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Lahore School of Economics

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The Comparative Efficiency of Public and Private Power Plants in Pakistan's Electricity Industry

Amir Jahan Khan*

Abstract

This study estimates a cost function for fossil fuel-based electricity generating plants operating in Pakistan during 2006–11. It employs a six-year panel dataset for 31 plants to estimate the cost function parameters. In the absence of any current evidence on comparative cost performance, the study's attempt to document the economic efficiency of power plants in a large electricity sector is an important contribution to the literature. We find that on average, private nonutility plants (IPPs) are about 17 years younger than utility-owned plants and that the average capacity utilization, as measured by load factor, is higher for private IPPs than for public plants. After controlling for observables, the results show that, for a large part of the system, private plants produce electricity at a lower unit fuel cost than utility-owned public plants. The low efficiency of public plants is likely a result of the lack of operational maintenance and routine repairs. We find that the average fuel price (PRs per MMBTU) is lower for public plants and utility-owned private plants compared to nonutility-owned private plants which is mainly due to the composition of the fuel mix used for power generation. We also find that (i) the partial effect of fuel price changes on the average unit cost is higher for private plants than for public plants and (ii) on average, private plants use relatively expensive fuels compared to public plants. On an average fuel cost comparison, the private sector plants may be better base load plants than public sector plants, though the private sector plants may not be being used as base load plants because of the higher tariffs they change.

Keywords: Cost function, utility-owned public plants, load factor, productive efficiency.

JEL classification: D22, D24, L94.

1. Introduction

Pakistan's electricity industry has been in transition for the last two decades, with financial constraints to the public sector and the

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perceived potential efficiency gains from private enterprise having motivated the federal government to initiate restructuring and privatization in the industry. Since 1994, the government has followed a policy of commissioning new generation capacity in the private sector through nonutility-owned independent power producers (IPPs) (see Government of Pakistan, 1994). The new plants that were set up initially supplied electricity to two vertically integrated state-owned utilities: the Water and Power Development Authority (WAPDA) and the Karachi Electric Supply Corporation (KESC).[1]

The initial reforms introduced in the power generation segment have been adopted without much evidence on the productive efficiency of electricity generation plants or of any comparative advantage across electricity generating establishments, either between private and nonprivate plants or utility- and nonutility-owned plants. The reports issued by the National Electric Power Regulatory Authority (NEPRA)[2] present technical indicators of the performance of public plants, but no information on their comparative economic efficiency with respect to private plants, particularly after taking into account their distinct characteristics.

Saleem (2007) shows that public ownership of a plant has a negative impact on technical efficiency. The study compares the technical efficiency of public and private plants, using a stochastic frontier framework but without incorporating the cost of inputs.[3] While the technical efficiency analysis helps understand whether plants can achieve their maximum possible output with a given set of inputs, it does not establish the relative economic efficiency of different sets of power plants. In order to determine which set of plants supplies electricity at the lowest cost, it is important to analyze their performance from an economic efficiency or operational cost perspective. The present study attempts to estimate a cost function for electricity generation plants after controlling for ownership and other relevant characteristics. The estimated unit cost function can indicate the efficiency differential across government-owned and privately owned plants.

The country's electricity industry has tended to perform poorly, with a system characterized by high levels of unreliability, pervasive load-shedding, lack of investment in new capacity (to meet the growth in

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[1] The KESC was privatized in 2005 while WAPDA remains in an erratic state of transition. Although the former's name was recently changed to "K-Electric," this study still refers to the utility as "the KESC."
[2] NEPRA's annual reports on the state of the industry review the electricity sector's progress.
[3] A different mix of inputs on the same isoquant can result in different levels of economic efficiency due to the variation in factor prices.

demand), and system losses (both physical and due to theft). According to the World Bank's enterprise survey for 2010, 65 percent of Pakistani firms see electricity as their main obstacle to growth. Rolling blackouts are common not only in small towns, but also in the major cities.

While there are multiple reasons for the current disorder in the electricity industry, the first stage of an analysis could potentially be to evaluate the economic efficiency of the industry's generation segment. Overall economic inefficiency can be a result of pricing issues[4] or operational inefficiency in the generation, transmission, or distribution sectors. However, this paper focuses on evaluating the efficiency of the generation segment. This is not to deny that efficiency issues—for instance, in the transmission system or distribution network—have direct and indirect implications for the performance of generating units. That being said, our strategy is to evaluate, using a simple cost function framework, whether in the short run the existing generation capacity is being efficiently utilized or if it operates at the least-cost supply level. The efficient performance of generating units can be considered a necessary condition of the system's overall economic efficiency.

This paper evaluates the comparative performance of private enterprise in the electricity industry of Pakistan.[5] Private firms operate mainly in the generation segment of the industry and the entrance of private IPPs in Pakistan is in line with international experience. Under certain conditions, entry by new firms increases the competiveness of the electricity generation segment, which is thought to be a relatively competitive segment (Joskow & Schmalensee, 1983). Arguably, however, if the reforms to encourage private enterprise in electricity generation were framed in order to enhance competition in the industry or if the new capacity was commissioned to cater to the high demand for electricity, then neither function was being fulfilled by the existing set of public plants.

Our findings show that, for the given sample, in the major part of the national grid, nonutility-owned private plants[6] have performed better than utility-owned public plants. The average unit cost difference between the two sets is economically and statistically significant after controlling for other factors. These findings raise doubts about the policy of using public

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[4] The price of electricity might not be equal to its marginal cost.

[5] However, this comparison is not intended as a "treatment evaluation" as plant ownership is not exogenous.

[6] The terms "nonutility-owned private plant" and "independent power producer" are used interchangeably.

plants as base-load plants,[7] at least on the basis of an average fuel cost comparison. It appears that the high tariff charged by private firms might prevent them from being used as base-load plants.

The following analysis is divided as follows. Section 2 documents the institutional details of the generation segment while Section 3 highlights the possible implications of institutional structure for the cost of electricity generation. Section 4 describes the data used, Section 5 specifies the empirical model, and Section 6 presents the study's findings. Section 7 provides a brief conclusion.

2. Electricity Generation and Institutional Structure

The extensive literature on privatization shows that, over time, private firms become more productive and more profitable (Megginson & Netter, 2001). They improve their resource allocation and employ modern management practices to increase efficiency within the firm. The KESC, for example, became a profitable organization in 2014 under private ownership. Privatization reforms can create a more competitive environment where firms engage in market-based interaction. Evidence from the US suggests that publicly owned generation plants that were not exposed to a market-based environment gained less from deregulation reforms (Markiewicz, Rose, & Wolfram, 2004).

According to recent policy briefs, the Government of Pakistan has recommended transferring the ownership of public generation companies (GENCOs) to private management to increase the productive efficiency of the generation segment. This indicates that, at the policy level, there is recognition of the fact that private enterprise may be able to increase efficiency in the electricity industry. The government has cited the persistently poor performance of GENCOs under public management as its rationale for introducing private management. However, to draw any policy implications, we need to estimate both the industry's productive efficiency according to plant ownership as well as the extent of the existing cost efficiency differential between public and private plants.

The reforms and regulation process could have a different impact on the electricity generation operations of the country's two vertically

[7] Base-load plants, which run through the year to meet continuous typical demand, are supposed to produce at a lower unit cost. Peak-load plants operate to meet exceptionally high seasonal demand (for instance, during the hot summer months). The latter's cost of production is higher as they are used only for relatively short periods when required. In Pakistan, the distinction between peak-load and base-load is blurred, given the state of perennial unmet demand in the system.

integrated utilities because WAPDA, the main utility, is still under public ownership while the KESC was privatized in 2005. This study draws empirical comparisons between utility-owned government plants and utility-owned private plants. The regulation of the industry has been followed by the corporatization of the public utility-owned plants into GENCOs with changes in managerial practices, while the private utility-owned plants under the KESC have been restructured substantially or new plants commissioned during the sample period.

In order to establish technological homogeneity across plants, our analysis focuses on fossil fuel (oil and gas)-based plants. Further, there are two institutional reasons for analyzing a sample of fossil fuel plants; First, private investment is limited mainly to fossil fuel plants and the bulk of new generating capacity (over the last two decades) comprises fossil fuel plants owned by private firms. In 2002, private generators accounted for about a third of the country's total electricity production; by 2010, this share had reached about two thirds. Second, fossil fuel plants are now the major source of electricity production: about two thirds of the total electricity in the country is produced by fossil fuel, 57 percent of which is generated using oil and 42 percent using gas. Utility-owned plants produce 40 percent of this electricity, while private sector IPPs generate the remaining 60 percent. Almost all the nonutility-owned generating units installed since the 1990s run on fossil fuels, and any new investment in the generation segment (undertaken primarily by private firms) has also targeted plants running on fossil fuels.

The current evidence pertaining to comparative generation performance focuses on technical efficiency (see Saleem, 2007) and suggests that private plants are more technically efficient than public plants (NEPRA, 2010). In the case of fossil fuel plants, the technology involved can be described as the process of generating heat from the fuel input (e.g., oil, gas, or coal) and converting that heat into electricity. The standard measure of fuel efficiency in the electricity industry is the kilowatt-hour (kWh) per unit of heat (British thermal unit or BTU). The regulator's reports support the notion that fuel efficiency is higher for private plants than for public plants (NEPRA, 2010). These findings are not surprising, given the vintage of the IPPs, most of which began operation after the 1994 power policy was issued.

In this context, the present study makes an important contribution to the literature by measuring the economic efficiency of electricity production, given that fuel efficiency covers only the technical aspect of efficiency and does not take into account input costs (NEPRA, 2011). It is also important to measure economic efficiency after controlling for other relevant variables that might affect plant performance.

Short-run production efficiency can be evaluated based on the cost of supplying electricity, which will depend on the efficient maintenance of plant equipment, minimum fuel costs, and the efficient utilization of labor (Joskow & Schmalensee, 1983). In theory, electricity generators connected to the national grid minimize costs, given inputs and electricity prices, irrespective of the given market structure. Deviations from cost minimization behavior can occur due to coordination and agency costs involved in plant management. These costs may be amplified when electricity prices are set by an asymmetrically informed regulator (Laffont & Tirole, 1993).

