from the monsoon rains. The low intensive and less frequent rains during monsoon season together with the shift in timings affect the groundwater recharge and quality of water due to the presence of soluble salts in the soil.

Changes in the frequency and intensity of rainfall during the monsoon season and an increased precipitation in the off-season bring an uncertain situation of water availability. In such events, the soil water deficiency occurs, thus reducing the biomass and yield. Water deficiency in the soil reduces water quantity in underground aquifers as well as affecting its quality. Table 6 exhibits changes observed by the respondents of household survey. Overall 67 percent of the respondents reported an increase in the depth of the underground aquifer while 89 percent mentioned reduction in the livestock grazing fields due to erratic and irregular soil and land erosion. Reduction in the number of water zones was mentioned by 48 percent men and 73 percent women. Since the collection of water is the responsibility of women, at water-scarce times the burden of managing water resources falls on women, which leads to an increased work load.

Table 6

Observed Changes Due to Drought

Variables	Changes	Male	Female
Underground Aquifers	Lowering	63.5%	70.4%
Livestock Grazing Fields	Decreases	93.5%	85.7%
Number of Water Zones	Decreases	48.4%	72.6%
Herbs/Plants/Bushes	Decreases	70.8%	50.2%

Source: SPDC Household Survey, 2014.

Women are more vulnerable to water scarcity and deteriorated quality amidst uncertainties during the 2nd period. In the current drought phenomenon, only men in the family are forced to migrate towards major towns and cities particularly in search of livelihoods for the survival of their families. They opt for migration towards greener areas, where they also receive relatively better social services and sustainable livelihoods. Women, children and elders are left behind to face difficulties of life particularly water scarcity and famine.

Table 7

Drinking Water Quality

Variables	Yes (%)
Sweet	23.5
Mixed	33.8
Bitter	42.7

Source: SPDC Household Survey, 2014.

Sweet water is scarce throughout the district except in ecological zones of '*vat', 'vango', 'kantho* and *parkar'*. It was reported in most sites that the depth of the underground aquifers has increased over the years that has affected the quality of ground water. In particular, the women, children and elders are more vulnerable in the context as they have to live in such harsh conditions where drinking water is not fit for human consumption. Table 7 reveals that, more than 75 percent of households in the sample have no access to sweet water. They have to rely on the available water which is not suitable for human consumption. A very few percentage of households can afford to purchase sweet water for drinking. This indicates that the lack of access to safe drinking water has increased the vulnerability of women, children and elders as they have no alternative choice except to use mixed and bitter water. Male member of the family have a choice to migrate from the area to other areas for earning purpose.

According to the report by National Disaster Management Authority (NDMA) in 2012:

> "*Like other countries, In Pakistan women have limited access to resources; little awareness of their rights, limited mobility with little exposure to environments outside their community or at times even the household, low levels of literacy and few life skills. This makes women highly vulnerable in periods of disaster where even greater challenges are faced in accessing basic resources. Stakeholders agree that to reduce the vulnerability of women and children in times of disaster,*

greater efforts must be made to understand the nature of barriers they confront and investment allocated to address these."[11]

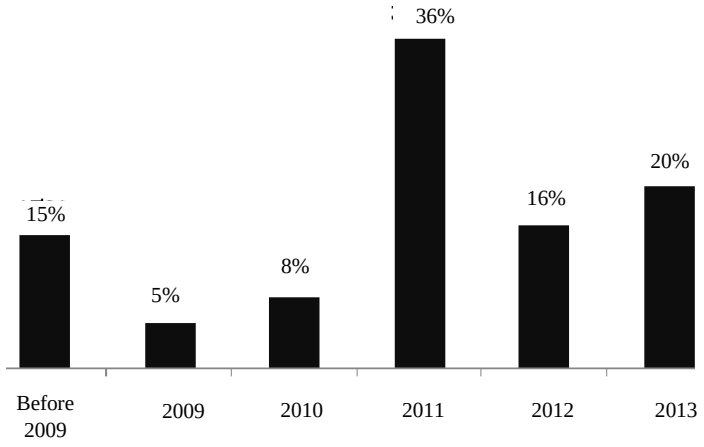
Life in the desert is harsh and difficult. In extreme cases droughts lead to famine, when crops have failed to grow. Recurring droughts increase the burden on women to manage food shortages and for men this means obtaining additional income from non-agricultural sources.[12]

Table 8

The Incidence of Starvation

Households ever experienced starvation	47%
Average number starvations in life **(male)**	7
Average number starvations in life **(female)**	13

Percentage Distribution of Households that have ever Experienced Starvation



The persistent drought conditions have resulted in severe food insecurity. Lack of livelihood options have plunged people into a state of hunger as they had no access to food and potable water. The field survey reveals that 47 percent of the households have experienced starvation[13] in their life (Table 8). On average, a household experienced over 11 times of starvation in the span of the last 30/40 years. Both men and women reported starvation experiences. However, the average starvation in women is almost twice as those in men. This reflects the cultural norms where women sacrifice their nutrition requirements for the entire family. As exhibited in Table 8, women experienced starvation 13 times in their life as compared to 7 times by men. Of the total households,

[11]National Disaster Management Authority, Government of Pakistan, "Disaster Risk Management Needs Report 2012", June 2012.

[12]Sibyl nelson and Yianna Lambrou, "Gender Dimensions, Climate Change, and Food Security of Farmers in Andhra Pradesh, India.. Gender and Climate Change: An Introduction", Edited by Irene Dankelman, Earthscan 2010.

[13]Starvation is defined as a no food for 24 hour.

40 percent reported at least 5 starvations and 20 percent reported at least 10 starvations in their life. The incidence of starvation is comparatively high during the last five years (2009-2013). People were asked to mention the year of most recent starvation. As shown in Table 8, out of all households that have ever faced starvation, 85 percent reported that their most recent experience was during the last five years.[14]

The mean vulnerability score of those who have experienced starvation is higher at 67 (141 households) as compared to mean VCI score of 63 for household who did not experience any starvation (166 households) in their life. Similarly, households in which women experience starvation are more vulnerable (mean VCI 69) as compared to households where only men reported the experience of starvation (mean VCI score 64). Further, household where women experienced starvation either singly or jointly with men are also more vulnerable with mean VCI score of 68. Starvation incidence is high in households below poverty line that is 87 percent, while they have monthly income less than or equal to Rs 16,666 with relatively high dependency ratios.

Coping and Adaptation Practices

Coping and adaptation practices in the last 10–20 years have changed considerably due to climate variability. During the last 10–20 years, respondents were unable to distinguish the changing characteristics of climate with the precise recognition and understanding of potential drought in the region. Migrations to barrage areas are still in practice. However, participants of FDGs mentioned that migration of the whole family has reduced. Mostly male members of the family migrate in search of livelihood while women, children and elders are left behind to face a difficult life, owing to water scarcity and limited availability of fodder for livestock. This may be one of the major reasons behind the high incidence of starvation in women as mentioned earlier. As shown in Table 9, current practice of temporary migration was reported by about 40 percent of household as compared to 59 percent in the past. The practice of storing food as coping mechanism has increased substantively from 33 percent to about 48 percent of households. However, the quantity of food available for storage was reported to be lower than the subsistent level. As stated by a female respondent: "*the practice of storing grain was a method of coping with drought, but we are unable to store enough due to decrease in yield and an increased frequency of disasters.*"

Table 9

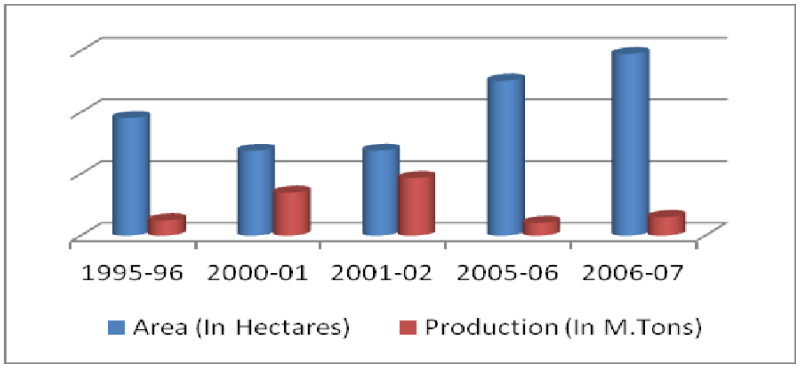
Coping and Adaptation and Coping Practices

Variables	Current	30 Years Back
Food Storage	47.5%	33%
Temporary Migration	39.9%	58.8%
Store Water	-	-
Change of Livelihood	10.9%	4.9%

Source: SPDC Household Survey, 2014.

[14]These responses should be taken with the caution that they are based on memory recall. People generally tend to remember their recent experiences more accurately.

Fig. 7. Area and Productivity of Millet in Selected Years



Source: Development Statistics of Sindh (Various Issues).

Agriculture in the district is entirely rain fed, depending on monsoon rains. In order to achieve the optimum growth, various crops have particular temperature requirement, moisture and nutrient during their growth cycle. If the moisture availability falls below the optimum amount during the growth cycle, the growth of crop will be impaired and yields reduced.[15] The main crops of the district are millet and guar (cluster bean), which are sown immediately after the first spell of mature rain. The agriculture cycle requires at least three to four spells of normal rainfall with an interval of 10-15 days. During the last 10 years, there are significant production losses due to irregular and erratic pattern of rainfall. As depicted in Figure 7, there has been decline in the productivity in 1995-96, 2005-06 and 2006-07, despite the fact that there was normal rainfall in terms of the amount but was erratic and irregular. The unpredictable rains normally vary within frequency and intensity in terms of area and time [Shaikh (2013)]. Lack of knowledge and absence of government support through agriculture extension department were cited as major reasons for inability of farmers to shift to other crops or change the cropping pattern.

Livestock activities are also changed owing to limited availability of fodder in the district. According to a respondent, horses were a common sight in the desert, but due to the loss of fodder, they are not seen anymore. Communities preferred to have more sheep and goats while donkeys have also received importance because of increased water scarcity and fast depletion of water zones. However, such practices are subjective in the wake of less resilience to diseases amidst available fodder and grazing lands. The donkeys are mostly used for carrying water from far flung areas. Green fodder livestock like cow and buffaloes are found in very small numbers particularly in areas which are canal irrigated or have better access to water resources. It is found from data that in 1970 ratio of cows to goats and sheep was 1:1 and district Tharparkar was declared as main cattle region of Pakistan, but it turned to 1:6 in 1998 amidst increase in water scarcity.[16] Analysing the primary data of sample communities, the ratio of cow to goats and sheep comes out as 1:8.

[15]Chahudary, Sheikh, Bari, 'History's Worst Drought Conditions Prevailed Over Pakistan', Pakistan Meteorological Department, Government of Pakistan.

[16] Ibid.

CONCLUSION

Climate change has now become a reality and arid ecosystems will be amongst the major sufferers. Decrease in rainfall, increase in temperature and increased incidences of extreme events are some of the changes expected in arid zones of district Tharparkar. For thousands of years, people of Tharparkar region have been living with their indigenous knowledge, combating the problems arising from the lack of natural resources and provision of facilities. But over the years global changes in the climatic pattern parallel with the over powering nature of social and economic factors have pushed the inhabitants of this arid region into a more vulnerable situation.

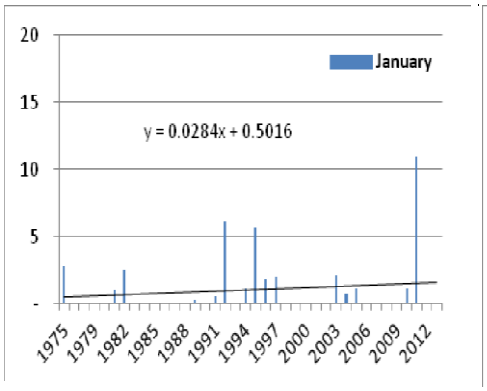
In the last two decades, changes in drought patterns instigated the higher level of the vulnerability in the people. Unlike historical droughts, the recurrent recent drought dragged the life of majority of people in the region to below subsistence level. Besides the change in climatic patterns, the other reason behind their vulnerability is the absence of industrial base that makes the economic base of the region fragile. Thus reduces the income generating opportunities of the district, negatively affects the food security and increases the incidence of poverty of the district. With increase in demographic pressure and inability of the government to provide economic opportunities and support the industrious potential of the population, the livelihood of the region will continue to be at risk. The availability of water and food would have been a minor issue if people have high purchasing power and adequate and diversified sources of livelihood.

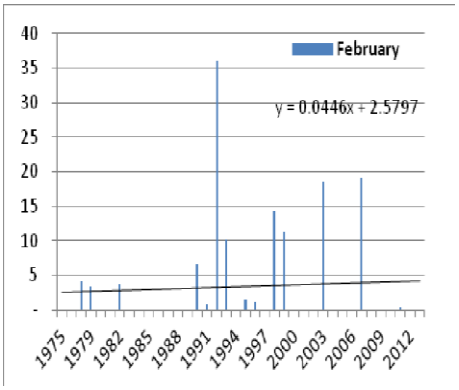
There is need to impart and enhance knowledge and understanding of hazards and climate changes in both men and women for more effective coping and adaptation strategies. Water is the main source of miseries of the people, as beside other chronic challenges, it is responsible for water borne diseases in the region. Ironically, women and children are mainly affected. The disjointed circumstances aggravate the vulnerability of the families, particularly the women because of their socially constructed roles and prominence in the society. Women have to bear the disproportionate burden and face hardship of life. Despite cumbersome responsibilities women radiate strength and is evident from their experience of starvation which is almost double than the entire family members. However, this results in high malnutrition in women leading to high maternal mortality rates. Further, the low birth weights result in high infant mortality rates in the district.

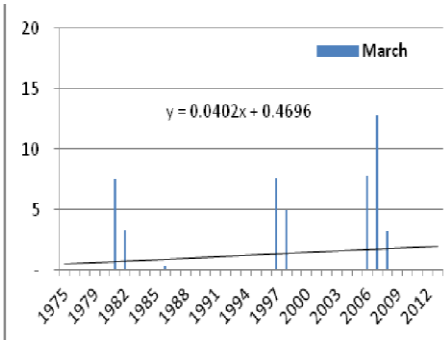
The underdevelopment of the entire Tharparkar region is another aspect aggravating the vulnerability and can be explained by malicious behaviour of the authorities. Lack of provision of basic infrastructure, poor communication network, pathetic health and education facilities and non-provision of clean drinking water are the key vulnerability factors. Thus the prevailing issues and the intense human sufferings will continue if provincial government chose to continue with its ad-hoc and disconcerted approach. Serious efforts are also needed to stop the corruption / pilferage and address the issue properly as an issue of a climate change—which would require serious technical inputs, a comprehensive strategy, envisaging short and long term of action; a gender lens; and an effective coordination between relevant government departments. Water availability being the main source of suffering, the provincial government must start by maintaining the existing wells and ponds and conversion of brackish water into sweet water with the help of technology. In the long term, a diversion of excessive water via outfall drains in the region would help in recharge of the ground water. Also a long run economic and development strategy would assist in improving the living standards and eliminate the economic disparity of the people of the Tharparkar district.

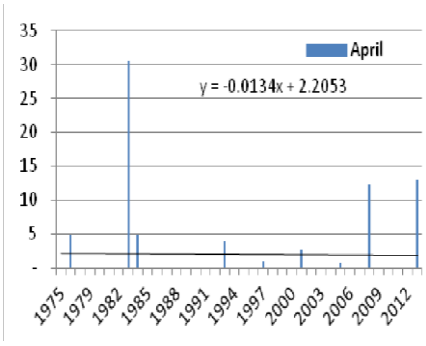
ANNEX A

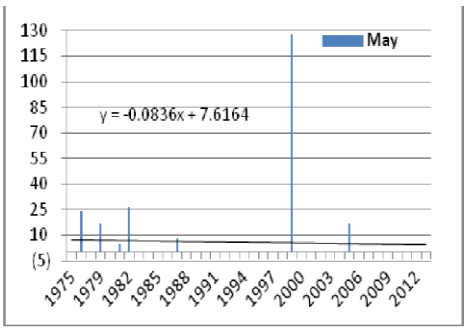
MONTHLY RAINFALL TRENDS - SELECTED MONTHS (IN MILLIMETER)

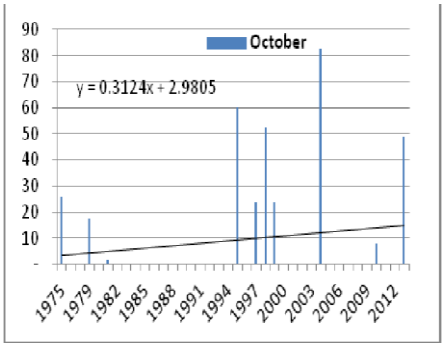


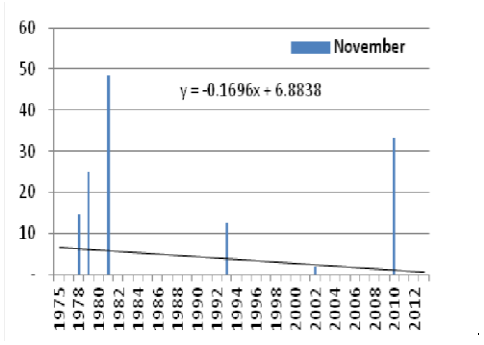


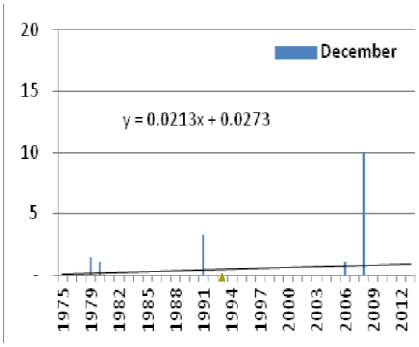












ANNEX B

Monthly Rainfall Averages

Month	1975-1994				1995-2013			
	Average	Median	Max	Min	Average	Median	Max	Min
January	0.96	-	6.20	-	1.35	-	11.00	-
February	3.08	-	36.00	-	3.49	-	19.20	-
March	0.53	-	7.50	-	1.92	-	12.80	-
April	2.11	-	30.60	-	1.56	-	13.00	-
May	3.86	-	26.10	-	7.71	-	128.20	-
June	14.60	-	112.20	-	25.07	18.80	87.20	-
July	84.32	34.10	231.80	-	67.64	32.60	354.30	-
August	92.69	73.30	356.10	-	113.24	69.80	562.80	-
September	35.14	13.70	241.20	-	95.94	26.20	778.1	-
October	4.58	-	25.65	-	15.78	-	82.90	-
November	4. 80	-	48.60	-	1.85	-	33.20	-
December	0.28	-	3.30	-	0.58	-	10.00	-
Total	249.1	255.3	499.1	24.6	336.1	221.0	1361.3	4.6

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Testing for Differences Across Genders: Evidence from Ultimatum Game

HAMID HASAN and NAUMAN EJAZ

This paper analyses the following propositions: (i) Are people generally self-interested; (ii) If people tend to be generous, what is their motive, i.e., whether they fear rejection or do they prefer fairness; and (iii) Is there any behavioural difference in bargaining between males and females?

We conduct an ultimatum bargaining experiment in a "same gender pairings" setting and observe the overall offers made by the proposers and the rejection rates of the responders. In order to test the second hypothesis we compare the offers that proposers anticipate will be accepted by the responders and the offers they actually make. If actual offer exceeds the minimum acceptable offer, anticipated by the proposer, we conclude that he is fair minded, otherwise, he is considered generous due to fear of rejection. In order to test the third hypothesis, we compare the offers and responses made by males and females in this game.

Our results indicate that people on average, are not self-interested and tend to exhibit generosity. This behaviour is dictated by a fear of rejection rather than a concern for fairness. Further, this fear of rejection is very realistic, particularly, in the case of males, where the rejection rates for unfair offers are very high.

Regarding gender differences, we find females to be more generous than males. However, reason for this generosity could not be found, since there is no significant difference in the degree of fairness or fear of rejection across the two genders. We also do not find any conclusive evidence that females are more reciprocal than males.

Keywords: Ultimatum Game, Fairness, Reciprocity

INTRODUCTION

Earlier studies in Pakistan [Naeem and Zaman (2014) and Razzaque (2009)] have analysed generosity while examining gender differences in the ultimatum game. However, the motives behind observed generosity have not been tested in these studies. In the present study we test that when people tend to be generous, is it because they fear rejection or because they have a preference for fairness.

The stylised form of negotiation, known as the ultimatum game, was first examined by Güth, Schmittberger, and Schwarze (1982). In the original experiment, proposers offered their opponents, on average, 36.7 percent of the pie, while one offer of 30 percent was rejected. These results contradict the usual economic assumption of self-interested individuals.

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Some regard the ultimatum game as one of the classic demonstrations of human irrationality. The rational (game theoretic) analysis of the game is simple. The responder has the choice of whatever the proposer offered him or nothing. Since, something is better than nothing, we would expect the responder to take whatever the proposer offers him. Knowing this, we would expect the proposer to offer the minimum possible amount to the responder.

The experimental studies, based on the ultimatum game reflect that results deviate from this Nash Equilibrium. When people play the ultimatum game in the lab, in a large number of human studies, conducted with different incentives in different countries, a majority of proposers offer 40-50 percent of the total amount, and about half of all responders reject offers below 30 percent.

Given that it is not irrational for proposers to offer higher amounts, if they know that responders reject lower offers. However, as discussed above, it is irrational for the responders to reject the proposed division. So, why do they do it?

A common interpretation is that responders would rather forgo some money than be treated unfairly (reciprocity). On the other hand, proposers' behaviour is understood as one combining two motives; a taste for fairness and the anticipation that small offers may be turned down (fear of rejection) [Thaler (1988)].

To answer this question, Forsythe, Horowitz, Savin, and Sefton (1994) compare offers in the ultimatum game with offers in the dictator game, to conclude that the more generous offers in the ultimatum game can be attributed more to fear of rejection than to fairness.

Further, in the ultimatum game, gender has been observed to influence a variety of decisions, for instance, Eckel and Grossman (2001) observe chivalry (men accept lower offers from women than from men) and solidarity (women accept lower offers from women than from men). Solnick (2001) finds, in contrast, that players of both sexes demand more from women than from men. Both studies report that offers are lower to women than to men, and that offers from women and men are not significantly different.

The purpose of our study is to examine the following propositions:

(1) Are people generally self-interested?
(2) If people tend to be generous, what is the motive; whether they fear rejection or have a preference for fairness?
(3) Is there any behavioural difference in bargaining between males and females?
    (a) Are females more generous than males?
    (b) If yes, then what is the motive?
    (c) Are females more reciprocal in their behaviour than males?

In this respect, we conduct an ultimatum bargaining experiment in a "same gender pairings" setting. In order to test the first statement we look at the overall offers made by the proposers and the rejection rates of the responders. In order to test the second proposition we compare the offers that proposers anticipate will be accepted by the responders and the offers they actually make. If actual offer exceeds the minimum acceptable offer anticipated by the proposer, we conclude that she is fair minded. Otherwise, she is being generous due to fear of rejection. In order to answer the third question, we compare the offers and responses of males and females in our experiment.

The rest of the paper is organised as follows: The next section reviews the existing literature on gender differences across a variety of experiments. We then present the experimental design with the following section reporting the results of our experiment. The final section concludes.

LITERATURE REVIEW

A key insight from experimental economics is that people typically do not behave as selfishly as traditional economics assumes them to do. An experimental game that produces very convincing and consistent evidence in this regard is the ultimatum game. For instance, Oosterbeek, Sloof, and Van de Kuilen (2004) report the findings of a meta-analysis of 37 papers with 75 results from the ultimatum game, to find that on average the proposer offers 40 percent of the pie to the responder. Also, on average 16 percent of the offers are rejected.

It has been investigated whether offers depend on the amount of money at stake. Results tend to reject this as an explanation; studies in which raising the stakes in ultimatum games is the explicit focus, typically find no significant differences in the shares offered. However, the rejection rate decreases as the stakes are increased [Cameron (1999); Munier and Zaharia (1998); Slonim and Roth (1998); List and Cherry (2000)].

Another explanation for variation in average offers and rejection rates is based on gender differences. Contemporary feminist ideals of minimalist sex differences further reinforce this perspective; much of the relevant feminist research seeks to "shatter stereotypes about women's characteristics and change people's attitudes, by proving that women and men are essentially equivalent in their personalities, behavioural tendencies and intellectual abilities" [Eagly (1995)].

Other studies suggest that many men and women assume that gender differences in negotiation exist and that they act consciously or unconsciously upon that assumption. One experiment based on an ultimatum game concludes that when the bidders know their partner's gender from a simple name cue, both males and females make significantly lower (more competitive) offers to female respondents [Solnick (2001)].