The literature shows that management practices are associated with the productivity differential across firms (see Bloom & Van Reenen, 2010). This applies to power companies in Pakistan as well. The IPPs, for instance, are run by private entrepreneurs, potentially in line with modern management practices that include timely plant maintenance and the employment of suitable staff for various jobs within the organization. Government-owned plants, on the other hand, are under bureaucratic management and are run by government employees with less incentive to improve plant performance. The management of public plants minimizes the cost of operation, but with certain additional constraints. The utility-owned private plants are managed privately (similar to some IPPs), with a properly functioning board or active top management that can potentially pursue policies geared toward upgrading production capacity and closing down older, less efficient plants.[8]

3. Pakistan's Electricity Industry: Institutional Structure and Costs

Historically, the electricity industry in Pakistan consisted of two vertically integrated utilities, both of which were government-owned monopolies. Karachi, the largest metropolitan area, was served by the KESC while the rest of the country was covered by WAPDA.[9] The electricity industry is an important sector of the economy, supplying 15

[8] The KESC is closing down old plants and investing in new power generation units.

[9] The industry's status changed with the privatization of the KESC in 2005 and the privatization and restructuring of WAPDA in 1998. WAPDA's fossil fuel-based GENCOs operate under the Pakistan Electric Power Company (PEPCO). In practice, WAPDA is still a vertically integrated utility and has not been successfully restructured (Malik, 2007; NEPRA, 2010).

percent of its final energy consumption. The power generation segment is also a major consumer of primary energy: 30 percent of the country's total gas consumption and 42 percent of its total oil consumption is attributed to fuel consumption within the power generation segment. The electricity industry also receives a substantial subsidy (more than a third of electricity revenues) through the public exchequer. The industry has been in transition for the last two decades, with privatization, deregulation, and corporatization strategies running parallel to one another.

The Government of Pakistan's (1994) power policy allowed private firms to establish power plants and sell electricity to the KESC and WAPDA. This was in line with industry experience, which suggested that the generation segment did not need to be efficiently served by a few suppliers compared to the transmission or distribution segments (Joskow, 1997). The 1994 power policy states that:

Presently the total installed capacity in the country is 10,800 MW. This capacity is insufficient to meet the demand on a year round basis… The system is characterized by a high degree of suppressed demand. Conservative projections for annual average increase in the demand are nearly 8% per year for the next 25 years, … such an ambitious program cannot be financed in the public sector due to ceilings on Public Sector Development Program (PSDP), and resource mobilization in the private sector is essential for meeting these development targets.

Given that the new private sector investment has been limited to electricity generation, it is useful to examine whether the institutional changes that have taken place have affected the unit cost of energy production between private and public plants differently. Although the fossil fuel-based plants currently connected to the system employ homogenous technology, they vary substantially in terms of age. The private plants are mostly new while the public plants are fairly old. Given that the basic technology used converts heat input derived from oil or gas into electricity, we would expect newer (private) plants to be more technically efficient than older (public) ones, assuming that newer technology can produce a higher output with a given heat input, after controlling for the calorific value of fuel.

Recent NEPRA reports show that the average technical efficiency of private plants is about twice that of public plants, suggesting that the latter's generation capacity has declined (NEPRA, 2010). However, it is not clear whether the technical efficiency differential is manifested in the cost performance of power plants and the system's overall economic efficiency. In the absence of any other research, we can employ the reports published by the regulator and the available data to understand the comparative economic performance of power plants.

The Government of Pakistan's unbundling strategy for the state-owned utility WAPDA was intended to convert public plants into independent GENCOs that would then compete with private producers to supply electricity to the national grid. However, the failure of the corporatization of WAPDA has affected the financial independence and performance of government-owned public plants such that even routine services are not carried out on time. For instance, the failure to procure spare parts because of the GENCOs' lack of liquidity has resulted in poor plant operation and maintenance (O&M) (NEPRA, 2010).

The regulator's reports show that existing public power plants need to be utilized around the clock, i.e., as base-load plants, in order to meet the persistent high demand over the year. The lack of mandatory shutdowns has resulted in poorly planned maintenance, with inadequate major overhauling, hot gas path inspections, combustion inspections, and annual boiler inspections. As a result, these plants run on partial load and forced outages increase.

The average availability from peak-load sharing to installed capacity varies from 42 to 58 percent for public plants, which is much lower than for private plants. The load factor—an important industry indicator defined as the ratio of total output to potential output at the maximum load assigned to a plant—also indicates the weak state of government plants. Their average load factor is 50 percent compared to 78 percent for private plants. The lower load factor (for a given amount of electricity produced) implies that the plant has to run longer in order to produce the given output, and this is likely associated with greater deterioration and higher fuel consumption.

The 1994 power policy stipulated a payment mechanism for privately owned electricity plants under which their power purchase agreements assured the producers of monthly capacity payments consisting of debt service, fixed O&M costs, insurance, and return on equity on an internal rate of return basis, even if no electricity was purchased. In addition, private plants were to receive payment for energy purchased based on a per-unit energy charge. The upfront tariff mechanism, however, may have given producers incentive not to operate their least-cost supply plants as the tariff system was not based on a competitive framework of installing new generation capacity (Government of Pakistan, 1998).[10] The IPPs probably forecasted that their plant factor during the initial years of production would be lower, given the growth in demand for electricity in the late 1990s, and that cash flows would thus depend on capacity price. How this affected their decision making during the investment process is not clear.

Labor efficiency can also be a factor in the efficiency differential between government-owned and privately owned plants. Private GENCOs may be well managed and have better human resources (see Lerner, Khwaja, & Leamon, 2012). Anecdotal evidence tends to favor the transfer of experienced and skilled staff from public to private plants or elsewhere in the private sector—this is due to better incentives for engineering and nonengineering staff. The failure of the corporatization of WAPDA, however, raises doubts about any efficiency gains being associated with better human resource management in government-owned plants (NEPRA, 2010). Similarly, the privatization of the KESC in 2005 may not have affected its labor management substantially, at least for the first few years.[11]

In the public sector, over-staffing and related costs tend to run high during the tenure of elected governments. Between 1999 and 2007, there was no major political change—the country underwent a mix of authoritarian and democratic structures—but the GENCOs that were part of WAPDA were exposed to political over-staffing before 1999 under successive democratic governments.

4. Data and Related Issues

Estimating plant-level, short-run variable cost efficiency requires sub-firm or unit-level data, collecting which involves the maximum possible disaggregation, given the data availability constraint. In the electricity industry, a plant can house several independent units of varying vintage. The definition of "plant" in this study depends on a mix of managerial, accounting, and regulatory contexts. For instance, nonutility

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[10] It is less clear if the Averch-Johnson effect is present because nonutility-owned plants are, on average, smaller than utility-owned plants. The political motivation arises from the lack of transparency in firm selection while missing competitive bidding failed to filter out generation units on a least-cost basis (Fraser, 2005).

[11] The KESC's new management has tried to reduce over-staffing in the utility, but failed to do so as a result of political pressure (although the proposed staff reductions may not have pertained to the generation component of the utility).

private plants are dispatched as a single unit while public plants are dispatched unit-wise or in blocks of units, depending on the fuel input used. Although unit-level data makes sense for examining short-run working-cost performance, in this analysis a plant can be an aggregate of several units or a single unit, depending on the availability of data.

Since the study focuses on oil- and gas-based power plants, the sample does not include plants producing hydroelectricity. Further, two nuclear plants and one coal plant have also been excluded due to possible differences in fuel cost and technology (compared to oil- and gas-based plants). The full sample includes 83 electricity generating plants/units that were operational between 2006 and 2011; the sample size is 356 plant-years. These power plants account for 68 percent of total electricity production in the country during the sample period.

Interestingly, the disaggregation in the available data matches the disaggregation required at plant level due to unit variations in vintage within plants. For instance, the variation in unit age within a plant is higher for public plants as is the disaggregated data available at the unit level; this enables us to capture any inefficiency differential in vintage. On the other hand, the data on nonutility-owned private plants is available at the aggregate plant level (aggregated for all units within a plant). Since most private firms started operation in a short span of time with the possibility of homogenous units within a plant, the chances of a cost-efficiency differential due to data disaggregation at the unit level for public plants and data aggregation for private plants are reduced, if not eliminated.

The data needed to estimate the variable cost function includes fuel prices, fuel consumption, total wage bill (labor cost), and variable maintenance expenditure. In addition, data on the total cost of production, total electricity generated, and maximum plant load assigned is required at the plant level. Our main sources of data are the reports published by NEPRA, the National Transmission and Dispatch Company (NTDC), and the KESC (see Table A1 in the Appendix for a complete list of variables). NEPRA's state-of-industry reports include plant-level data on generating capacity, the electricity generated in a year, fuel quantity, and load factor.

One important point to note for our analysis is that, although detailed information on the required variables is available for the majority of government-owned plants, there is no data on the O&M expenditure and labor cost variables of IPPs. Since we focus on oil- and gas-run plants, the fuel expenditure is likely to be the most important component of total variable cost. This is intuitive, given that fuel costs account for about 94 and 93 percent, respectively, of the total variable cost for the given sample of public and private plants.[12]

5. Empirical Production Model

In the case of a single-output production process, one can assess productive efficiency by observing whether the firm is maximizing its output, given the inputs, and if it employs the best mix of inputs, given input prices. The production function describes the various possibilities for transforming inputs into output, but without taking into account the relative prices of inputs. On the other hand, cost minimization assumes that firms minimize their production costs for a given level of output by incorporating input prices. An electricity plant might be producing the maximum electricity possible using a given mix of plant, material, fuel, and labor, but it may not be minimizing its costs if the labor is cheaper than the material while the plant uses more material and less labor.

Even if different types of fuel are used to produce heat input, it is cost-effective to use the cheaper fuel for a given amount of heat produced. Thus, if it is possible to produce the same level of output by using more labor and less material or a different fuel, then the plant can lower its costs by employing a different mix of inputs. Therefore, an efficient electricity generating plant will minimize the cost of producing any amount of electricity, given input prices.

The study's productive efficiency comparison between utility-owned and nonutility-owned (private) electricity generation plants is based on cost function specifications. The duality between the production function and cost function allows econometricians to recover production parameters from the cost function under certain regularity conditions (Diewert, 1971). Similarly, the cost minimizing factor demand expressions can be derived from the production function.

Nerlove (1963) and Christensen and Greene (1976) are among the earliest applications of the duality theory in empirical analyses of the electricity industry. Their rationale hinges on the exogeneity of both factor prices and electricity output: this is because factor prices are typically determined in competitive markets or through regulation, while electricity output is determined mainly by the load demand. Therefore, fuel prices

[12] The estimate for private plants is based on the fuel cost component and O&M cost component of the upfront power tariff.

and electricity output are not related with unobserved heterogeneity in the cost function. Estimating the production function complicates matters as inputs become endogenous for the plant manager, requiring a full structural specification to consistently estimate the technology parameters (Markiewicz et al., 2004). Given the limited data available for Pakistan, a structural estimation of the production function is not feasible.