Using variations on the prisoner's dilemma, some studies find women to be more cooperative or generous [Aranoff and Tedeschi (1968); Meux (1973); Ortmann and Tichy (1999)]. Others find men to be more cooperative [Rapoport and Chammah (1965); Kahn Hottes, and Davis (1971); Mack, Auburn, and Knight (1971)]. Yet others find inconsistent or no significant difference between the genders [Dawes, McTavish, and Shaklee (1977); Stockard, Van de Kragt, and Dodge (1988); Orbell, Dawes, and Schwartz-Shea (1994)]. Similarly, Mason, Phillips, and Redington (1991) find no gender difference in a duopoly experiment. In public goods experiments, Brown-Kruse and Hummels (1993) find that women contribute significantly less than men, while Nowell and Tinkler (1994), on the other hand, report significantly higher contributions by groups of women than by mixed-sex or all-male groups. Bolton and Katok (1995) find no difference between the behaviour of men and women in dictator games.

Eckel and Grossman (1996) examine gender differences in a punishment game, where subjects could choose to divide evenly a $10 (or $12) pie with someone who had previously been generous with another subject, or an $8 pie with someone who had

previously been ungenerous. They find that women are at least as likely as men to punish ungenerous counterparts. In a later study, Eckel and Grossman (1998) use a dictator experiment to find that women are more generous to their partners than men; women donate, on average, about twice as much as men.

Regarding gender differences in the trust game Croson and Buchan (1999) give two explanations for female responders, returning more than male responders. First, it may be that women are more altruistic than men and thus they return a higher proportion of their earnings. However, if this were so one would expect to see a significant gender effect in both amounts, sent and proportion returned, not only in the later. Alternatively, the authors suggest that reciprocity could be driving the difference between male and female behaviour in this setting. This explanation involves women being more likely to reciprocate than males, rather than being simply more altruistic.

With respect to the ultimatum game specifically, Botelho, Hirsh, and Rutström (2000) use experimental data, collected in Russia and in the United States to find that the average offer made by female subjects in the two countries equals about 45 percent of the pie, and the median offer is 48.8 percent and 42.5 percent in the United States and Russia, respectively. Corresponding figures for male subjects are 31.5 percent in the United States and 35.3 percent in Russia, while the median offer is 30 percent in both the countries. Further they report that, irrespective of the offer range, female subjects in both the United States and Russia exhibit substantially higher rejection rates than male subjects.

Eckel and Grossman (2001) find that although women proposers are more generous than men, the difference is statistically weak. Further, they observe systematic differences in the behaviour of men and women; women are significantly more cooperative in that the probability that a woman will accept a given offer is higher than for a man. They also find that context is important; the gender of the respondent's partner has a strong effect on the subject's decision, in the sense that women both reject and get rejected less frequently (solidarity between women) and that male respondents do not usually reject unfair offers by female proposers (chivalry among men).

Solnick (2001) suggests that both males and females tend to offer less to women, seemingly expecting women to be content with less. However, as indicated by the higher minimum acceptable offers chosen by females, this expectation seems to be wrong footed. Further, both genders set their minimum acceptable offers higher when they are facing a female proposer, thus indicating that they expect more generosity from females as compared to males. The author concludes that there are systematic differences caused by gender, and that these can have important and interesting consequences for economic behaviour. Further, the results have implications for experimental methodology. In particular, experimenters may need to take care in assuring that their studies are gender balanced, and that findings are due to economic factors and not because of the gender composition of their samples

The general conclusion that can be drawn from this body of work is that women are more socially-oriented (selfless) and men are more individually-oriented (selfish). If these differences carry over to economic decisions, when money is at stake, then theories that model agents as homogeneous, or being drawn from a common distribution, may predict behaviour inaccurately. If instead, gender differences in behaviour are overwhelmed by monetary incentives, then economic decisions are fundamentally different from those examined in other social and behavioural sciences.

Another relevant concern is the reconciliation of the fact that gender seems to manifest itself only in certain domains while remaining indiscernible in others. The only plausible answer to this question, as pointed out by Riley and McGinn (2002), may be that "Findings from gender research mirror the inductive conclusions one is likely to draw from daily experience: Men do not consistently act one way and women another, sometimes gender matters, and sometimes it does not".

EXPERIMENTAL DESIGN

A total of 146 (76 females and 70 males) subjects participate in this study. Graduate and undergraduate students are recruited from the student population at International Institute of Islamic Economics, International Islamic University, Islamabad.

There are three sessions; first session comprised of 24 undergraduate male students, second session was of 76 graduate female students and third session consisted of 46 graduate male students. In each session half of the subjects make offers and the remaining half accept or reject these offers.

Participants are paid in the form of 5 bonus marks in a subject that they are enrolled at that time of participating in the experiment (the worth of these marks is assumed to be high enough for the students to induce them to participate in the game). They bargain over Rs. 50[1] in all the sessions.

All the experimental sessions are conducted in large classrooms where there is plenty of room for participants to spread out for privacy. All sessions have two rounds. In the first round, the proposers are handed over a simple questionnaire which requires them to state what they expect is the minimum offer (expected MAO) that would be acceptable to the responder. Similarly, the responders are asked to state the minimum offer (MAO) that they will accept from the proposer.

In the second round, the proposers are handed over an envelope containing actual money along with another envelope in which they could put the amount they intend to give to the responder.

Once the proposers have made their decisions, they hand over the responders' envelopes to the experimenter who distributes these envelopes between the responders randomly.

Each responder after considering the offer made by the proposer decides whether to keep the envelope (in case of acceptance) or return it to the experimenter (in case of rejection). The proposers whose offers are rejected then return their envelopes, so that in case of rejection both the parties get nothing.

RESULTS AND DISCUSSION

Descriptive Statistics

The mean offer is Rs 22.88 (46 percent of the total amount), indicating that people are more generous than what economists predict. Further, this result is consistent with the standard experimental results. The offers are reported in Table 1.[2]

[1] Equivalent to US$ 0.83 at the exchange rate prevailing at the time the experiment was conducted.

[2] For tables and figures refer to the annexure.

The rejection rate for all the responders is 23.29 percent. It can be seen from Table 2 that most of the rejections are for the offers that are below the 50 percent division. However, in some cases fair and hyper-fair are also rejected by the responders where they expect more generosity from the proposers. This rejection rate is also comparable with previous experimental results.

The proportion of proposers who are generous due to their preference for fairness (who give more than what they think would be acceptable to the responder) is 27.4 percent. The remaining proposers offer generously due to fear of rejection. Again this is analogous to the experimental findings that generosity on the part of the proposers is mainly attributable to the fear that the offer will be rejected and they would get nothing. Fairness only plays a smaller part in this behaviour.

Regarding gender differences in proposer behaviour, males offer Rs 21.57 (43 percent of the pie) to the responders while females offer Rs 24.08 (48 percent of the total amount) to their counterparts. The details of these offers are given in Tables 3 and 4.

The rejection rates across genders vary by a considerable amount. The rejection rate for males is 40 percent while that for females is almost 8 percent. This difference may be attributed to the fact that female proposers generally offer higher shares as compared to male proposers. This is also evident from the data that most of the offers rejected by males lie in the 0.08-0.25 dollars range (10-30 percent share of the pie). Further, the variance in female offers is much less (0.05) as compared to males (0.12).

The proportion of proposers exhibiting fairness is also considerably different, with female proposers exhibiting a greater level of fairness as compared to males. Almost 32 percent of the females demonstrate fairness in their offers to the responders as compared to nearly 23 percent of the males. However, a considerable amount of proposers in both genders have fear of rejection as the main motivation behind their behaviour. Further, this fear of rejection is well founded, especially in males where many of the unfair offers are rejected.

Inferential Statistics

The results of various tests carried out with respect to the propositions stated in the introduction are reported as follows:

(1) Are people generally self-interested?

In order to test whether people systematically make generous offers or not, we applied the t-test of significance. The hypothesis in this case is that mean offer is not significantly different from Rs 5 (10 percent of the pie and the minimum amount that the proposer can offer to the responder as suggested by economists). The hypothesis is rejected at 5 percent level of significance (the results are reported in Table 5). Thus we can conclude that people do not behave selfishly as proposed by game theorists.

(2) If people tend to be generous, what is the motive?

In this respect we use the one-tailed z-test of proportions to test the hypothesis that proportion of fair offers is not significantly different from 0.5, i.e., we expect that taste for fairness and fear of rejection figure equally in the proposer behaviour. Again, the hypothesis is rejected at 5 percent level of significance. The results are reported in Table

6. We can further conclude that fairness has a lesser role to play in people's decisions as compared to fear of rejection.

(3) Is there any behavioural difference in bargaining between males and females?

(a) Are females more generous than males?

We apply the test of equality of means (Table 7). The null hypothesis is that both males and females make equal offers on average. The mean test shows that the difference between mean offers is significant at 10 percent level of significance thus indicating that, on average, male proposers offer less than female proposers. This may indicate that females are more generous than males.

In addition we also regress offers made on the gender of the proposer. The detailed results are reported in Table 8. The regression indicates that gender has a significant effect on the mean offer.

The results of the equality of variance test (Table 9) indicate that male offers have a greater variance than that of female offers and that the difference in two variances is significant (low p-values of four out of five tests). Therefore, we can conclude that women deviate from the generous offers less frequently than males.

(b) What is the motive behind female generosity?

In this case we test whether females are generous because they have a greater taste for fairness as compared to men or that they have a greater fear of rejection which causes them to offer generously. Again we use the z-test of proportions to test the hypothesis that proportion of fair offers made by females is equal to that of males. The results (Table 10) indicate that the hypothesis is accepted at 5 percent level of significance. So we cannot conclude that the more generous offers made by females are due to the reason that they are more fairer or that they fear rejection more than the males.

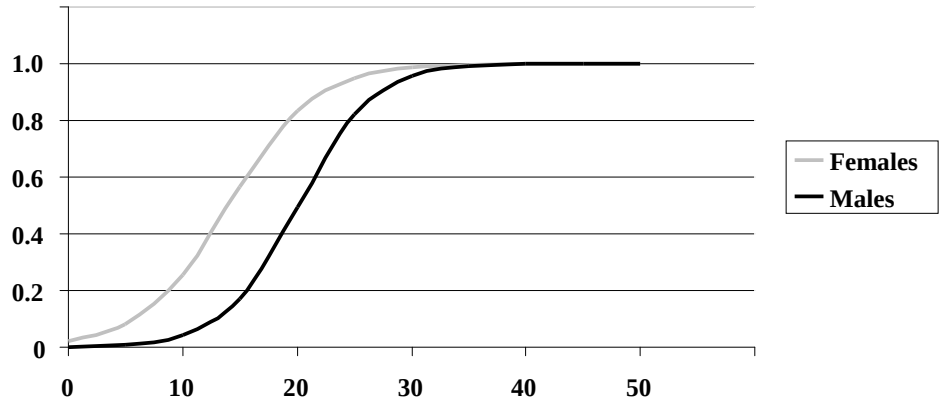
(c) Are females more reciprocal than males?

In this case we fit a Logit model by regressing acceptance rates for males and females on the offers made by each gender respectively. The results (Tables 11 and 12) indicate that, for females, offer has an insignificant effect on rejection/acceptance. On the contrary, for males, offer has a significant effect on rejection/acceptance. In other words, the amount offered significantly explains rejection/acceptance behaviour of male respondents only.

Further, in order to determine gender based differences in behaviour, probabilities of accepting an offer are calculated for each gender (Table 13). The information is also given in Figure 1.

As can be seen from this figure, the probability of females accepting a given offer is greater than that of males for all offers. This indicates that female responders are more likely to accept both unfair and fair offers than males. This result seems to be consistent with the finding that males have a higher rejection rate than females. Also, it is important to note that the probability of female accepting an unfair offer is far greater than males (for example, the chances of a female accepting 10 percent, 20 percent and 30 percent shares are nine, six and three times greater than those for males, respectively).

Fig. 1. Probability of Acceptance for Different Offers



Combining the lower rejection rates and higher acceptance probabilities of females for unfair offers, we can conclude that females are not necessarily more reciprocal than males.

CONCLUSION

The most elementary result, also verified by many other experimental studies, is that people in general are not selfish, at least not to the extent that economists assume. This calls for a serious rethinking by economists, since the existing neoclassical microeconomic theory is firmly based on the assumption of self-interested economic agents.

Secondly, generosity is mainly grounded in fear of rejection rather than any specific preference for fairness. Again this is a replication of previous studies. Further, this fear of rejection is very realistic, particularly, in case of males where the rejection rates for unfair offers are very high.

Lastly, regarding gender differences, we find females to be more generous than males. However, the reason for this greater generosity could not be determined, since there is no significant difference in the degree of fairness or fear of rejection between the two genders. May be economists should look towards psychological motives rather than purely economic motives for the observed differences in behaviour. We also do not find any conclusive evidence that females are more reciprocal than males.

ANNEXURE

Table 1

Offers, Expected MAOs and MAOs for the Entire Group

Game	Expected MAO	MAO	Offer	Game	Expected MAO	MAO	Offer
01	20	15	20	38	25	25	25
02	25	25	30	39	5	20	20
03	25	25	25	40	20	25	20
04	25	25	25	41	20	25	20
05	20	15	20	42	30	35	30
06	20	10	20	43	20	25	25
07	20	25	25	44	15	30	15
08	10	15	15	45	20	30	30
09	20	25	25	46	5	15	10
10	20	25	25	47	5	10	30
11	25	25	30	48	15	35	15
12	15	20	20	49	25	20	25
13	25	25	25	50	5	10	5
14	25	25	25	51	5	25	5
15	20	25	25	52	25	25	25
16	25	5	25	53	30	25	30
17	20	25	25	54	25	25	25
18	25	30	25	55	5	0	20
19	25	25	25	56	15	25	15
20	25	25	25	57	30	20	30
21	25	25	25	58	25	15	25
22	25	25	25	59	25	25	25
23	25	25	25	60	15	20	15
24	20	25	20	61	5	30	10
25	25	25	25	62	30	5	30
26	25	25	25	63	25	25	25
27	25	25	25	64	25	25	25
28	25	25	25	65	25	20	25
29	25	25	25	66	25	25	25
30	25	25	25	67	20	15	20
31	25	25	20	68	30	50	30
32	20	25	25	69	25	25	25
33	20	25	25	70	25	15	25
34	25	20	25	71	30	5	30
35	25	25	25	72	10	25	10
36	25	25	20	73	10	25	15
37	20	50	25				

Table 2

Acceptance / Rejection and Fairness / Fear of Rejection

Game	Offer	Accepted /Rejected	Fairness	Game	Offer	Accepted /Rejected	Fairness
1	20	Accepted	Fear of Rejection	38	25	Accepted	Fear of Rejection
2	30	Accepted	Fair	39	20	Accepted	Fair
3	25	Accepted	Fear of Rejection	40	20	Rejected	Fear of Rejection
4	25	Accepted	Fear of Rejection	41	20	Rejected	Fear of Rejection
5	20	Accepted	Fear of Rejection	42	30	Rejected	Fear of Rejection
6	20	Accepted	Fear of Rejection	43	25	Accepted	Fair
7	25	Accepted	Fair	44	15	Rejected	Fear of Rejection
8	15	Accepted	Fair	45	30	Accepted	Fair
9	25	Accepted	Fair	46	10	Rejected	Fair
10	25	Accepted	Fair	47	30	Accepted	Fair
11	30	Accepted	Fair	48	15	Rejected	Fear of Rejection
12	20	Accepted	Fair	49	25	Accepted	Fear of Rejection
13	25	Accepted	Fear of Rejection	50	5	Rejected	Fear of Rejection
14	25	Accepted	Fear of Rejection	51	5	Rejected	Fear of Rejection
15	25	Accepted	Fair	52	25	Accepted	Fear of Rejection
16	25	Accepted	Fear of Rejection	53	30	Accepted	Fear of Rejection
17	25	Accepted	Fair	54	25	Accepted	Fear of Rejection
18	25	Rejected	Fear of Rejection	55	20	Accepted	Fair
19	25	Accepted	Fear of Rejection	56	15	Rejected	Fear of Rejection
20	25	Accepted	Fear of Rejection	57	30	Accepted	Fear of Rejection
21	25	Accepted	Fear of Rejection	58	25	Accepted	Fear of Rejection
22	25	Accepted	Fear of Rejection	59	25	Accepted	Fear of Rejection
23	25	Accepted	Fear of Rejection	60	15	Rejected	Fear of Rejection
24	20	Rejected	Fear of Rejection	61	10	Rejected	Fair
25	25	Accepted	Fear of Rejection	62	30	Accepted	Fear of Rejection
26	25	Accepted	Fear of Rejection	63	25	Accepted	Fear of Rejection
27	25	Accepted	Fear of Rejection	64	25	Accepted	Fear of Rejection
28	25	Accepted	Fear of Rejection	65	25	Accepted	Fear of Rejection
29	25	Accepted	Fear of Rejection	66	25	Accepted	Fear of Rejection
30	25	Accepted	Fear of Rejection	67	20	Accepted	Fear of Rejection
31	20	Accepted	Fear of Rejection	68	30	Rejected	Fear of Rejection
32	25	Accepted	Fair	69	25	Accepted	Fear of Rejection
33	25	Accepted	Fair	70	25	Accepted	Fear of Rejection
34	25	Accepted	Fear of Rejection	71	30	Accepted	Fear of Rejection
35	25	Accepted	Fear of Rejection	72	10	Rejected	Fear of Rejection
36	20	Rejected	Fear of Rejection	73	15	Rejected	Fair
37	25	Accepted	Fair				

Table 3

Data for Male Participants

Game	Expected MAO	MAO	Offer	Accepted / Rejected	Fairness
1	5	20	20	Accepted	Fair
2	20	25	20	Rejected	Fear of Rejection
3	20	25	20	Rejected	Fear of Rejection
4	30	35	30	Rejected	Fear of Rejection
5	20	25	25	Accepted	Fair
6	15	30	15	Rejected	Fear of Rejection
7	20	30	30	Accepted	Fair
8	5	15	10	Rejected	Fair
9	5	10	30	Accepted	Fair
10	15	35	15	Rejected	Fear of Rejection
11	25	20	25	Accepted	Fear of Rejection
12	5	10	5	Rejected	Fear of Rejection
13	5	25	5	Rejected	Fear of Rejection
14	25	25	25	Accepted	Fear of Rejection
15	30	25	30	Accepted	Fear of Rejection
16	25	25	25	Accepted	Fear of Rejection
17	5	0	20	Accepted	Fair
18	15	25	15	Rejected	Fear of Rejection
19	30	20	30	Accepted	Fear of Rejection
20	25	15	25	Accepted	Fear of Rejection
21	25	25	25	Accepted	Fear of Rejection
22	15	20	15	Rejected	Fear of Rejection
23	5	30	10	Rejected	Fair
24	30	5	30	Accepted	Fear of Rejection
25	25	25	25	Accepted	Fear of Rejection
26	25	25	25	Accepted	Fear of Rejection
27	25	20	25	Accepted	Fear of Rejection
28	25	25	25	Accepted	Fear of Rejection
29	20	15	20	Accepted	Fear of Rejection
30	30	50	30	Rejected	Fear of Rejection
31	25	25	25	Accepted	Fear of Rejection
32	25	15	25	Accepted	Fear of Rejection
33	30	5	30	Accepted	Fear of Rejection
34	10	25	10	Rejected	Fear of Rejection
35	10	25	15	Rejected	Fair

Table 4

Data for Female Participants

Game	Expected MAO	MAO	Offer	Accepted / Rejected	Fairness
1	20	15	20	Accepted	Fear of Rejection
2	25	25	30	Accepted	Fair
3	25	25	25	Accepted	Fear of Rejection
4	25	25	25	Accepted	Fear of Rejection
5	20	15	20	Accepted	Fear of Rejection
6	20	10	20	Accepted	Fear of Rejection
7	20	25	25	Accepted	Fair
8	10	15	15	Accepted	Fair
9	20	25	25	Accepted	Fair
10	20	25	25	Accepted	Fair
11	25	25	30	Accepted	Fair
12	15	20	20	Accepted	Fair
13	25	25	25	Accepted	Fear of Rejection
14	25	25	25	Accepted	Fear of Rejection
15	20	25	25	Accepted	Fair
16	25	5	25	Accepted	Fear of Rejection
17	20	25	25	Accepted	Fair
18	25	30	25	Rejected	Fear of Rejection
19	25	25	25	Accepted	Fear of Rejection
20	25	25	25	Accepted	Fear of Rejection
21	25	25	25	Accepted	Fear of Rejection
22	25	25	25	Accepted	Fear of Rejection
23	25	25	25	Accepted	Fear of Rejection
24	20	25	20	Rejected	Fear of Rejection
25	25	25	25	Accepted	Fear of Rejection
26	25	25	25	Accepted	Fear of Rejection
27	25	25	25	Accepted	Fear of Rejection
28	25	25	25	Accepted	Fear of Rejection
29	25	25	25	Accepted	Fear of Rejection
30	25	25	25	Accepted	Fear of Rejection
31	25	25	20	Accepted	Fear of Rejection
32	20	25	25	Accepted	Fair
33	20	25	25	Accepted	Fair
34	25	20	25	Accepted	Fear of Rejection
35	25	25	25	Accepted	Fear of Rejection
36	25	25	20	Rejected	Fear of Rejection
37	20	50	25	Accepted	Fair
38	25	25	25	Accepted	Fear of Rejection

Table 5

Are Offers Significantly Different from Purely Selfish Offers

Overall Mean Offer	22.88
Hypothesised Value	5
SE	5.65
t-statistic	3.17

Table 6

Test for Equality of Fairness and Fear of Rejection in Decision Making

Overall Fairness	27.40%
Hypothesised Value	50.00%
SE	0.06
Z	-3.86

Table 7

Test for Equality of Means between Genders

Method	df	Value	Probability
t-test	71	1.93	0.0575
Anova F-statistic	(1, 71)	3.73	0.0575

Analysis of Variance

Source of Variation	df	Sum of Sq.	Mean Sq.
Between	1	114.56	114.56
Within	71	2181.34	30.72
Total	72	2295.89	31.89

Category Statistics

Variable	Count	Mean	Std. Dev.	Std. Err. of Mean
Male	35	21.57	7.45	1.26
Female	38	24.08	2.81	0.46
All	73	22.88	5.65	0.66

Table 8

Regression Results Where Offers are Regressed Over Gender

Dependent Variable: OFFER
Method: Least Squares
Included observations: 73

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21.57	0.94	23.02	0.0000
DUMMYMF	2.51	1.30	1.93	0.0575

R-squared	0.05	Mean dependent var	22.88
Adjusted R-squared	0.04	S.D. dependent var	5.65
S.E. of regression	5.54	Akaike info criterion	6.29
Sum squared resid	2181.34	Schwarz criterion	6.35
Log likelihood	-227.58	F-statistic	3.73
Durbin-Watson stat	2.09	Prob(F-statistic)	0.058

Table 9

Test for Equality of Variance between Genders

Method	df	Value	Probability
F-test	(37, 34)	7.02	0.0000
Siegel-Tukey	(1, 71)	0.36	0.5477
Bartlett	1	29.64	0.0000
Levene	(1, 71)	33.68	0.0000
Brown-Forsythe	(1, 71)	16.79	0.0001

Category Statistics

Variable	Count	Std. Dev.	Mean Abs. Mean Diff.	Mean Abs. Median Diff.	Mean Tukey-Siegel Rank
Male	35	7.45	6.20	5.71	35.57
Female	38	2.81	1.98	1.45	38.32
All	73	5.65	4.01	3.49	37.00
Bartlett weighted standard deviation: 5.54					

Table 10

Test for Equality of Proportions between Genders

Female Fairness	0.32
Female Fear of Rejection	0.68
Female Observations	38
Male Fairness	0.23
Male Fear of Rejection	0.77
Male Observations	35
SE	0.1036
Z	0.8422

Table 11

Logit Model Where Acceptance Rates are Regressed Over Offer (Male)

Dependent Variable: Acceptance Male
Method: ML - Binary Logit
Sample: 1 35
Included observations: 35
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	–6.23	2.23	–2.79	0.0052
Male	0.31	0.10	3.09	0.0020
Mean dependent var	0.60	S.D. dependent var		0.50
S.E. of regression	0.33	Akaike info criterion		0.88
Sum squared resid	3.63	Schwarz criterion		0.97
Log likelihood	–13.44	Hannan-Quinn criter.		0.91
Restr. log likelihood	–23.56	Avg. log likelihood		-0.38
LR statistic (1 df)	20.23	McFadden R-squared		0.43
Probability(LR stat)	6.87E-06			
Obs with Dep=0	14	Total obs		35
Obs with Dep=1	21			