Recent empirical studies in the industrial organization literature have employed cost function estimations to address various performance-related issues in the industry (Maloney, 2001). Estimating a cost function can be a good starting point for building baseline knowledge about the performance of the power generation industry in Pakistan. Price and output exogeneity[13] appear to be credible assumptions in the case of Pakistan as plants are forced to produce the required electricity and profit maximization does not seem plausible. The oil and gas regulator controls fuel prices while the power generator purchases fuel according to its plant technology.

Plant ownership, however, can change the level of the cost function: as mentioned in the NEPRA reports, utility-owned plants may generate a particular amount of electricity at a higher cost compared to nonutility-owned plants. In order to improve average unit cost comparisons, an econometric cost function can control for all the observed relevant factors. These different empirical comparisons along with their summary statistics are discussed below.

Following Foreman-Peck and Waterson (1985), we specify a simplified form of the trans-log cost function as a goal function, which extends Christensen and Greene's (1976) study. The trans-log framework can also be used to study substitution effects, scale effects, and technological changes (Greene, 1980). The specification proposed here is informative as it incorporates the effect of the load factor on the average unit cost of electricity generation.

The load factor (*load*) is defined as the total electricity output (q) in a period, divided by the product of the maximum load (m) and the time the plant remains connected to the load (v): $load = q/m*v$. Load factor is an important factor affecting the cost of electricity generation (Foreman-Peck

[13] The variation in fuel prices in Table 1 is partly a result of the fuel mix (gas and oil) and partly due to the nature of contracts with gas suppliers. On average, gas and oil prices are reflected by exogenous market forces and by competitive fuel demand in the economy. Therefore, prices are potentially exogenous in short-run cost functions.

& Waterson, 1985). The adapted version of the trans-log cost function is given below in equation (1):

$$\log(c_{it}) = \alpha + \beta_1 \log(q_{it}) + \beta_2 (\log(q_{it}))^2 + \beta_3 \log(p_{it}) + \gamma \log(load_{it})$$
$$+\lambda \log(age_{it}) + \rho private_i + \sum_{t=2}^{T} \rho T_t + u_{it} \quad (1)$$

$i = 1, 2, \ldots N; t = 1, 2, \ldots T$

where *C* is the unit cost of production (in PRs per kWh), *p* is the fuel price per million British thermal units (MMBTUs), *age* is the vintage of the plant, and *private* is an ownership dummy that takes a value of 1 if the plant is owned by a private firm and 0 if the plant is owned by a public GENCO.

The electricity output is scaled in kilowatt-hours while capacity utilization is based on the maximum load in kilowatts and the proportion of time the plant remained connected to the load. Recent studies have employed different expressions of capacity utilization: for instance, Maloney (2001) adds the term "intermittent idling" (electricity generation time as a proportion of the total time in the year) to equation 1 (given above). This term may be more useful when coal-based generation is high, which is not the case in Pakistan.

The above specification is estimated for fuel unit costs only because the funds allocated to fuel input in fossil fuel-based power generation are likely to be substantial. This intuition is supported by the available data: on average, 93 percent of total variable expenditure can be attributed to fuel costs both for public and private power plants. There is also limited data available on the price indices for labor and maintenance costs of private power plants.

6. Findings and Results

Table 1 gives the summary statistics for the variables used in the regression analysis. These are based on a sample of public and private plants for plant-years with positive production and nonzero fuel inputs. The private plants are subdivided into utility-owned and nonutility-owned groups, where the utility-owned plants fall under the KESC.

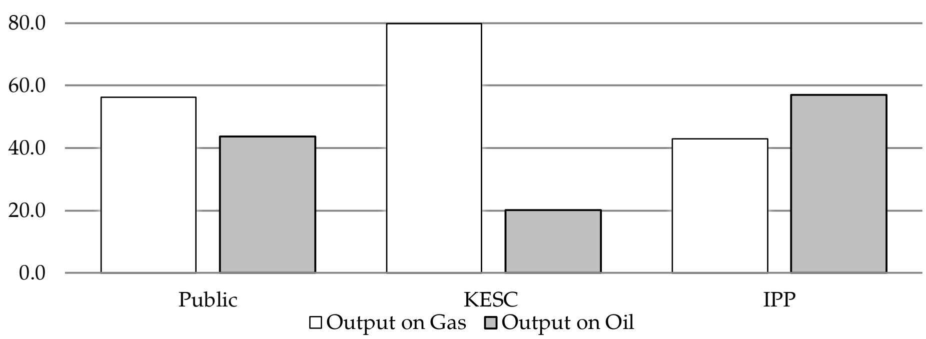
The summary statistics presented in the table are for an aggregate sample and may miss variations across plants over time. On the other hand, public plants produce electricity at a higher average unit cost (PRs per kWh) than private plants. There are also substantial differences in average plant age according to plant ownership.

Table 1: Summary statistics for power plants

Variable	Observations	Mean	SD	Min.	Max.
Government plants					
Output (GWh)	184	506.9	456.8	0.5	1,887.1
Unit output cost (PRs per kWh)	184	3.8	2.1	0.8	10.6
Fuel price (PRs per MMBTU)	184	295.7	182.7	41.1	798.0
Load factor (%)	184	49.1	26.6	0.2	97.0
Plant age (years)	184	27.9	10.2	10.0	51.0
Private plants (IPPs)					
Output (GWh)	73	2,121.0	2,402.1	50.4	9,140.8
Unit output cost (PRs per kWh)	73	3.6	1.8	0.6	7.1
Fuel price (PRs per MMBTU)	73	429.2	209.2	73.4	839.8
Load factor (%)	73	77.2	18.3	5.1	98.6
Plant age (years)	73	10.4	3.0	1	19.0
Private plants (utility-owned)					
Output (GWh)	99	451.1	477.3	0.1	1,553.5
Unit output cost (PRs per KWh)	99	2.9	1.1	1.3	8.7
Fuel price (PRs per MMBTU)	86	223.5	101.6	126.5	705.1
Load factor (%)	98	82.4	8.8	49.4	96.8
Plant age (years)	99	22.6	11.3	1.0	42.0

Note: Estimates based on plant-year data for 2006 to 2011. 1 MMBTU ≈ 293 kWh.
Source: Author's calculations.

Figure 1: Fuel sources for electricity production, 2006–12 (%)



Source: National Electric Power Regulatory Authority, Annual Reports (2010, 2011).

Cost function specification (1) described in the previous section is employed to produce regression estimates for public and private plants.

The results for the three comparisons are presented in Table 2. Column (1) compares all public and private power plants; columns (2) and (3) compare public plants and IPPs, and public plants and utility-owned private plants, respectively.

Table 2: Comparison of pooled regression estimates of cost function

	Dependent variable = log output unit cost					
	Cost specification					
Explanatory variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Log fuel prices	0.902***	0.873***	0.884***	0.880***	1.025***	0.977***
	(0.02)	(0.022)	(0.02)	(0.021)	(0.027)	(0.058)
Log electricity output	-0.321	-0.471*	-0.375	-0.304	-0.441	0.793
	(0.191)	(0.204)	(0.246)	(0.259)	(0.822)	(0.533)
Square of log electricity output	0.005	0.01	0.007	0.005	0.01	-0.022
	(0.005)	(0.005)	(0.006)	(0.007)	(0.019)	(0.014)
Log load factor	0.043	0.05	0.04	0.054	0.002	0.236
	(0.024)	(0.029)	(0.023)	(0.034)	(0.085)	(0.199)
Age of plant	-0.001	0.0004	0.0001	-0.002	0.009	0.009***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)
Age of plant * private plant interaction	0.015***	0.013*	0.009***			
	(0.002)	(0.006)	(0.002)			
Dummy for private plant	-0.330***	-1.239***	-0.153**			
	(0.053)	(0.163)	(0.055)			
Log fuel prices * private plant interaction		0.147***				
		-0.032				
Constant	0.208	1.657	0.691	0.264	0.003	-12.329*
	(1.841)	(1.949)	(2.298)	(2.362)	(8.455)	(5.6)
Observations	343	257	270	184	73	86
R^2	0.945	0.960	0.943	0.947	0.987	0.926

Notes: The estimates are based on a pooled sample for 2006 to 2011. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are clustered at the plant level and reported in parentheses below the coefficients.
Column (1) = overall sample, (2) = private IPPs and public plants, (3) = public and utility-owned private plants (KESC), (4) = public plants only, (5) = IPPs only, (6) = utility-owned (KESC) private plants.
Source: Author's calculations.

The performance differential between public and private plants should be reflected in the difference in slope coefficients or in an intercept shift or both for the estimated cost function. The results of the structural stability tests do not accept the hypothesis of equal coefficients between public and private plants for the year dummies and vintage coefficients for the three comparisons mentioned above. Further, the coefficient of log prices is also statistically different for nonutility private plants (IPPs) and public plants in column (2) of Table 2.

The analysis yields the regression results in columns (1), (2), and (3) of Table 2 after allowing for separate vintage effects for private plants and for the adjustment of separate slope coefficients for fuel prices in column (2). The log fuel price coefficient is statistically significant in all the models and the estimated price elasticity of the average unit cost for the full sample is 0.90. This shows a percentage change of < 1 to 1 in average unit cost with respect to the change in fuel price. In column (5), the estimated fuel price elasticity for utility-owned private IPPs is higher than for public plants. The price elasticity of the unit output cost is also higher for utility-owned private plants in column (6).

The estimated plant vintage coefficients for public and private plants are statistically different: –0.001 and 0.014, respectively. The impact of private plant aging on the unit cost is positive, which implies that the newest IPP plant will produce at a 26.6 percent lower average unit cost than the oldest IPP plant, holding other factors constant. The vintage coefficient for public plants is not statistically significant, indicating no substantial impact of plant aging on their unit cost. However, the public plants in the sample are older than most of the private plants and, due to deterioration over the years, the former group consists of technically inefficient and homogenous plants.

In a cost function scale, economies can be evaluated on the basis of output coefficients. The output and output-squared coefficients have the expected signs but are not statistically significant in most of the regressions in Table 2, except column (2). Therefore, there is no clear evidence of a scale effect on cost reduction for public and private plants. However, the subsample of gas-run plants demonstrates substantial scale economies as shown in Table A2 in the Appendix. There might be potential confounding between scale economies and vintage: the IPP plants running on gas are younger and larger while the public plants operating on gas are fairly old and smaller. The estimated scale economies $SCE = 1 - \partial \log(c) / \partial \log(q)$ are presented in Table 3 below.