Table 12

Logit Model Where Acceptance Rates are Regressed Over Offer (Female)

Dependent Variable: Acceptance Female
Method: ML - Binary Logit
Sample: 1 38
Included observations: 38
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	–3.76	4.15	–0.91	0.3642
FEMALE	0.27	0.18	1.46	0.1455
Mean dependent var	0.92	S.D. dependent var		0.27
S.E. of regression	0.27	Akaike info criterion		0.60
Sum squared resid	2.69	Schwarz criterion		0.69
Log likelihood	–9.47	Hannan-Quinn criter.		0.63
Restr. log likelihood	–10.50	Avg. log likelihood		-0.25
LR statistic (1 df)	2.05	McFadden R-squared		0.10
Probability(LR stat)	0.151839			
Obs with Dep=0	3	Total obs		38
Obs with Dep=1	35			

Table 13

Probabilities for Males and Females of Accepting an Offer

Offer	Males	Females
0	0.0020	0.0227
5	0.0092	0.0817
10	0.0422	0.2546
15	0.1721	0.5672
20	0.4952	0.8341
25	0.8224	0.9507
30	0.9563	0.9867
35	0.9904	0.9965
40	0.9980	0.9991
45	0.9996	0.9998
50	0.9999	0.9999

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Business Group Affiliation and Firm Performance— Evidence from Pakistani Listed Firms

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This study analyses the financial performance of business group affiliated firms relative to stand-alone firms in Pakistan. The investigations are done across the sample period of 1993-2012. The study employs 'Chop shop' methodology to construct the excess values (performance measure); in order to compare the results with earlier well documented studies of both developed and emerging countries. Both univariate and regression analyses clearly demonstrate that group affiliated firms are trading at discount (underperform relative to stand-alone firms) during the sample period. Despite the historical success in the past, the findings suggest that business groups evolve differently in the post financial reforms and privatisation programs era. The findings are consistent with the market failure argument and agency theory. However, the study finds a little evidence of efficient internal markets of Pakistani business groups.

Keywords: Business Groups, Group Affiliation, Excess Value, Market Failure Theory, Agency Theory, Chop Shop Methodology

1. INTRODUCTION

Research, on the role of business groups is one of the most extensively investigated areas in the fields of corporate finance and firm strategy. [Chang and Hong (2000); Khanna and Palepu (2000a); Soo, *et al.* (2010)]. Business groups play an important yet poorly understood role in the economies like South Korea, China, Indonesia, Chile, India, and Pakistan [Khanna and Yafeh (2007)]. Business groups are defined as the coalition of legally independent firms that are linked to each other by a constellation of formal (ownership) and informal (social) ties and are accustomed to taking coordinated actions [Granovetter (1994); Khanna and Rivkin (2001)].

A number of researchers propose theoretical perspectives to support the argument that business group affiliation improves firm performance in emerging economies [Kali and Sarkar (2005); Gadhoum, *et al.* (2007); Mishra and Akbar (2007)]. A prevalent view suggests that affiliation with a business group enhances firm performance in the countries with extensive market failures and excessive associated transaction costs [Leff (1978); Hovakimian (2011)]. Khanna and Palepu (1997) opine that business groups serve as substitute of missing business, supporting institutional environment in the developing countries. Khanna and Palepu (2000a) document that advanced countries possess

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developed and well functioning capital, labor and product markets. In contrast certain institutional voids, for instance information and contracting problems, poor law enforcement and weak regulatory and corporate governance systems, etc., exist in emerging economies like South Korea, China, India and Pakistan. Business groups substitute for these missing institutional voids. These are well diversified across various industries and facilitate affiliated firms to internalise market transactions and thus create internal networks of value enhancing mechanism, by providing access to scarce group resources and capabilities. These resources may include information, skills and management, markets, brand names and finance [Mahmood, *et al.* (2011); Lamin and Dunlap (2011)].

The business groups' headquarters are not only concerned with the profit maximisation but also serve for group stability and survival. Estrin, Poukliakova, and Shapiro (2009) present that resource sharing within group affiliates minimises transaction costs and reduces risk. Khanna and Yafeh (2005) provide evidences for risk sharing role of business groups through reallocation of funds from one affiliate with excess cash flows to another having shortage of cash flows and further these help in smoothing income flows among their affiliates. Resource based view suggests that recurring transactions among group firms lead to richer flow of information and thus improve resource allocation [Guillen (2000)]. These privileges are unavailable to stand-alone (unaffiliated) firms and these may contribute positively to the financial performance of group affiliated firms relative to their counterpart stand-alone firms.

The institutional setting plays a vital role regarding group affiliation-performance relationship. As the institutional environment changes, the performance impacts of group affiliation strategy are also expected to evolve differently [Chakrabarti, Singh, and Mahmood (2007)]. Lee, *et al.* (2008), Purkayastha (2013) and Khanna and Palepu (2000b) find evidences that group firms perform better than stand-alone firms during the early periods when institutional environment was underdeveloped in the country and however, these group firms tend to show lower performance in the latter periods as market institutions got matured.

In Pakistan, financial reforms and privatisation programs were initiated in early 1990s and these had dramatically changed the economic landscape for business groups. The business groups had to restructure their group affiliation related strategies, owing to institutional setting that had facilitated them in corporate control until pre-reforms era. Having enjoyed highly privileged licenses and quota systems, big business tycoons, having dominated the corporate sector, have to face much needed stiff market competition and further those business groups, thrived on rent seeking and other in-efficiencies in the pre-reforms period, may have suffered in the post reforms era.

A growing number of studies contend that group affiliation harms firm value. Lopez-de-Silanes, *et al.* (1999), La Porta, *et al.* (1997, 1999) and Waseemullah, *et al.* (2017) among others document that the unique business group structure often forms pyramidal ownership structures. Such ownership structures allow an apex firm to achieve an ultimate control over many other firms simultaneously, without making commensurate cash flows investments. The ultimate controller attempts private benefits consumption at the expense of external shareholders; thus posit costs of group affiliation, particularly in emerging markets where legal institutions are poorly developed [Faccio, *et al.* (2001);

Joh (2003); Holmén and Högfeldt (2005); Djankov, *et al.* (2008); Gohar and Karacaer (2009)]. This may engender agency conflicts among the shareholders and the centre of the corporate governance shifts away from traditional principal-agent (P-A) conflicts to principal-principal (P-P) conflicts e.g., conflicts between ultimate controlling shareholders and external shareholders [Claessens, Djankov, and Lang (2000b); Bae, *et al.* (2002); De Holan and Sanz (2006)].

Bertrand, Mehta, and Mullainathan (2002), Ikram and Naqvi (2005) and Dow and McGuire (2009) propose that tunneling is prevalent, although not universal in the business groups of the emerging countries and obviously this activity destroys firm value. Some other researchers argue business groups as in-efficient organisation depending on rent seeking, facing a burden of excessive coordination and bureaucratic costs, concentration of incompetent management and inefficient resource allocation among the group affiliated firms.

A number of researchers examine the group affiliation-performance relationship by applying a unitary lens. However, a unitary theoretical perspective provides partial view of the relationship and thus it is immensely required to investigate the relationship by applying multi-theoretic lens of market failure theory in a changed institutional perspective and agency theory [Wright, *et al.* (2005); George and Kabir (2008)].

In Pakistani context, there is no conclusive evidence regarding the group affiliation-performance relationship. Ghani, Haroon and Ashraf (2011) and Ahmad and Kazmi (2016) find superior performance (measured by ROA) whereas Gohar and Karacaer (2009) observe lower performance of group affiliated firms than stand-alone firms. Further, there is an increasing concern regarding the endogeneity problem and selection bias in group affiliation-performance relationship [Choe, *et al.* (2014)]. OLS has been used in earlier studies that does not appropriately handle these issues and the present study attempts to address them.

The study is primarily concerned with exploring the comparative financial performance of group affiliated firms relative to stand-alone firms in Pakistan. An effort is made to explore whether group affiliation creates value/value loss (premium or discount) in an emerging economy with changed institutional setting in the country. One major concern in performance comparison is matching of the group firms with stand-alone firms of varying characteristics. In order to resolve that issue, Chop shop methodology has been used in the earlier studies conducted in the advanced countries. The principal contribution of the study lies in adopting the modified "Chop-shop" methodology of Berger and Ofek (1995), proposed for measuring the excess values (group affiliation premium/discount). Chop-shop valuation approach is widely used in the finance literature to estimate the imputed value of a group firm as it operates as an average stand-alone firm in the industry and then finding if group firm outperform or underperform than an average standalone firm in the same industry.

2. REVIEW OF LITERATURE

A lot of literature on the surge of group affiliation-performance relationship appears but there is still disagreement of the researchers whether group affiliation creates or destroys firm value. A number of researchers suggest that group affiliated firms outperform stand-alone firms [Hoskisson, *et al.* (2004); Castaneda (2007); Ghosh (2010);

Waqar, Ghani, and Haroon (2011); Shi (2015)] whereas some others argue that opposite is true [Laeven and Levine (2007); van Lelyveld and Knod (2009); Schamid and Walter (2009); Gohar and Karacaer (2009**)**] and a few of them observe mixed evidences and each scholar can point to empirical support for his position [Khanna and Rivkin (2001)]. A few studies reveal that group affiliation-performance relationship is not universal and these show mixed evidences. Khanna and Rivkin (2001) explore the effect of group affiliation on firm profitability by taking a sample of 14 emerging markets and observe that group affiliation enhances firm profitability in 6 countries whereas it is harmful in 3 countries and even is ineffectual in the remaining 5 countries. Kim (2012) and Hyland and Diltz (2002) reveal that group affiliation itself may not be value enhancing or value destroying activity and that differences in firm characteristics might influence firm value.

Khanna and Yafeh (2005) document that business groups serve not only for the profits maximisation but also helps in reduction of risk for their affiliates. They find evidences of risk sharing role of business groups in many emerging countries for instance South Korea, India, Thailand, Taiwan and Brazil. They suggest that risk sharing is occurred through shared resources, dividends and intra group transfers through flexible loans and receivables. Gopalan, *et al.* (2007) document that group affiliation provide coinsurance function. Similarly, group affiliated firm get benefits of tax shield [Gramlich, *et al.* (2004).

Institutional setting plays a key role in explaining group affiliation-performance relationship. In developing countries, business supporting institutional environment is underdeveloped. The business groups substitute for the external environment and fill the gap of missing labor, capital and product markets [Leff (1978); Khanna and Palepu (1997)]. Chang and Choi (1988) find superior profitability of diversified group affiliated firms relative to stand-alone firms in Korea. They observe 2 percent higher accounting profits for firms affiliated with large business groups than unaffiliated firms. Khanna and Palepu (2000b) find that firms affiliated with the largest business groups perform better than stand-alone firms in India. Large diversified business groups could internalise the bureaucratic and coordination costs associated with the management of diverse operations of the business group more efficiently and are consequently able to generate more value for their affiliated firms.

Claessens, *et al.* (2000a) employ a data set of 2,187 firms from 9 East Asian countries including high income countries (Japan, Singapore, Hong Kong and Taiwan) and low income countries (Thailand, Philippines and Indonesia). They find significantly higher excess values for group firms in low income countries whereas lower excess values for higher income countries. The findings confirm market failure argument that arrangement of finance is critical for firms in the countries with underdeveloped capital markets and business group fills that gap efficiently which results in higher firm performance. Similarly, Buysschaert, *et al.* (2004) find superior financial performance of group affiliated firms in Belgium and however, they discover an inverse link of intra-group financing with firm performance which suggests that business groups face problems in allocation of funds among their affiliated firms.

A number of studies on group affiliation-performance relationship conclude that changes in institutional environment matters. The relationship between strategic choices and financial outcomes is dynamic and contingent on the institutional environment

[Chakrabarti, *et al.* (2007); Purkayastha (2013)]. A few researchers observe that group firms show superior performance during the period of underdeveloped institutional environment and conversely these firms underperform than stand-alone firms in the latter periods when market infrastructure is remarkably developed. The study of Lee, *et al.* (2008) observes that Korean chaebols reveal a declining trend in performance relative stand-alone firms. They find that group firms were trading at premium (higher excess values for group firms than stand-alone firms), started from 1980s until through early 1990s. They observe a declining trend in group premium which finally turned into discount in the mid-1990s. Their findings support market failure theory that group firms decline in performance with the development of institutional infrastructure in South Korea.