Table 3: Economies of scale for gas-based units

Unit	SCE	Standard error
All plants	1.14***	0.02
WAPDA system	1.10***	0.02
Public plants and KESC plants	1.00***	0.04

Note: *** $p < 0.001$.
Source: Author's calculations.

The estimate for the plant ownership dummy in column (1) of Table 2 indicates that private plants in the system produce electricity at a lower (33 percent less) unit fuel cost than public plants, after allowing for different slope coefficients for the year dummies and plant vintage, and controlling for other observable factors. Similarly, the results in column (2) show that public plants produce electricity at a substantially higher average unit cost compared to private IPP plants. The bulk of nonutility-owned private IPPs fall within the WAPDA system where private plants produce electricity at a substantially lower unit fuel cost than public plants.

The comparison between private plants owned by the KESC[14] and public plants in the WAPDA system is given in column (3); the estimates show that the average unit cost for private utility-owned plants is 15 percent less than that for public plants. The results for public-, IPP-, and utility-owned private plants (KESC plants) are given in the last three columns of Table 2, respectively. However, the standard errors of the individual results in columns (5) and (6) may be problematic due to the small number of clusters for IPP plants and utility-owned private plants.

The regression results in columns (1) and (3) of Tables 2 and A2 indicate the risk of selective privatization of utility-owned plants, although most of the plant-year sample data for KESC-owned plants refers to older plants comparable in vintage to public-owned plants. The results in column (2) of Tables 2 and A2 do not give the risk of ownership selection as the private plants in the subsamples were established by IPPs.

Estimating a fully specified variable cost function is not possible due to the unavailability of data on labor and maintenance costs for private plants. However, in order to assess the impact of nonfuel costs on the total

[14] The two main systems are the WAPDA or NTDC system and the KESC system. The KESC grid is interconnected to the NTDC grid system through two double-circuit 220 KV transmission lines. On average, the KESC purchased 330 GWh annually from the WAPDA system during 2005–10.

cost, Table A3 in the Appendix gives estimates for the fully specified variable cost function for the subsample of government-owned plants.

In Table A3, the wage bill reflects the per-unit cost of labor and the maintenance bill reflects the per-unit maintenance cost. The wage bill is calculated by dividing total wages and salaries by plant/unit output; the maintenance bill is calculated by dividing the total maintenance cost by plant/unit output. The proportionate change in the electricity unit cost or elasticity with respect to the fuel price, wage bill, and maintenance bill is 0.88, 0.01, and –0.04, respectively. The results show that the wage cost has an insignificant impact on electricity production costs. There is also an indication that, as maintenance expenses per unit produced increase, the cost of production declines. This result demonstrates the importance of timely maintenance expenses for increasing plant efficiency.

The regulator's reports present data on the declining fuel efficiency of public plants in the WAPDA system on the basis of technical efficiency alone. This leaves room to interpret that these plants operated at low cost because they were generating electricity with gas as their fuel input (which is relatively cheap). The evidence on their economic efficiency, however, reinforces the notion that public plants are not only less technically efficient, but are also economically inefficient, particularly relative to the IPPs in the system. Further, the estimates in Table A2 show that gas-based public plants produce electricity at a higher average unit cost than privately owned gas-based plants. Therefore, the fuel allocation policy, and in particular the gas supply policy, needs to be reconsidered such that scarce gas fuel is supplied to cost-efficient plants wherever possible.

The results in Tables 2 and A2 need to be qualified, which may have some important implications as well. The analysis is based on the short-run cost function, which uses the fuel cost to proxy the total variable cost; any implications should thus be considered in this context. The private IPP plants are newer than the public plants and WAPDA's GENCOs have not invested in new public plants or in any major repair plan for the existing units (which are fairly old) since industry reforms were introduced in the early 1990s.[15]

The absence of data on wage bills and routine maintenance for private plants constrains the estimation of a fully specified short-run variable cost function. Future research will require the collection of detailed

[15] The only young public plant, the Kot Addu power plant, was completed in 1996, but then privatized. The GENCO plants are now being revamped with funds supplied by USAID.

cost information on private plants in order to incorporate price indices for wage bills and plant maintenance. Moreover, our findings do not necessarily imply that privatization will improve the efficiency of a given plant. Proposing policies such as the recent option to transform public plants into privately managed units will require a further understanding of the issues that underlie the low efficiency of public plants.

7. Concluding Remarks

The study's estimation of a cost function for power plants is an attempt to compare plant performance according to plant ownership in Pakistan's electricity industry. Our results show that public plants are less efficient than private plants, both technically and economically. This does not, however, imply that the latter perform better on other dimensions of cost, including wage bills and maintenance, because this exercise was based on the limited information available, particularly for private plants.

To assess the cost of private production to the final supply of electricity, further research is needed to analyze the long-term contracts between IPPs and the central power purchase company. Although the public plants are owned by public companies, i.e., GENCOs, their management still falls under a vertically integrated utility. Dynamic issues in the regulation of other components of the utility and issues relating to transmission and distribution are likely to have affected the functioning of public power firms and thereby the plants they run.

The current state of public plants also needs to be looked at in the historical context of industry reforms and vanishing new investments either to repair existing plants or set up modern vintage sets. Given that the public plants are still effectively part of a vertically integrated utility, their lack of financial independence and related tariff issues need to be better understood for future reforms.

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Appendix

Table A1: List of variables

Variable	Unit
Installed capacity	MW
Dependable capacity	MW
Units generated	GWh
Auxiliary consumption from own system	GWh
Auxiliary consumption from other systems	GWh
Units sent out	GWh
Gross heat rate	
Net heat rate	
Gross efficiency	%
Net efficiency	%
Shutdown hours	Hours
Total running hours	Hours
Maximum load	MW
Plant load factor	%
Plant utilization factor	%
Plant capacity factor	%
Plant availability factor	%
Gas consumed	MCF
HSD consumed	Liter
RFO consumed	Mton

Figure A1: Unit fuel prices

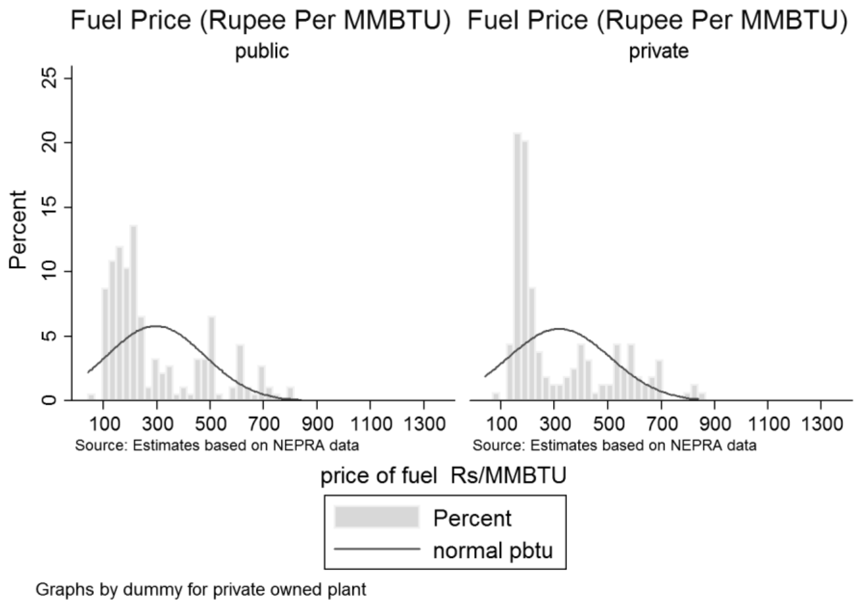

Figure A2: Unit fuel costs

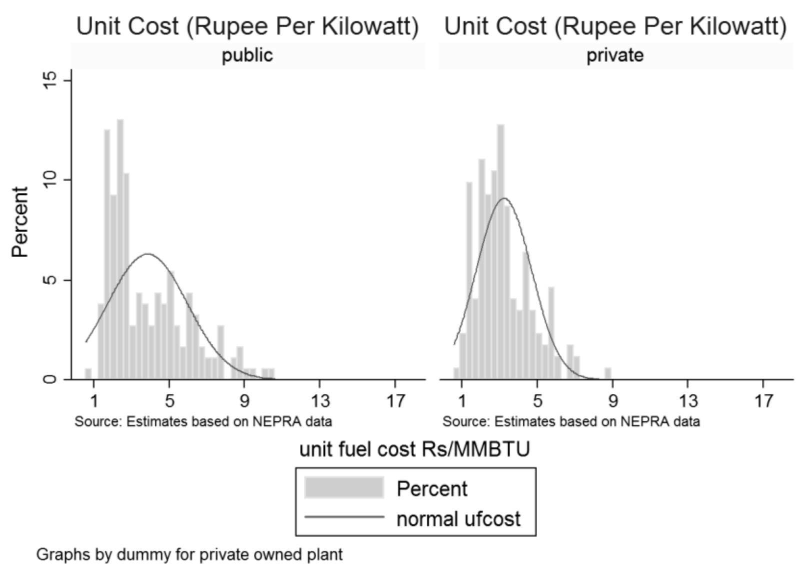

Table A2: Comparison of pooled regression estimates of cost function

Dependent variable = log output unit cost (plants running on gas)

	Cost specification		
Explanatory variable	**(1)**	**(2)**	**(3)**
Log fuel prices	0.897***	0.893***	0.876***
	(0.029)	(0.033)	(0.033)
Log electricity output	-0.501*	-0.777***	-0.883***
	(0.189)	(0.185)	(0.231)
Square of log electricity output	0.009	0.017***	0.021**
	(0.005)	(0.005)	(0.006)
Log load factor	0.043	0.042	0.034
	(0.024)	(0.023)	(0.018)
Age of plant	-0.008**	-0.005	-0.001
	(0.003)	(0.003)	(0.004)
Age of plant * private plant interaction	0.021***	0.014*	0.011*
	(0.003)	(0.006)	(0.004)
Dummy for private plant	-0.581***	-1.087***	-0.195
	(0.084)	(0.216)	(0.119)
Log fuel prices * private plant interaction		0.083*	
		(0.039)	
Constant	2.418	4.710*	5.515*
	(1.856)	(1.827)	(2.114)
Observations	181	139	150
R^2	0.930	0.957	0.930

Notes: The estimates are based on a pooled sample for 2006 to 2011. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are clustered at the plant level and reported in parentheses below the coefficients.
Column (1) = overall sample, (2) = private IPPs and public plants, (3) public and utility-owned private plants (KESC).
Source: Author's calculations.