The same trend is shown in the study of Khanna and Palepu (2000a). They find higher profitability for group affiliated firms than stand-alone firms in Chile and however, there is a gradual decrease in performance with the development of market infrastructure in the country. Kumar, *et al.* (2008) employ a data set for a period of 1990-2006 and observe that group firms decline in performance, corresponding to stand-alone firms in the post financial reforms era in India. They demonstrate that group firms tend to decrease in performance with the development of market institutions in the country. Moreover, they observe that older group firms perform relatively better in these situations of institutional transitions. Pattanayak (2009) confirms lower performance of group affiliated firms than stand-alone firms in India. They argue that advantageous effect of group affiliation disappears as capital markets get matured.

Lee, *et al.* (2002b) attempt answering few questions regarding the emergence and performance of business groups in South Korea. They focus how business groups emerged and then what happened with them that they declined in performance. They propose that business groups emerged in response to market failures. Further, business groups facilitate their affiliates entering in the new markets which were formerly monopolised by the forerunning businesses. They document few reasons behind the decline in the performance of business groups. They suggest that performance of business groups decreases over the time with the development of institutional setting in the country. Moreover, group firms suffer from in-efficient investment drive that leads to agency conflicts among the shareholders.

Lins and Servaes (2002) observe a significant discount for diversified business groups relative to single segment firms in 7 emerging markets. They suggest that ultimate controllers in group affiliated firms enjoy excess control rights than cash flow rights and that they are motivated in expropriation of firm resources from one firm where they have least cash flow rights to other firms where they have higher cash flow rights. Betrand, Mehta, and Mullainathan (2000) document tunneling evidence in the Indian business groups. Bae, *et al.* (2002) find that wealth is transferred to dominant shareholders at the expense of minority shareholders within Korean chaebols.

In Pakistani context, the earlier studies show mixed results. Ghani, Haroon and Ashraf (2011) take a sample of KSE listed firms for the years 1998 and 2002 and find higher financial performance (ROA) of group affiliated firms than stand-alone firms. Similarly, Ahmad and Kazmi (2016) document that group firms outperform stand-alone firms in Textile Sector of Pakistan. In contrast, Gohar and Karacaer (2009) employ a

sample of 166 KSE listed firms for a period of 2002 to 2006 and find that group firms underperform than stand-alone firms. The results suggest that group firms fall into serious problem of agency conflicts among the shareholders. These contrasting results stress the need to investigate the group affiliation-performance relationship on a dynamic longitudinal data, by applying relevant methodology of Chop shop in a country facing remarkable changed institutional setting. Both of the earlier studies have ignored the Chop shop methodology that had been widely used in the studies conducted on group affiliation-performance relationship.

2.1. Hypotheses of the Study

H 1_a: There is a significantly lower financial performance of group affiliates than stand-alone firms.

H 1_b: There is a significantly higher financial performance of group affiliates than stand-alone firms.

3. METHODOLOGY

The study sample consists of 367 (including 159 stand-alone firms and 208 group affiliated firms belonging to 60 business groups) non-financial firms listed on Karachi Stock Exchange covering a period of 1993-2012.

The study modifies the widely used 'Chop Shop' methodology of Berger and Ofek (1995) to determine group premium or discount so that study results can be compared with the earlier studies, for instance Lang and Stulz (1994), Ferris, *et al.* (2003) and Lee, *et al.* (2008). The excess value is obtained through two main steps. In the first step, imputed value of a group firm is estimated as multiplying the group firm's earnings before interest and taxes with the capital value to earnings before interest and taxes ratio for median stand-alone firm operating in the same industry.[1] In the second step, excess value is calculated as the natural log of the ratio of firm's actual value (defined as market value of equity plus book value of liabilities) to its imputed value.[2] The positive excess value suggests that group affiliation enhances the performance of the group affiliates whereas negative excess value shows that affiliation with a business group harms firm value.

There are some issues in estimation that are needed to be addressed carefully. One of the major issues is that there may be endogeneity problems (omitted variables, selection bias and reverse causality). Besides the observable factors like group affiliation, there may be some unobservable factors like managerial skills among others that may affect the firm performance but may not be included as regressors in the value equation. In addition, there may be regressors (group affiliation in this case) that may be correlated with the error term.

Most importantly, group affiliation may be endogenous [Bae, *et al.* (2011)] because there are certain factors like firm profitability, risk, growth prospects and/or

[1]Following Berger and Ofek (1995) and Lee, *et al.* (2008) industry median is derived from the sample of standalone firms.

[2]In order to eliminate the firms with extreme excess values, the study follows Ferris, *et al.* (2003) and Lee, *et al.* (2008). Those firms with excess values more than four times the firm's imputed value or one-fourth of the imputed value are excluded from the sample.

firm size among others that motivate a business group to acquire/select a firm under his control; and these factors affecting the propensity of a firm to be a group affiliate may also influence firm performance. Hence, selection of a firm to be a group affiliate or not may not be random rather it is based on some firm specific factors [Choe, *et al.* (2014)] and further, firm performance may be dynamic in nature [Mishra (2014)].

Therefore, the study employs both system Generalised method of moments (GMM) and treatment effects of endogenous self-selection (Heckman selection styled model) to investigate the impact of group affiliation on firm performance. In GMM models, lag dependent variable and explanatory variables are used as instruments following Arellano and Bond (1991); Javid and Iqbal (2008). The treatment effect models consider the effect on an endogenously chosen binary treatment, in this case the choice to be a group affiliate, on another endogenous continuous variable, in this case an indicator of firm performance, conditional on two sets of independent variables. The first set of variables is used to estimate a selection equation that describes the group affiliation choice. The estimates from the selection equation are then used in the value function.

In lines with Yu, Ees, and Lensik (2009), the study uses Heckman styled self-selection treatment effect model as follows:

$$y_{it} = \alpha_0 + \beta_1 \mathrm{D}_{it} + \beta_2 \varkappa_{it} + \varepsilon_{it} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Where y_{it} is the dependent variable (performance indicator e.g., Excess value-EBIT) for firm i at time t, D_{it} is the binary independent variable ($D_{it} = 1$ for group affiliated firm and otherwise $D_{it} = 0$ for standalone firm i at time t). X_{it} are the control variables for a firm i at time t (e.g., list age, leverage, size, risk, profitability and growth) that affect firm performance and ε_{it} is the error term.

The group affiliation decision (selection equation) is given below:

$$D^*_{it} = \delta z_{it} + \mu_{it} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

$D_{it} = 1$ if $D^*_{it} > 0$ and $D_{it} = 0$ otherwise. Z_{it} are the variables that affect the group affiliation decision of the firm, μ_{it} is the error term.

By substituting D_{it} in Equation (2) with Equation (3); firm performance model is as follows:

$$y_{it} = \alpha + \beta_1(\delta z_{it} + \mu_{it}) + \beta_2 \varkappa_{it} + \varepsilon_{it} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

If $D^*_{it} > 0$; $D_{it} = 1$ and

$$y_{it} = \alpha + \beta_2 \varkappa_{it} + \varepsilon_{it} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Where $D^*_{it} \leq 0$; $D_{it} = 0$

In line with the reasoning of Heckman's (1979) two step procedure, the study employs two-steps procedure to estimate the regression coefficients of Equations (3) and (4). In the first step, the probability of group affiliation is found and obtaining the estimates of selection correction—called lambda (hazards). In the second step, the lambda (hazards) estimates from the first step are included in the regression model of firm performance.

Fig. 1. Variable Definitions

Excess Value-EBIT

It is calculated as natural logarithm of actual value to imputed value ratio (as discussed above). The positive value implies that group affiliated firm outperforms than standalone firms operating in the same industry (group affiliation premium) and negative value indicates that group affiliated firm underperforms than stand-alone firms operating in the particular industry (group affiliation discount) [Lee, *et al.* (2008)].

Group Affiliation

Dummy A dummy variable of 1 is given for firms affiliated with a business group and 0 if a firm is stand-alone. Group firms are selected on the basis of ultimate control of members under the umbrella of a particular group. The ultimate control is determined by examining the social ties, management, cross directorate-ships, cross shareholdings and pyramidal structures.

List Age

Natural logarithm of the number of years till 2012 from the date of firm listing on the stock exchange [Yu, Ees, and Lensik (2009)].

Leverage

Leverage is defined as total liabilities/total assets [Yu, Ees, and Lensik (2009)].

Size

The natural logarithm of market capitalisation is taken as a proxy of firm size.

Risk

Risk is the standard deviation of return on capital employed.

Profitability

Firm profitability is measured by earnings before interest and taxes/total sales [Lee, *et al.* (2008)].

Growth

Growth is calculated as market value of equity/book value of equity [Manos (2001)].

4. EMPIRICAL FINDINGS

Table 1 demonstrates the information pertained to Pakistani business groups included in the sample. The statistics show the number of business groups covered in the study sample every year, average number of firms and minimum/maximum number of firms belong to each business group every year.

Table 1

Information of Pakistani Business Groups in Each Year

Year	No. of Business Groups	Avg No. of Firms	Median No. of Firms	Min No. of Firms	Max No. of Firms
1993	45	2.7560	2	1	10
1994	45	2.7780	2	1	10
1995	45	2.6222	2	1	9
1996	46	2.7177	2	1	9
1997	45	2.9333	2	1	10
1998	46	2.9133	2	1	10
1999	47	2.8722	2	1	10
2000	47	2.9155	2	1	10
2001	56	3.5000	3	1	13
2002	56	3.5000	3	1	13
2003	56	3.4820	3	1	13
2004	56	3.4290	3	1	13
2005	56	3.3930	3	1	13
2006	56	3.4111	3	1	13
2007	56	3.3755	3	1	13
2008	56	3.3578	3	1	13
2009	56	3.3578	3	1	13
2010	56	3.3578	3	1	13
2011	55	3.3090	3	1	12
2012	55	3.2180	3	1	12

Note: Author Source.

Table 2 presents the information related to composition of sample, categorised into group firms and stand-alone firms every year. The figures show that sample comprises of group (stand-alone) firms of 124 (84) in 1993 which significantly expand to 177 (114) during the sample period until 2012. The same trend is expressed in Figure 2.

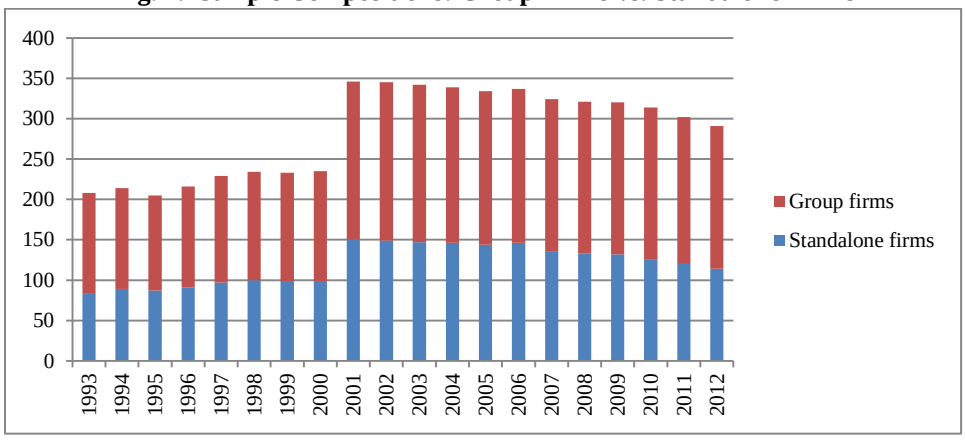
Table 2

Number of Group Firms and Standalone Firms in Each Year

Year	Group Firms	Standalone Firms
1993	124	84
1994	125	89
1995	118	87
1996	125	91
1997	132	97
1998	134	100
1999	135	98
2000	137	98
2001	196	150
2002	196	149
2003	195	147
2004	193	146
2005	190	144
2006	191	146
2007	189	135
2008	188	133
2009	188	132
2010	188	126
2011	182	120
2012	177	114
	3303	2386

Note: Author Source.

Fig. 2. Sample Compositions: Group Firms vs. Standalone Firms



Panel A in Table 3 presents the univariate analyies. A comparison of Excess value-EBIT is done across stand-alone firms and group firms. The statistics show that both mean and median excess values-EBIT are remarkably lower for group firms than their corresponding stand-alone firms and the differences of mean and median values are highly significant. The findings clearly show that group discount is present during the sample period. The underperformance (discount) of group firms than stand-alone firms in the post financial reforms era supports Hypothesis 1_a and is consistent with the market failure argument and agency theory.