Table A3: Pooled regression estimates of fully specified variable cost function

Dependent variable = log output unit cost (government-owned plants)

Explanatory variable	Estimates
Log fuel prices	1.982***
	(0.222)
Log wage bill	0.332*
	(0.137)
Log maintenance bill	-0.899***
	(0.084)
Log electricity output	-0.777***
	(0.094)
Square of log electricity output	0.030***
	(0.004)
Log fuel price * log wage bill	-0.046*
	(0.022)
Log fuel price * log maintenance bill	-0.021
	(0.014)
Log wage bill * log maintenance bill	0.083***
	(0.007)
Log output * log fuel price	-0.065***
	(0.012)
Log output * log wage bill	0.009
	(0.007)
Log output * log maintenance bill	0.058***
	(0.004)
Constant	1.145
	(0.963)
Observations	146
R^2	0.993

Notes: The estimates are based on a pooled sample of government-owned plants for 2006 to 2011. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are clustered at the plant level and reported in parentheses below the coefficients. Year dummies are included in the regression to control for time variation. The wage bill is calculated by dividing the total wage bill by plant/unit output. The maintenance bill is calculated by dividing the wage bill by plant/unit output.
Source: Author's calculations.

Table A4: List of plants used in empirical analysis

Public plants

- GTPS Faisalabad (units 1 to 8)
- GTPS Kotri (units 1 to 6)
- NGPS Multan (units 1, 3, 4, and 5)
- SPS Faisalabad (units 1 and 2)
- TPS Guddu (units 1 to 4 and 9 to 12)
- TPS Jamshoro (units 1 to 4)
- TPS Muzaffargarh (units 1 to 6)

Private IPPs

- AES Lal Pir Limited
- AES Pak Gen (Private) Limited
- Altern Energy Limited
- Engro Energy Limited
- Fauji Kabirwala Power Company Limited
- Gul Ahmed
- Habibullah Costal Power Company Limited
- Hub Power Company (HUBCO)
- Japan Power Generation Limited
- Kot Addu Power Company (KAPCO)
- Kohinor Energy Limited
- Rousch Pakistan (Power) Limited
- Saba Power Company
- Southern Electric Power Company
- Tapal Energy
- Liberty Power Limited
- Uch Power Limited

KESC plants (utility-owned)

- Bin Qasim Thermal Power Station (units 1 to 6)
- Korangi GTPS (units 1 to 4)
- Korangi CCGT (units 1 to 4)
- Korangi GTPS II
- Korangi Thermal Power Station (units 1, 3, and 4)
- SITE GTP (units 1 to 5)
- SITE GTPS II

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The Impact of Corporate Governance and Ownership Structure on Earnings Management Practices: Evidence from Listed Companies in Pakistan

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Abstract

This study analyzes the impact of corporate governance and ownership structure on earnings management for a sample of 372 firms listed on the Karachi Stock Exchange over the period 2003–10. We estimate discretionary accruals using four well-known models: Jones (1991); Dechow, Sloan, and Sweeney (1995); Kasznik (1999); and Kothari, Leone, and Wasley (2005). The results indicate that discretionary accruals increase monotonically with the ownership percentage of a firm's directors, their spouses, children, and other family members. This supports the view that managers who are more entrenched in a firm can more easily influence corporate decisions and accounting figures in a way that may serve their interests. This finding is consistent with prior research evidence on the role of dominant directors in expropriating external minority shareholders in Pakistan. Further, our results indicate that institutional investors play a significant role in constraining earnings management practices. We do not find any evidence that CEO duality, the size of the auditing firm, the number of members on the board of directors, and ownership concentration influence discretionary accruals. Among the control variables, we find that firms that are more profitable, are growing, or have higher leverage actively manage their earnings, while earnings management decreases with the age of the firm. The results are robust to several alternative specifications.

Keywords: Corporate governance, earnings management, ownership structure, discretionary accruals, KSE, Pakistan.

JEL classification: G32, G3, M4.

1. Introduction

Corporate governance refers to the "set of mechanisms through which outside investors protect themselves against expropriation by the insiders" (La Porta, López-de-Silanes, Shleifer, & Vishny, 2000), where "insiders" include the controlling shareholders and management. The

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main objective of corporate governance is to protect the rights of stockholders and creditors and to ensure that the interests of insiders and outsiders converge. Good corporate governance can contribute to a country's social and economic development by enabling corporations to perform better.

The 1997 Asian financial crisis, which exposed weak governance in many corporations, made the business community more sensitive to the need to examine the effectiveness of corporate governance systems within firms. In the following years, as increasing instances of fraud surfaced in the financial statements of several large corporations such as Enron, WorldCom, Tyco International, Aldelphia, Parmalat, the Taj Company and, very recently, the Olympus Corporation, many countries drafted codes of corporate governance to improve their corporate governance mechanisms. One of the key tasks of a corporate governance structure is to make sure that financial reporting procedures are transparent.

Earnings management refers to attempts by firm managers to manipulate accounting figures, thereby making their financial statements less transparent. While there is no consensus on the definition of earnings management practices (Beneish, 2001), a widely accepted definition by Healy and Wahlen (1999) is that "earnings management happens when managers use judgment in financial reporting to either deceive some stakeholders about the underlying economic performance of the firm or to manipulate contractual outcomes that rely on reported accounting numbers."

Earnings management entails purposeful involvement in a firm's external financial reporting procedures with the intention of personal gain (Schipper, 1989). It is legal if the described profits are modified in line with generally accepted accounting principles (GAAP), for example, changing the procedure for inventory estimation and depreciation. Earnings management becomes fraudulent, however, when it goes beyond GAAP, such as accelerating income acknowledgment and deferring cost recognition (Yang, Chun, & Shamsher, 2009).

Financial statements present important information to outside firm stakeholders. Investors' heavy reliance on financial data gives managers a strong incentive to alter financial statements for their own benefit. Such incentives may stem from career security, contractual obligations between outside stakeholders and managers, personal concerns in the existence of the compensation system, or the need to meet target earnings and market expectations (Healy & Wahlen, 1999). Earnings management can take numerous forms, for example, structuring certain revenues, expenses, and transactions; altering accounting measures; and accruals management. Among these, accruals management is harmful to the integrity of financial information because shareholders are often ignorant of the scope of such accruals (Mitra, 2002).

Corporations generally set annual earnings targets, which they might exceed or fall short of in different cases. For this purpose, managers use accruals to manage actual earnings and present their investors with a sound picture of the firm's targets achieved. However, total accruals do not necessarily represent earnings management. Rather, they are divided into discretionary and nondiscretionary accruals where only the former—for example, income-increasing and income-decreasing discretionary accruals—reflect earnings management. Investors are often ignorant of such actions and are thus vulnerable to making ineffective decisions based on manipulated information.

In 1999, the Organization for Economic Co-operation and Development developed a set of basic criteria for judging a country's corporate governance performance. The Securities and Exchange Commission of Pakistan (SECP) issued the Pakistani Code of Corporate Governance (PCCG) in March 2002 for the purpose of improving corporate governance practices and reducing the trust deficit among the business community, owners, and agents. The code consists of 47 clauses and sub-clauses, each covering some aspect of corporate governance standards. In conjunction with the Economic Affairs Division and UNDP, the code was implemented the same year.

In order to examine corporate governance practices in Pakistan, the SECP and International Financial Corporation conducted a survey in 2007, which revealed the need to create awareness of corporate governance among boards of directors. The Karachi Stock Exchange (KSE) undertook a similar initiative and set up a board to monitor firms' compliance with the PCCG. In the last two years, the SECP has increased its monitoring of corporations to enhance the quality of their disclosures.

Despite such steps, Pakistan's corporate governance environment is still not mature enough and insider-controlled businesses remain common (Javid & Iqbal, 2008). Existing studies show that insider-controlling shareholders play a dominant role in many corporate decisions. Abdullah, Shah, Iqbal, and Gohar (2011) investigate whether corporate dividend payouts in Pakistan are determined by minimizing the transaction costs of external finance or by the relative power of insider-controlling shareholders and external shareholders. The authors consider nonpayment of dividends an indication of the expropriation of external minority shareholders. They conclude that, in the absence of powerful external shareholders, insider-controlled firms will not willingly pay out dividends. This evidence suggests that insider-controlled businesses have the potential to expropriate minority shareholders.

Does the market see such businesses negatively? Abdullah, Shah, and Khan (2012) study 183 firms listed on the KSE between 2003 and 2008 and find that insider-controlled firms perform poorly in terms of market- as well as accounting-based measures. This provides the rationale for the present study to develop and test several hypotheses related to ownership structure and earnings management in Pakistan. We argue that the presence of insider-controlled businesses should result in a higher incidence of earnings management. Control over decision rights gives owner-managers enough power to expropriate external minority shareholders in different ways, while earnings management can serve as an effective tool to this end.

Few studies have focused on assessing the relationship between earnings management and corporate governance and ownership structure in Pakistan's context. Shah, Zafar, and Durrani (2009), who investigate the relationship between board composition and earnings management for 120 companies listed on the KSE between 2003 and 2007, fail to find any significant association between these variables. However, their study includes only two variables and does not consider other important board composition and control variables.

Shah, Butt, and Hassan (2009) investigate the association between earnings management practices and corporate governance mechanisms. Their sample of 53 firms listed on the KSE-100 index in 2006 yields significant results. The positive association between corporate governance and earnings management is surprising, but may be explained by the fact that (i) the sample period is only a year long, and (ii) Pakistani firms were in transition after the promulgation of the PCCG in 2002, which then brought about a tendency to boost discretionary accruals as a risk aversion measure.

The present study aims to include all nonfinancial firms listed on the KSE over the period 2003–10 to assess the impact of ownership structure and corporate governance on earnings management. We include several important explanatory variables such as ownership concentration, institutional ownership, managerial ownership, audit quality, chief executive officer (CEO) duality, and board size alongside an extensive set of control variables.

The study contributes to the literature on several counts. First, it provides evidence on earnings management practices for a country where insider-controlled firms are ubiquitous. Such firms are characterized by a different set of agency problems compared to widely held firms. Unlike the latter, where the conflict of interest is between managers and shareholders, insider-controlled firms feature a conflict of interest between majority and minority shareholders. Dominant insiders can easily manipulate accounting figures in their favor. This makes it relevant to test whether governance mechanisms to control earnings management practices are effective in the presence of dominant corporate insiders. We use the percentage of shares owned by a firm's directors, their spouses, children, and other family members as a proxy for insider dominance.