Table 3 Panel A

Comparative Excess Value-EBIT for Standalone Firms and Group Firms

Variable	Firm	Mean	Median	St. Dev.
Excess Value-EBIT	Standalone	0.0849	0.0662	0.2391
	Group	0.0458***	0.0358***	0.2521
	All	0.0613	0.0500	0.2478

Note: T-tests are used for comparisons of means, and Wilcoxon signed-rank tests are used for comparisons of medians. ***, ** and * denote significance of differences at 1, 5 and 10 percent levels, respectively.

Panel B in Table 3 highlights the financial demographics across group firms and stand-alone firms. The statistics show that group firms underperform than stand-alone firms in terms of market performance measure of Tobin's Q, consistent with the above results and however, these show superior performance in terms of accounting performance measure of ROA (return on assets). Group firms are paying higher dividends than stand-alone firms and these firms exhibit higher listing exposure. Group firms are significantly different in financing policies. The financial leverage is significantly lower for group firms than stand-alone firms. In Pakistani market, larger part of debts comes from the banks and other financial institutions which required higher level of monitoring and transparent financial reporting to safeguard their investment. The ultimate group controllers avoid such monitoring. They use complex pyramidal ownership structures to achieve and maintain their ultimate control over many firms

simultaneously with the least capital invested. Group firms exhibit significantly lower level of risk relative to stand-alone firms. These findings are consistent with risk sharing and group stability arguments of Khanna and Yafeh (2005) and Estrin, *et al.* (2009). Group firms are larger in terms of both total assets and sales. Group firms show relatively higher liquidity (measured by current ratio) consistent with resource sharing argument. These can transfer surplus funds from one firm to another firm with shortage of funds.

Table 3 Panel B

Comparative Financial Characteristics for Standalone and Group Firms

Variables	Firm	Mean	Median	St. Dev.
Tobin q	Standalone	1.3470	0.9710	1.6130
	Group	1.1110***	0.9190***	0.9160
	All	1.2100	0.9380	1.2620
ROA	Standalone	–0.0100	0.0030	0.1620
	Group	0.0110***	0.0170***	0.1280
	All	0.0020	0.0100	0.1430
Dividend Payout Ratio	Standalone	0.1150	0.0000	0.3920
	Group	0.1750***	0.0000***	0.4040
	All	0.1500	0.0000	0.4000
Dividend Yield	Standalone	0.0190	0.0000	0.0580
	Group	0.0340***	0.00***	0.0710
	All	0.0280	0.0000	0.0660
List Age	Standalone	27.2120	21.0000	12.8320
	Group	30.6280***	25.0000***	35.4460
	All	29.1950	23.0000	28.3060
Leverage	Standalone	0.9120	0.7200	0.9490
	Group	0.7490***	0.6680***	0.6040
	All	0.8180	0.6890	0.7720
Growth	Standalone	0.15	0.0360	0.6200
	Group	0.16	0.0860***	0.5360
	All	0.16	0.0680	0.5720
Risk	Standalone	0.2310	0.0510	0.5540
	Group	0.1670***	0.0570	0.4240
	All	0.1940	0.0540	0.4840
Total Assets	Standalone	1136.0000	392.0000	2732.0000
	Group	3105.0000***	910.0000***	7989.0000
	All	2279.0000	656.0000	6413.0000
Sales	Standalone	971.0000	385.0000	1936.0000
	Group	2682.0000***	1020.0000***	6661.0000
	All	1965.0000	684.0000	5295.0000
Group Diversification	Standalone	1.0000	1.0000	0.0000
	Group	8.5620***	7.0000***	6.0660
	All	5.3900	3.0000	5.9400
Current Ratio	Standalone	1.1850	0.8740	1.4830
	Group	1.3680***	0.9990***	1.6760
	All	1.2910	0.9480	1.6000
Fixed Assets Ratio	Standalone	0.5730	0.5960	0.2390
	Group	0.5340***	0.5390***	0.2200
	All	0.5510	0.5580	0.2290

Note: T-tests are used for comparisons of means, and Wilcoxon signed-rank tests are used for comparisons of medians. ***, ** and * denote significance of differences at 1, 5 and 10 percent levels, respectively.

Table 4 presents the correlation metrics among the variables. The Variance Inflation Factor (VIF) procedure confirms that there is no strong correlation among the explanatory variables indicating that there exists no serious problem of multicollinearity.[3]

Table 4

Correlations

Variable	Excess Value-EBIT	Group Affiliation Dummy	List Age	Leverage	Size	Risk	Profita-bility	Growth
Excess Value-EBIT	1							
	–							
Group Affiliation Dummy	–0.0771	1						
	0.0000	–						
List Age	–0.0056	0.1251	1					
	0.7432	*0.0000*	–					
Leverage	0.2354	–0.0574	0.0217	1				
	0.0000	*0.0007*	*0.2014*	–				
Size	–0.1348	0.2558	0.1820	–0.2255	1			
	0.0000	*0.0000*	*0.0000*	*0.0000*	–			
Risk	–0.0205	–0.0599	0.0335	0.1945	–0.1766	1		
	0.2281	*0.0004*	*0.0485*	*0.0000*	*0.0000*	–		
Profitability	–0.4852	0.0700	0.0451	–0.0968	0.1475	0.0825	1	
	0.0000	*0.0000*	*0.0080*	*0.0000*	*0.0000*	*0.0000*	–	
Growth	0.0708	0.0410	–0.0392	–0.1049	0.2568	–0.0718	0.0892	1
	0.0000	*0.0158*	*0.0212*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	–

Note: All coefficients greater than 0.05 values are significant at 1 percent significance level. P-values are in italics.

Table 5 reports the pooled OLS and GMM regression results. Group affiliation dummy is –0.0155 ($p<0.10$) and –0.0158($p<0.05$) which suggest that group firms tend to show lower Excess value-EBIT (group discount) than their corresponding stand-alone firms in Pakistan during the 1993-2012 period. The findings suggest that group firms underperform than stand-alone firms during the post financial reforms period despite a historical success in 1950s and 1960s. Consistent with univariate results, the empirical results support Hypothesis 1_a.

The presence of group discount is consistent with market failure theory that group firms decline in performance because their advantageous effect disappears with the development of institutional setting in the country during the post financial reforms and liberalisation period. The regression results support Hypothesis $1_{a,}$ consistent with the studies of Khanna and Palepu (2000a) for Chile; Lee, *et al.* (2008) for South Korea; Pattanayak (2002) for India and Purkayastha (2013) for India and Japan. Further, the findings lend support to the agency theory that business groups form pyramid structures and the ultimate controllers in these group firms are engaged in tunneling. They plunder firm resources away from the minority shareholders for their personal benefits. The findings strongly support to the earlier studies of Bertrand, *et al.* (2002); Bae, *et al.* (2002); Lee, *et al.* (2002_b) and Lins and Servaes (2002).

Leverage is significantly positively related to firm value, consistent with tax shield argument and pecking order theory. However, firm size is negatively related to firm value. The impact of risk is negative as per expectations. However, firm profitability is

[3]VIF procedure is adopted and however, the results are not reported for brevity.

negatively associated with firm value. The negative relationship confirms the presence of earning management practices adopted by firms in Pakistan and further it indicates the lack of confidence of the investors at the reported earnings. The findings are consistent with the earlier studies' results for instance Lee, *et al.* (2008). Moreover, firm growth positively affects firm value.

Table 5

Pooled OLS and GMM Results of Group Affiliation and Excess Value-EBIT

Variable	Pooled OLS Model	GMM Model
Excess Value-EBIT$_{t-1}$	0.3316***	0.3208***
	0.0000	*0.0000*
Group Affiliation Dummy	–0.0155*	–0.0158**
	0.0786	0.0457
List Age	*0.0020*	*0.0025*
	0.7363	0.7146
Leverage	0.1418***	0.1479***
	0.0000	*0.0000*
Size	–0.0067**	–0.0061*
	0.0190	*0.0576*
Risk	–0.0235*	–0.0299*
	0.0798	*0.0698*
Profitability	–0.1408***	–0.1153**
	0.0000	*0.0334*
Growth	0.0221***	0.0237***
	0.0000	*0.0000*
Intercept	–0.0276	–0.0427*
	0.2084	*0.0752*
Adjusted R-squared	*0.2216*	*0.2203*
F-statistic	*93.7112***	
Prob(F-statistic)	*0.0000*	
Hansen J-statistic		*9.7420*
Prob(J-statistic)		*0.1359*

Note: ***, ** and * denote to coefficients significant at 1, 5 and 10 percent respectively. P-values are in italics.

Table 6 reports the regression results of treatment affects models. At first step, a binary dependent variable of group affiliation dummy is regressed on firm characteristics to determine the firms' propensity to be a group affiliate. At the second step, the obtained estimates are used in the value regression. The results show that group affiliation dummy variable is strongly negative and significant even after controlling the endogenous self-selection, indicating that group affiliation harms firm value.

Table 6

Treatment Effects' Results of Group Affiliation and Excess Value-EBIT

Variable	Model 1
Group Affiliation Dummy	–0.3158***
	0.0000
List age	0.0014***
	0.0000
Leverage	0.1417***
	0.0000
Size	0.0043
	0.2540
Risk	–0.0643***
	0.0000
Profitability	–0.1100***
	0.0000
Growth	0.0191***
	0.0000
Intercept	0.1018***
	0.0000
Group Affiliation Dummy as Dependent Variable:	
List Age	0.0090***
	0.0000
Leverage	0.0050
	0.9300
Size	0.1851***
	0.0000
Risk	–0.0783
	0.1820
Profitability	0.2495**
	0.0170
Growth	–0.0166
	0.2800
Intercept	–0.8539***
	0.0000
Athrho	*0.7936***
	0.0000
Lnsigma	*–1.3006****
	0.0000
Wald Chi-squared	*371.6900****
	0.0000
Rho	*0.6604*
Sigma	*0.2724*
Lambda	*0.1799*
Wald test of Rho=0	*13.8100****
	0.0002

Note: ***, ** and * denote to coefficients significant at 1, 5 and 10 percent respectively. P-values are in italics.

Table 7 reports the regression results of interaction analysis to highlight the role of internal markets of business groups in affecting their affiliated firms' performance, relative to stand-alone firms in Pakistan. The impact of firm characteristics like firm listing exposure, leverage, size, growth and profitability may affect firm excess value differently for group firms than stand-alone firms, depending upon the strength of business groups in providing the internal markets. Group affiliated firms may get benefits from the value enhancing internal networks of resource sharing. These firms may share resources like information, skills, finance, markets and these may even help each other in getting loans [Guillen (2000); Khanna and Palepu (2000a)].

Table 7

GMM Results of Interaction Analyses

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Excess Value-EBIT$_{t-1}$	0.5804***	0.3329***	0.3188***	0.3197***	0.6161***	0.5645***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Group Affiliation Dummy	-0.1105***	-0.1056***	-0.0475**	-0.0229***	0.0044	-0.0302***
	0.0050	*0.0000*	*0.0165*	*0.0000*	*0.6448*	*0.0005*
List Age	-0.0051	0.0006	0.0030	0.0008	0.0041	0.0085
	0.5304	*0.9255*	*0.6527*	*0.8976*	*0.6718*	*0.3761*
Leverage	0.1197***	0.0851***	0.1507***	0.1523***	0.1194***	0.1256***
	0.0000	*0.0074*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Size	0.0092***	-0.0015	-0.0106***	-0.0062**	0.0137***	0.0099***
	0.0031	*0.6020*	*0.0090*	*0.0470*	*0.0000*	*0.0006*
Risk	0.0015	-0.0212	-0.0314**	-0.0546*	0.0059	-0.0077
	0.9524	*0.1474*	*0.0442*	*0.0542*	*0.8465*	*0.7750*
Profitability	-0.3440***	-0.1370**	-0.1173**	-0.1150**	-0.1214*	-0.3710***
	0.0000	*0.0124*	*0.0287*	*0.0395*	*0.1048*	*0.0000*
Growth	0.0132**	0.0189***	0.0240***	0.0222***	0.0135**	0.0106*
	0.0329	*0.0002*	*0.0000*	*0.0000*	*0.0140*	*0.0656*
Group Affiliation Dummy*List Age	0.0299**					
	0.0180					
Group Affiliation Dummy*Leverage		0.1404***				
		0.0002				
Group Affiliation Dummy*Size			0.0062**			
			0.0578			
Group Affiliation Dummy*Risk				0.0402		
				0.3066		
Group Affiliation Dummy*Profitability					-0.5576***	
					0.0000	
Group Affiliation Dummy*Growth						0.0046
						0.5795
Intercept	-0.0759**	-0.0118	-0.0241	-0.0360	-0.1360***	-0.1130***
	0.0346	*0.6865*	*0.3802*	*0.1336*	*0.0007*	*0.0017*
Adjusted R-squared	*0.1849*	*0.2262*	*0.2204*	*0.2199*	*0.1789*	*0.1917*
Hansen J-statistic	*7.1442*	*9.5461*	*9.7998*	*10.2821*	*7.5728*	*7.0537*
Prob(J-statistic)	*0.4140*	*0.2158*	*0.2002*	*0.1731*	*0.3718*	*0.4233*

Note: ***, ** and * denote to coefficients significant at 1, 5 and 10 percent respectively. P-values are in italics.

The sign of interaction between group affiliation and list age is positive and significant whereas it is insignificantly negative for list age variable. It shows that firm listing exposure positively affects group firms' value and however, it seems ineffectual for stand-alone firms. Similarly, both leverage and interaction between group affiliation dummy and leverage are significantly positive. This suggests that impact of leverage is positive for both stand-alone and group firms (consistent with pecking order theory) but the strength of relationship is stronger for group firms. Business groups may transfer

Table 7

Treatment Effects' Results of Interaction Analyses

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Group Affiliation Dummy	-0.3556***	-0.3302***	-0.3293***	-0.3139***	-0.2276***	-0.3230***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
List Age	-0.0003	0.0014***	0.0014***	0.0014***	0.0012***	0.0014***
	0.5110	*0.0000*	*0.0000*	*0.0000*	*0.0020*	*0.0000*
Leverage	0.1420***	0.1248***	0.1416***	0.1423***	0.1467***	0.1406***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Size	0.0026	0.0041	0.0026	0.0042	0.0004	0.0042
	0.5130	*0.2810*	*0.6040*	*0.2710*	*0.9260*	*0.2690*
Risk	-0.0617***	-0.0631***	-0.0643***	-0.0791***	-0.0632***	-0.0655***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Profitability	-0.1100***	-0.1123***	-0.1101***	-0.1103***	-0.0570***	-0.1098***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0010*	*0.0000*
Growth	0.0200***	0.0187***	0.0192***	0.0188***	0.0193***	0.0153***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0010*
Group Affiliation Dummy*List Age	0.0029***					
	0.0000					
Group Affiliation Dummy*Leverage		0.0344*				
		0.0950				
Group Affiliation Dummy*Size			0.0026			
			0.5990			
Group Affiliation Dummy*Risk				0.0330		
				0.1180		
Group Affiliation Dummy*Profitability					-0.1910***	
					0.0000	
Group Affiliation Dummy*Growth						0.0068
						0.2130
Intercept	0.1308***	0.1100***	0.1100***	0.1011***	0.0737***	0.1066***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0010*	*0.0000*
Group Affiliation Dummy as Dependent Variable						
List Age	0.0083***	0.0089***	0.0089***	0.0090***	0.0090***	0.0090***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Leverage	0.0048	0.0093	0.0041	0.0053	0.0032	0.0046
	0.9330	*0.8700*	*0.9420*	*0.9270*	*0.9560*	*0.9360*
Size	0.1860***	0.1857***	0.1844***	0.1856***	0.1932***	0.1847***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Risk	-0.0748	-0.0780	-0.0784	-0.0788	-0.0703	-0.0780
	0.2010	*0.1830*	*0.1820*	*0.1720*	*0.2310*	*0.1840*
Profitability	0.2359**	0.2461**	0.2502**	0.2415**	0.0363	0.2494**
	*0.0270***	*0.0200*	*0.0160*	*0.0220*	*0.6870*	*0.0170*
Growth	-0.0167	-0.0164	-0.0166	-0.0164	-0.0169	-0.0174
	0.2770	*0.2840*	*0.2790*	*0.2860*	*0.2740*	*0.2540*
Intercept	-0.8480***	-0.8593***	-0.8505***	-0.8563***	-0.8850***	-0.8514***
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Athrho	*0.7458****	*0.7668****	*0.7942****	*0.7737****	*0.5663****	*0.7972****
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Lnsigma	*-1.3186****	*-1.3092****	*-1.3005****	*-1.3070****	*-1.3710****	*-1.2997****
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Wald Chi-squared	*387.3800****	*372.2500****	*370.8500****	*373.6800****	*396.3500****	*372.9500****
	0.0000	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Rho	*0.6326*	*0.6451*	*0.6608*	*0.6491*	*0.5126*	*0.6625*
Sigma	*0.2675*	*0.2700*	*0.2724*	*0.2706*	*0.2539*	*0.2726*
Lambda	*0.1692*	*0.1742*	*0.1800*	*0.1757*	*0.1301*	*0.1806*
Wald test of Rho=0	*7.3600*	*11.8500*	*12.6000*	*12.7800*	*5.1300*	*13.6200*
	0.0067	*0.0006*	*0.0004*	*0.0004*	*0.0236*	*0.0002*

Note: ***, ** and * denote to coefficients significant at 1, 5 and 10 percent respectively. P-values are in italics.

surplus funds from one firm to another firm having shortage of funds and thus timely availability of funds may help in availing the opportunities and reduction in cost of funds, risk and uncertainty [Estrin, *et al*. (2009); Khanna and Yafeh (2005)]. The use of external funds contributes positively to the excess value if the internal capital markets are efficient [Peyer (2002)]. Similarly, interaction between group affiliation and size variable is significantly positive indicating that firm size is significantly positively related to firm value. The findings provide evidence that group firms are efficient networks of internal markets that help each other by providing inputs, assets and other valuable resources.

More interestingly, both profitability and interaction between group affiliation and profitability variables are significantly negative which propose that firm profitability is negatively associated with firm value. These results are consistent because earnings management practices are well pronounced in the firms of the countries with weak corporate governance and regulatory system. Moreover, the ultimate group controllers are more entrenched that further augment the potential of earning management practices which may ultimately hamper group firms' value [Shah (2009)].

Table 7 reports the interactive regression results of Treatment effect models. These results are highly consistent with the above GMM results.

5. SUMMANY AND CONCLUSION

Like many other emerging economies, business groups are ubiquitous in business environment of Pakistan. Business groups are endogenous response to weak legal system, underdeveloped financial system and missing other market institutions which support business environment. Financial reforms and other privatisation and liberalisation programs initiated in early 1990s strengthen the financial sector. This study sheds light on the group affiliation-performance relationship in a changed institutional environment which is expected to evolve differently. The study extends and supports the institution-based theory of group affiliation and agency theory by adding a dynamic, longitudinal and temporal component.

The results confirm that group firms are trading at discount and affiliation to a diversified business group harms firm value in Pakistan. The results support the market failure argument that business groups decline in performance because the institutional environment got gradually developed in the post financial reforms and liberalisation era in Pakistan. The group affiliation benefits, owing to market failures, disappear and these business groups face stiff competition from the external markets and have to frame policies according to the changing institutional environment for their survival. The results are highly consistent with the market failure theory. The study also finds an empirical evidence of severe agency conflicts among the ultimate controlling shareholders and external shareholders. The ultimate controllers in these business groups engage in tunneling firm resources for their personal consumption that detriment to the external shareholders' wealth.

However, the study finds a little evidence in favor of business groups' internal markets argument. The internal networks permit the affiliated firms sharing valuable resources, like information, inputs and capital which may be a source of value creation. The study finds both positive and negative traits of business group affiliation and however, negative attributes outweigh the positive and net effect of group affiliation is clear. Group affiliation is seen as a value destroying economic organisation.

The study is very important in Pakistani context as it provides guidance to managers, practitioners and investors and further it contributes to the existing finance literature. The business groups have to restructure and modernise their activities related to group affiliation, instead of depending upon rent seeking or other inefficiencies in order to compete in the changed institutional setting of capital, labor and product markets. Further, it also sheds lights on an important corporate governance issue that business groups are engaged in tunneling firm resources that detriment the firm value and cause severe agency conflicts among the controlling shareholders and external shareholders.

This study excludes the financial service firms and further it is a firm level study. In future it is important to examine the performance relationships within business groups. Other sources of costs and benefits to group affiliation, like financial constraints, internationalisation strategy, among others are required to be explored in future. Moreover, agency conflicts among the ultimate group controllers and minority shareholders should be explored further in future studies.

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Book Review

Paul Collier. *The Future of Capitalism: Facing the New Anxieties*. London, UK: Allen Lane. 2018. 256 pages. Price UK £ 20.00 (Hardback).

The Future of Capitalism by Paul Collier is an insightful book. In this book the author has highlighted the things that are wrong with capitalism. He has also highlighted not only the problems created by capitalism but also the problems being faced by capitalism today. The author has made a cogent case to show that deep economic rifts in the UK and the USA are "tearing apart the fabric of our societies" (p. 3). Collier has, in a nutshell, shown in the book how to save the capitalism from itself. The book is different from the books written with either the conservative or with the liberal perspective in that rather than relying on mere rhetoric, Collier has tried to present pragmatic solutions to the socioeconomic problems that are so rampant today. He has argued that in these times when there are deep political divisions, no new economic theory can work the magic. Instead he has made a case for policies that are not only pragmatic but are communitarian in nature. What is unique about the book is that ethics and moral philosophy are at the centre stage of Collier's narrative. George Akerloff, a Nobel laureate in Economics, has termed the book as the most revolutionary work since Keynes.

There are ten chapters in the book, which are divided into four sections. The first section is title 'Crisis' and there is only one chapter in this section, which is titled 'New Anxieties'. The second section is titled 'Restoring Ethics'. It consists of five chapters. The first chapter of the section discusses the foundations of morality. The remaining four chapters in the section talk about the ethics and discussed the ethical state, the ethical firm, the ethical family, and the ethical world. The third section is titled 'Restoring the Inclusive Society'. There are three chapters in this section. The theme of this section is divisions in the society, including geographical, class, and global divisions. The last and final section is titled 'Restoring Inclusive Politics', which contains only one chapter. The focus of this section is on politics in polarised societies and how this polarisation may be eradicated.

The book is nothing if not original. A careful reading of the book shows that Collier understands that the current socioeconomic problems are not only economic but also have cultural and psychological roots. He highlights the philosophical shortcomings of the liberalist ideas, which are based on the so-called *homo economicus*, and the shortcomings of the utilitarian ideas at the same time. Collier claims that "we are living a tragedy" (p. 17) and argues that the benefits offered by capitalism that were enjoyed by the previous generations have eroded due to unequal economic growth that is achieved by financial services. The book argues that there are many gaps that need to be narrowed. The geographical divide, according to this book is "between booming metropolis and broken provincial cities" (p. 7). The inequality in educational attainment makes the

matters worse, it is argued. The challenge, according to the author, is to rebuild a shared identity that is compatible with modernity.

Collier criticises both the leftist and conservative ideologies. He argues that the leftists have put too much faith in the government and the conservatives, on the other hand, have relied too on much unbridled markets. He advocates a return to the policies that are much more pragmatic and are characterised by communitarianism in which the focus is on shared prosperity, reciprocal obligations, and enhanced trust and cooperation. Collier is critical of the end of the ethical state that, according to him, is replaced by a "paternalistic state" (p. 13), which has dampened the sense of shard identity as well as personal responsibility. He is also critical of the current nature of the firm, which has replaced the ethical firm.

Talking about the policies, Collier introduces the concept of "social maternalism", which is a recipe of an active state. He argues that although the tax policy should encourage redistribution, but it should not come at the cost of wealth. As regards the regulation policy, he argues that regulation should be introduced to mitigate the costs of capitalism and not to kill of the innovative ideas of the entrepreneurs, which is a hallmark of the market economy. The idea of social maternalism has both ethical and policy dimensions. Based on this idea, the author suggests the creation of an ethical state and suggests policies at the government, firm, family, and foreign policy levels. Collier places a particular emphasis on the geographical divide. He argues that although the market can create industrial clusters, but it cannot create economic and social clusters.

The diagnosis presented in the book of the ailments in the present system is compelling and it is hard, if not impossible, not to agree with the author. At the same time, it is not easy to agree with everything that the author has presented as a cure because everyone might not be comfortable with the idea of communitarianism. However, the book successfully highlights the shortcomings of the political ideologies at both ends of the spectrum and anyone who is enamoured with either of these philosophies must read this book.

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