Second, unlike other Pakistan-based studies, we use four different models to calculate discretionary accruals as a proxy for earnings management: (i) Jones (1991), (ii) Dechow, Sloan, and Sweeney (1995), (iii) Kasznik (1999), and (iv) Kothari, Leone, and Wasley (2005). The existing literature on discretionary accruals does not conclusively support any one specific model. Aaker and Gjesdal (2010) argue that the detection of earnings management through financial statements often requires jointly testing accrual models and earnings management; relying on one model alone can yield misleading results. Apart from employing four of the most widely used models for detecting earnings management, we also calculate their average value of discretionary accruals as a robustness check.

Third, compared to existing studies on Pakistan,[1] we use a larger dataset in terms of sample period and number of firms. Where our sample comprises 370 firms between 2003 and 2010, other studies have used data for 120 firms or fewer and for a period of up to five years.

The rest of the study is organized as follows. Section 2 discusses the literature on earnings management and the role of ownership structure in association with corporate governance; this leads to the development of our hypotheses. Section 3 describes the data and

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[1] As mentioned above, only two other studies have examined corporate governance and earnings management in Pakistan: Shah, Zafar et al. (2009) and Shah, Butt et al. (2009).

methodology of the study, followed by an analysis of the results in Section 4. Section 5 presents a conclusion and policy implications.

2. Literature Review

While there is no consensus on the impact of corporate governance on earnings management (Siregar & Utama, 2008), several studies have investigated the relationship between the two variables and, in most cases, found a significant association (see, for example, Saleh, Iskandar, & Rahmat, 2005; Shen & Chih, 2007; Liu & Lu, 2007; Lo, Wong, & Firth, 2010; Bekiris & Doukakis, 2011; Chen, Elder, & Hsieh, 2007). Karamanou and Vafeas (2005) examine the relationship between corporate boards, audit committees, and earnings management and present results that are consistent with the literature.

Corporate ownership structure can potentially affect the monitoring mechanisms used to control agency costs and earnings management activities (Siregar & Utama, 2008). Javid and Iqbal (2008) note that, in Pakistan, company ownership is commonly concentrated in the hands of a few large stockholders. They also argue that, in most emerging markets (such as Pakistan), closely held firms—controlled by families, the state, or financial institutions—tend to dominate the corporate scenario.

Different proxies can be used to gauge ownership structure. García-Meca and Ballesta (2009), for example, use ownership concentration, institutional ownership, and managerial ownership to measure ownership structure and investigate its relationship with earnings management. Cornett, Marcus, and Tehranian (2008) use institutional and managerial ownership as proxies for ownership structure. In this study, we use ownership concentration, institutional ownership, and managerial ownership to measure ownership structure, while CEO duality, audit quality, and board size are used as proxies for board characteristics. The following sections discuss each proxy and its association with earnings management.

2.1. Institutional Ownership and Earnings Management

Institutional investors have a strong incentive to gather information about the corporations in which they have invested or intend to invest. Further, such motivation grows with the level of investment involved. Large ownership is likely to spur institutions to actively observe any manipulation of earnings and relevant policy decisions (Mitra, 2002).

There are two schools of thought concerning the role of institutional ownership in deterring earnings management. In the first view, institutional investors have both the power and incentive to restrict opportunistic behavior by executives in the form of earnings management practices. In the second view, institutional investors are often more concerned with short-term returns and are not interested in controlling managers: they would rather sell their stakes than monitor or remove incompetent management.

Chung, Firth, and Kim (2002) argue that large institutional shareholders with a substantial stake can deter earnings management because they have the incentive and resources to monitor it. They also note that, under the GAAP rules, managers may be tempted to transfer profits from one accounting period to the next in order to take advantage of bonuses or promotions by using reported income-increasing or decreasing accruals. Institutional investors are often long-term investors and discourage earnings management. Their advanced level of knowledge and experience, coupled with their substantial stake in a company, leads to decreasing information asymmetry between owners and agents, making it harder for the latter to manipulate earnings (Al-Fayoumi, Abuzayed, & Alexander, 2010).

High levels of institutional ownership and low levels of company performance can deter managers' incentives to employ income-increasing discretionary accruals (Chung et al., 2002). This is because, in most cases, institutional investors are long-term investors who want to maximize company performance and share value rather than encourage earnings management. Bushee (1998) provides evidence that institutional investors create fewer incentives for management to cut R&D expenditure in order to attain short-term targets and play a key role in monitoring management behavior. Other studies such as Majumdar and Nagarajan (1997), Cheng and Reitenga (2000), and Rajgopal and Venkatachalam (1997) present results that are consistent with this view.

In the second view, institutional investors are short-term-oriented, which some studies refer to as being transient or myopic: such owners focus primarily on current rather than long-term earnings (Bushee, 2001). They engage less in monitoring the management, and if they sense something is amiss, they would rather sell their shares than remove or monitor inefficient managers (Coffee, 1991).

Bhide (1993) notes that institutional owners' involvement in corporate governance is bound to be inactive either because of their transient or fragmented ownership. Transient institutional owners may trade off control for liquidity (Coffee, 1991). Hsu and Koh (2005) investigate the impact of long-term and short-term institutional ownership on the degree of earnings management in Australian corporations. Their results provide evidence that long-term institutional and transient owners can co-exist and have different impacts on earnings management. Transitory institutional owners are associated with income-increasing accruals, while long-term institutional owners are likely to deter this activity.

Charitou, Lambertides, and Trigeorgis (2007) examine managers' earnings behavior in times of financial distress, using a sample of 859 US firms that filed for bankruptcy from 1986 to 2004. They show that such companies' management with higher (lower) institutional ownership is less (more) likely to engage in downward earnings management, respectively. Roodposhti and Chashmi (2011) find a significant positive relationship between earnings management and institutional ownership for a sample of firms in Iran.

In light of the above discussion, we hypothesize that institutional ownership has a negative effect on earnings management (H1). To account for the transient nature of intuitional investors, we test this hypothesis using the 2SLS regression technique.

2.2. *Managerial Ownership and Earnings Management*

While the division of control and ownership in corporations is now common in the modern business environment, it also creates a severe conflict of interest between owners and agents. Managers who possess power may have an incentive to use firm resources for their own benefit and expropriate wealth in terms of bonuses or other benefits at the cost of shareholders (Beasley, 1996; Fama, 1980). Berle and Means (1932) argue that, whenever a little equity is held by the managers of a firm whose owners are scattered, then the former will use the firm's resources for their own benefit rather than for the benefit of their shareholders. Legally, managers are bound to utilize resources effectively and efficiently in order to maximize shareholders' wealth. However, as rational actors, managers tend to make choices that mostly benefit them (Eccles, 2001).

What happens when we increase the ownership stake of managers in a firm? The answer is not straightforward, but can be addressed using two hypotheses: (i) alignment of interest and (ii) entrenchment. The alignment-of-interest hypothesis states that, when managers' ownership stake in a firm increases, it reduces the agency conflict between shareholders and managers (Jensen & Meckling, 1976). This should, in turn, reduce the scope for opportunistic behavior on the part of managers. Consistent with this idea, Demsetz and Lehn (1985) find a positive association between managerial ownership and firm performance.

The entrenchment hypothesis states that ownership stakes beyond a certain level put managers in a dominant position, which they can use to exploit external minority shareholders (Morck, Shleifer, & Vishny, 1988). Teshima and Shuto (2008), who investigate the association between managerial ownership and earnings management in Japanese firms, have developed a theoretical model according to which earnings management incentives are lower when the level of managerial ownership is either low or high; incentives are higher at an intermediate level of managerial ownership. Thus, there is a cubical or nonlinear relationship between earnings management and managerial ownership. Correspondingly, managerial ownership is significantly and negatively associated with discretionary accruals at low and high levels, and positively associated with discretionary accruals at an intermediate level. Warfield, Wild, and Wild (1995) and Banderlipe (2009) find an inverse association between earnings management and managerial ownership.

In light of the existing evidence on the role of insiders' dominance in Pakistan,2 we expect the entrenchment hypothesis to hold strongly. Specifically, we expect that higher levels of managerial ownership give managers enough power to engage in earnings management in the form of bonuses, perks, and perquisites, which they are in a position to approve in their favor. Also, at higher levels of ownership, managers benefit equally from any improvement in operational profitability. Thus, owner-managers will have high incentive to derive all possible benefits from earnings management, such as obtaining external finance at a lower cost (Dechow, Sloan, & Sweeney, 1996). Thus, we hypothesize that managerial ownership is positively associated with earnings management (H2).

2.3. Ownership Concentration and Earnings Management

Shleifer and Vishny (1997) suggest that concentrated ownership has comparatively large advantages in developing countries, where property

[2] Insider-controlled firms pay smaller dividends and usually have lower market share prices (Abdullah et al., 2011; Abdullah et al., 2012).

rights are not well defined and protected by legal systems. La Porta, López-de-Silanes, Shleifer, and Vishny (1999) confirm this proposition: using the ownership concentration of the three largest shareholders of the biggest companies in countries around the world, they find that weak legal and institutional environments (laws and implementations) are linked with extremely concentrated company ownership.

Ownership concentration has two alternative effects on earnings management: alignment and entrenchment. According to the alignment impact, owners in a concentrated ownership structure have more incentive to monitor management because it costs less to do so than the anticipated advantages of their large stakes in the company. Ramsay and Blair (1993) suggest that concentrated ownership provides sufficient incentive to larger shareholders to monitor management. Their greater voting power allows them to affect the board-of-directors composition and its decisions (Persons, 2006).

The alignment impact decreases the controlling owner's incentive to expropriate firms for their personal benefit and to minimize earnings management practices in order to secure firms and their own future (Fan & Wong, 2002). Consistent with this view, Roodposhti and Chashmi (2011), Alves (2012), and Abdoli (2011) find a significant and inverse association between earnings management practices and ownership concentration.

In contrast to this, Bebchuk (1994) and Stiglitz (1985) suggest that concentrated ownership might inversely influence the value of the firm, given the capacity of larger shareholders to exploit their dominant position at the cost of minority stockholders. Liu and Lu (2007) argue that the expropriation of minority shareholders by majority shareholders is directly associated with the extent of the latter's power in a firm. Their study finds a positive and significant association between the level of ownership concentration and earnings management practices.

Fan and Wong (2002) and Claessens, Djankov, and Lang (2000) provide empirical evidence that poor governance and lack of fair financial information disclosure are the main results of concentrated ownership in Asian corporations. Wang (2006) investigates the association between the presence of concentrated owners and the incidence of fraud, and finds that high ownership concentration is linked with a higher likelihood of fraud and a tendency to commit fraud. Choi, Jeon, and Park (2004) and Kim and Yoon (2008) also document a positive association between ownership concentration and earnings management.

Given the corporate landscape in Pakistan where family businesses are common, concentrated ownership can imply the concentration of shares in the hands of a few family members—making the entrenchment hypothesis even more relevant. Thus, we hypothesize that there is a positive relationship between ownership concentration and earnings management (H3).

2.4. Audit Quality and Earnings Management

Auditors play a key role in their clients' disclosure practices and procedures. Concerns regarding the quality of financial information and its association with the quality of the auditing process have grown with time, given the rising incidence of fraud in big businesses, failures, and litigation (Chambers, 1999; Tie, 1999). The auditing procedure serves as an investigation tool that can constrain managers' incentive to influence a firm's reported earnings (Wallace, 1980). Thus, auditing may reduce misreporting and mispricing in financial reporting and control managerial incentives and discretion with respect to earnings management.

DeAngelo (1981) characterizes audit quality as the mutual likelihood of reporting and detecting errors in a company's financial statements; this depends partially on the auditors' independence. External quality auditors are linked with financial reports featuring fewer earnings manipulation practices. Larger auditing firms have more incentive to preserve their reputation as well as more resources, which allows them to perform better auditing services than smaller auditors (Palmrose, 1988).

There are several proxies for measuring audit quality, including the size of the auditing firm (DeAngelo, 1981), the auditor's tenure with its clients (Johnson, Khurana, & Reynolds, 2002), and the presence of an industry-specific auditor. However, there is sufficient evidence that the size of the auditing firm is a good proxy for audit quality (see Francis, Maydew, & Sparks, 1999; Becker, DeFond, Jiambalvo, & Subramanyam, 1998; Chia, Lapsley, & Lee, 2007). Consistent with the literature, we hypothesize that there is a negative relationship between audit quality and earnings management (H4).

2.5. CEO Duality and Earnings Management

When the same person serves as both a firm's CEO and board chairperson, we refer to this as CEO duality. Under Clause VI of the revised PCCG 2002,[3] the SECP recommends a division of roles between board chairperson and CEO to avoid substantial concentration of control. However, given that 32 percent of the sample firms feature CEO duality, we consider it to be a significant variable.

Previous studies that have investigated CEO duality include Peng, Zhang, and Li (2007), and Dalton, Daily, Ellstrand, and Johnson (1998). The impartiality and quality of board control is generally perceived to suffer if the CEO is also the board chairperson. The centralization of authority in a firm may tempt the CEO to exercise excessive influence over the board, such as in managing meetings, setting board agendas, and controlling the stream of information made available to board members (Persons, 2006).

The literature puts forward two views on the role of CEO duality: the agency theory and stewardship theory (Abdul Rahman & Haniffa, 2005). Under the agency theory, it is essential that these two roles are kept separate to ensure effectual board control over the firm's managers: this is provided through crosschecks to minimize any combative strategies by the CEO (Hashim & Devi, 2008). When one person holds two key positions, they are more likely to follow policies that benefit them instead of all the firm's shareholders. Zulkafli, Abdul-Samad, and Ismail (2005) support this view and show that a division of power between the CEO and board chair permits effective monitoring via the firm's board.

Anderson, Mansi, and Reeb (2003) indicate that the reliability of information on accounting earnings is positively associated with the division of roles between board chair and CEO. Firms that commit fraud are more likely to have CEOs who also chair the board (CEO duality) (Chen, Firth, Gao, & Rui, 2006). Worrell, Nemec, and Davidson (1997) document an inverse association between firm performance and CEO duality, which is consistent with the agency theory. Other studies, however, find no evidence of an association between these variables (see Daily & Dalton, 1997; Peasnell, Pope, & Young, 2000a; Bédard, Chtourou, & Courteau, 2004; Kao & Chen, 2004; Xie, Davidson, & DaDalt, 2003; Rahman & Ali, 2006).

Contrary to the above view, the stewardship theory states that combining the two roles of CEO and board chair enhances decision-making and enables strategic vision, allowing the chair/CEO to lead the

[3] The PCCG was revised in 2012 and is available at www.secp.gov.pk

board toward the firm's goals and objectives with minimal intervention from the board. Given the problems of coordination, some boards favor CEO duality (Finkelstein & D'Aveni, 1994). In addition, Haniffa and Cooke (2002) find that firms with CEO duality are subject to less interference in management, while depending on strong boards to provide adequate checks.

While the discussion above shows that studies have not reached a consensus on whether CEO duality reflects poor corporate governance and increases earnings management or vice versa, we have followed the literature and the PCCG in proposing that the roles of CEO and chair be separated. Thus, we hypothesize that CEO duality is positively associated with earnings management practices (H5).

2.6. Board Size and Earnings Management

Several studies show that larger boards have greater monitoring power over management activities. Some studies use board size to measure board expertise (Bacon, 1973; Herman, 1981), while Jensen (1993) argues that size is a value-relevant aspect of corporate boards. Smaller boards are believed to work more effectively than larger boards because they are easier to coordinate (Jensen, 1993). Yermack (1996) links better firm performance with smaller boards, specifically for large industrial corporations in the US, where firms with smaller boards have a higher market value.

Jensen (1993) and Lipton and Lorsch (1992) find that smaller boards are more effective than larger boards: the latter may be less efficient in carrying out oversight duties if the CEO tends to dominate board matters. Moreover, larger boards may be subject to a greater degree of protocol and etiquette, making it easier for the CEO to control the board (Jensen, 1993). Rahman and Ali (2006) and Chin, Firth, and Rui (2006) find a positive association between board size and earnings management.

The other view is that larger boards are able to contribute more time and effort to supervising management (Monks & Minow, 1995). This argument is supported by Klein (2002), who suggests that larger boards are positively associated with effective monitoring, given their collective experience and ability to allocate the workload across several board members. Peasnell et al. (2000a), Bédard et al. (2004), and Xie et al. (2003) provide empirical evidence that earnings management practices are less common in firms with larger boards. Pearce and Zahra (1992) confirm that larger boards have a comparative advantage in terms of information and expertise over smaller boards. In most bankruptcy cases, for instance, firms are found to have smaller boards (Chaganti, Mahajan, & Sharma, 1985).

Dalton, Daily, Johnson, and Ellstrand (1999) show that firm performance is positively associated with board size because larger boards have greater access to important resources such as financial support and expertise and more external linkages than smaller boards in executing company operations. Smaller boards are perceived as unable to detect or constrain earnings management (Yu, 2008) if dominated by large shareholders or management. Larger boards are better able to monitor the actions of top management (Zahra & Pearce, 1989).

Larger boards with a more diverse range of academic and technical backgrounds, expertise, and perspectives on how to develop the quality of decision making are more likely to protect and represent shareholders' interests. They are thus less vulnerable to CEO dominance. Given this, we hypothesize that there is a negative relationship between board size and earnings management (H6).

2.7. Control Variables

Moses (1987) argues that larger firms are more visible, which means that they are expected to manage their earnings to reduce their visibility. Ashari, Koh, Tan, and Wong (1994), however, show that larger firms are subject to closer scrutiny by analysts and investors because there is more information available on them in the market. Sun and Rath (2009) investigate earnings management practices among Australian firms and find that most firms are involved in earnings management, of which the return on assets (ROA) and firm size are key determinants. Kim, Liu, and Rhee (2003) show that smaller firms engage in more earnings management practices than large firms. In view of this, we expect a negative relationship between firm size and earnings management.

We also include financial leverage as a control variable. Sweeney (1994) argues that managers use discretionary accruals to assure debt agreement requirements because highly leveraged companies have greater incentive to boost earnings. Becker et al. (1998) support this view and provide evidence that managers respond to debt contracting by strategically reporting discretionary accruals.

Dechow and Skinner (2000), however, argue that firms with a high leverage ratio are expected to report little boost in earnings. Similarly, Sveilby (2001) establishes that firms with a low financial leverage are expected to increase rather than decrease earnings. Chung and Kallapur (2003) examine the association between discretionary accruals and leverage, but fail to find a significant relationship between the two. In this study, we measure leverage as the ratio of total liabilities to total assets, denoted by LEVG.

We include ROA to control for long-term growth forecasting errors with respect to the incentive for earnings management (Kasznik, 1999; Dechow et al., 1995). Bartov, Gul, and Tsui (2000) argue that the incentive to engage in earnings management is greater among firms that are experiencing financial difficulty and performing poorly, i.e., in terms of ROA and cash flow. Several studies on corporate governance and earnings management include ROA as a control variable (see, for example, Ali, Salleh, & Hassan, 2008; Rahman & Ali, 2006; Chen, Cheng, & Wang, 2010). We expect a positive association between ROA and earnings management.

Other control variables include the age of the firm (AGE), cumulative loss (LOSS), the book-to-market ratio (BM), growth in sales (GROWTH), and volatility of net income (VOL). We include all these in the study's model, given that they can potentially influence the firm's tendency to manage its earnings. For example, older firms, which are likely to have a higher cash flow, less operational risk, and a good reputation, are expected to avoid earnings management practices. Concerning the growth variable, the literature reveals that firms with high growth opportunities are often involved in earnings management in order to avail external finance at a lower cost. Similarly, firms with a volatile cash flow are expected to manage their earnings. Finally, Butler, Leone, and Willenborg (2004) suggest that discretionary accruals are higher for financially distressed firms. Therefore, we expect a positive relationship between discretionary accruals and existing accumulated loss.

3. Data and Methodology

This section presents an overview of the data, variables, and methodology used in the study.

3.1. Sample and Data Sources

Given that the SECP announced the PCCG in March 2002, the study's sample period spans 2003 to 2010. The sample consists of all firms listed on the KSE. However, the analysis does not include financial firms and firms for which there is incomplete data. Financial firms are uniquely regulated: their accruals behavior is different from that of nonfinancial firms (Klein, 2002) and is less easily captured by total accrual models (Peasnell, Pope, & Young, 2000b).

Roodposhti and Chashmi (2011) observe that financial firms (including banks) are excluded because the industry is regulated and likely to have fundamentally different cash flows and accrual processes. Other studies provide evidence that commercial banks use loan loss provisions to manage their earnings (Beatty, Chamberlain, & Magliolo, 1995). Klein (2002), for instance, excludes "53 banks (SIC codes: 6000 to 6199) and 36 insurance companies (SIC codes: 6300-6411) because it is difficult to define accruals and abnormal accruals for financial services firms." Bédard et al. (2004) exclude financial firms for similar reasons.

Table 1 describes the sample selection procedure. The sample is adjusted for outliers using a residual versus predicted scatter plot. In this analysis, the residuals are plotted on the y-axis and the predicted values on the x-axis; extreme values are identified and eliminated because they might distort the regression results and make generalization difficult. The data used has been collected from the annual reports of the companies listed on the KSE and from their respective websites.

Table 1: Sample selection details

Total number of firms listed on the KSE in Mar–Jul 2010	650
Financial firms excluded	146
Firms with incomplete data	132
Number of firms included in the analysis	372
Firm-year observations available for calculation of accruals	1,551
Firm-year observations available in discretionary accruals in all models	986

Source: Authors' calculations.

3.2. Calculation of the Dependent Variable

The dependent variable in this study is discretionary accruals (*DAC*). Accruals are defined as the difference between net income and cash flows from operations (Jones, 1991; Chen, Lin, & Zhou, 2007). They can be further divided into discretionary (nonobligatory expenses) and nondiscretionary accruals (obligatory expenses). Discretionary accruals represent the modifications made to the cash flow by the firm's managers; nondiscretionary accruals are accounting-based adjustments to the firm's cash flow, which are directed by bodies that set accounting standards

(Rao & Dandale, 2008). Following Subramanyam (1996), Jones (1991), Shah et al. (2009), and Roodposhti and Chashmi (2011), we use discretionary accruals to estimate earnings management.

The first step in calculating discretionary accruals is to estimate total accruals, following which a particular model can be used to separate discretionary accruals from total accruals. Total accruals are defined as the difference between net income and the cash flow from operations scaled by the lagged total assets (Kasznik, 1999; Dechow et al., 1995).

$$TA_{it} = NI_{it} - CFO_{it} \quad (1)$$

where TA_{it} refers to the total accruals of firm i at time t, NI_{it} is the net income of firm i at time t, and CFO_{it} refers to the cash flow from operations.

There are four well-known models used to separate accruals into their nondiscretionary and discretionary components. As explained in Section 1, we use all four models to calculate discretionary accruals for comparison and to determine the robustness of the results. These models are discussed below.

Prior to Jones (1991), nondiscretionary accruals were assumed to be constant over time. Jones introduced a model that accounted for the firm's changing economic circumstances in explaining total accruals. Her model is given below:

$$TA_{it}/A_{it-1} = \alpha_1[1/A_{it-1}] + \alpha_2[\Delta REV_{it}/A_{it-1}] + \alpha_3[PPE_{it}/A_{it-1}] + e_{it} \quad (2)$$

where ΔREV_{it} is the change in revenue for firm i from time t – 1, A_{it-1} refers to lagged total assets, and PPE_{it} denotes gross property, plant, and equipment for firm i in time t.

The model includes PPE and ΔREV to control for changes in nondiscretionary accruals caused by the firm's changing macroeconomic circumstances. Changes in revenue can serve as an objective proxy for shifting economic conditions, while gross property, plant, and equipment captures the effect of nondiscretionary depreciation expenses on total accruals. All the variables are scaled by lagged total assets (A_{it-1}) to control for heteroskedasticity (see Kothari et al., 2005; Rajgopal & Venkatachalam, 1997; Jones, Krishnan, & Melendrez, 2007; Liu & Lu, 2007). Equation (2) is then estimated for each year in a cross-sectional regression, where the regression residuals for each firm are calculated to determine DAC.

Although Jones (1991) assumes that the firm's managers do not manage its revenues, i.e., revenues are nondiscretionary, there may be situations where managers choose to manipulate revenue figures. For example, Dechow et al. (1995) argue that, if managers decide to accrue the firm's revenues at the year's end where the cash has yet to be received, then the revenues will reflect an inflated amount in that year with a commensurate increase in account receivables. The authors adjust the Jones (1991) model to account for this managerial discretion over revenues. They deduct the change in account receivables (ΔREC) from the change in revenues (ΔREV). Their model is shown in equation (3):

$$TA_{it}/A_{it-1} = \alpha_1[1/A_{it-1}] + \alpha_2[\Delta REV_{it} - \Delta REC_{it})/A_{it-1}] + \alpha_3[PPE_{it}/A_{it-1}] + e_{it} \quad (3)$$

Kasznik (1999) adds the change in free cash flows (ΔCFO) to the Dechow et al. (1995) model because evidence from Dechow (1994) suggests that ΔCFO is negatively correlated with total accruals. Omitting ΔCFO from the accruals equation results in a higher estimation error. The Kasznik model is given below:

$$TA_{it}/A_{it-1} = \alpha_1[1/A_{it-1}] + \alpha_2[\Delta REV_{it} - \Delta REC_{it})/A_{it-1}] + \alpha_3[PPE_{it}/A_{it-1}] + \alpha_4[\Delta CFO_{it}/A_{it-1}] + e_{it} \quad (4)$$

Kothari et al. (2005) employ a technique similar to Dechow et al. (1995) and add lagged ROA. They argue that the earnings management proxy would suffer from measurement error if one did not control for past performance. This is because accruals are associated with operating performance. They propose the following model:

$$TA_{it}/A_{it-1} = \alpha_1[1/A_{it-1}] + \alpha_2[\Delta REV_{it} - \Delta REC_{it})/A_{it-1}] + \alpha_3[PPE_{it}/A_{it-1}] + \alpha_3[ROA_{it}/A_{it-1}] + e_{it} \quad (5)$$

3.3. Model Specification and Tests

Having constructed DAC, we follow the literature with respect to including other key variables and control variables in a regression model to assess the relationship between corporate governance and ownership structure and DAC (see, for example, Becker et al., 1998; Liu & Lu, 2007; Ashbaugh-Skaife, Collins, Kinney, & LaFond, 2008; Prawitt, Smith, & Wood, 2009; Dhaliwal, Naiker, & Navissi, 2010).

3.3.1. Model for Estimating DAC

The study's model is written as

$$DAC_{it} = \alpha + \beta_1 DIROWN_{it} + \beta_2 INSTOWN_{it} + \beta_3 OWNCON_{it} + \beta_4 AUDQ + \beta_5 BSIZ_{it} + \beta_6 CEO_{it} + \beta_7 BIG5OWN_{it} + \beta_8 FSIZ_{it} + \beta_9 LEVG_{it} + \beta_{10} ROA_{it} + \beta_{11} AGE_{it} + \beta_{12} GROWTH_{it} + \beta_{13} MB_{it} + \beta_{14} VOL_{it} + \beta_{15} LOSS_t + e_{it} \quad (6)$$

where DAC_{it} refers to the discretionary accruals (as a proxy for earnings management) of firm i at time t while e_{it} is the error term. Table 2 defines the other explanatory and control variables in the model.

Table 2: Description of explanatory and control variables

Variable		Measured by
Ownership concentration	$OWNCON_{it}$	Natural log of the number of firm shareholders (Rozeff, 1982)
Institutional ownership	$INSTOWN_{it}$	Percentage of common stock held by institutions (Chashmi & Roodposhti, 2011)
Managerial ownership	$DIROWN_{it}$	Percentage of common stock held by management (Saleh et al., 2005)
Audit quality	AUDQ	Dummy variable = 1 if firm is audited by the Big Four (PwC, Deloitte Touche Tohmatsu, Ernst & Young, KPMG) and 0 otherwise (Siregar & Utama, 2008)
Board size	$BSIZ_{it}$	Number of board members (Zhou & Chen, 2004)
CEO duality	CEO_{it}	Dummy variable = 1 if CEO is also board chairperson and 0 otherwise (Roodposhti & Chashmi, 2011)
Big 5 ownership	$BIG5OWN_{it}$	Sum of ownership percentage of the five biggest firm shareholders
Firm size	$FSIZ_{it}$	Log of total assets (Roodposhti & Chashmi, 2011)
Leverage	$LEVG_{it}$	Ratio of total liabilities to total assets (Roodposhti & Chashmi, 2011)
Return on assets	ROA_{it}	Ratio of net income to total assets (Bekiris & Doukakis, 2011)
Firm age	AGE_{it}	Difference between focal year and year of incorporation
Firm growth	$GROWTH_{it}$	Geometric mean of the annual percentage increase in total sales calculated in a rolling window of four years
Market-to-book value	MB_{it}	Ratio of market value per share to book value per share
Volatility	VOL_{it}	Coefficient of the variation in net income in a rolling window of four years
Loss	$LOSS_t$	Dummy variable = 1 if the firm has accumulated losses in balance sheet and 0 otherwise

Since we are using panel data, we must choose from among a pooled, fixed, or random effects model. Assuming that there are no systematic differences in earnings management practices across firms, years, and industries, pooled OLS is the preferred choice. However, the results of the Breusch-Pagan Lagrangian multiplier test (which helps choose between a random effects and pooled OLS model) show that pooled OLS cannot be used.

To choose between using a random and fixed effects model, we apply the Hausman specification test, the results of which favor the use of fixed effects (Table 3). Following the existing studies on earnings management, we include year and industry dummies to control for unobservable fixed effects in a given year or given industry while adjusting the errors for clustering at the firm level (see Badolato, Donelson, & Ege, 2014; Dechow et al., 1995).

Table 3: Hausman specification test for fixed and random effects

Model	Chi^2 value	P-value
Kothari et al. (2005)	19.86	0.0306
Kasznik (1999)	32.90	0.0030
Dechow et al. (1995)	6.76	0.0700
Jones (1991)	12.78	0.0540

Source: Authors' calculations.

Some of the independent variables and control variables are significantly correlated. In order to avoid over-specifying the model, we do not include all the variables in one regression; instead, we gradually add and drop variables in different models. Therefore, we estimate seven different regressions for each of the four accrual models discussed above.

3.3.2. Endogeneity Test

It is possible that some of the ownership variables and DAC are endogenously determined. For example, knowing that a firm will engage in earnings management through tactics that are beyond their control, institutional investors might choose not to invest in the firm or to simply leave once they discover instances of earnings management. In such cases, the causality can run from accrual management to institutional ownership or vice versa.

We test for this possibility using the Wu-Hausman endogeneity test, the results of which (Table 4) show that institutional ownership is endogenous in relation to accruals. Therefore, we run a 2SLS regression to test the relationship between DAC and institutional ownership. The instruments selected for institutional ownership are ASMAT (fixed assets to total assets) and CASH (cash to total assets). These are selected on the basis of their high correlation with the INSTOWN variable, but nonsignificant correlation with the error term.

Table 4: Hausman-Wu test for endogeneity of institutional ownership

Model	Degrees of freedom	F-test value	P-value
Kothari et al. (2005)	F(1, 896)	12.96600	0.0003
Kasznik (1999)	F(1, 896)	14.98060	0.0001
Dechow et al. (1995)	F(1, 896)	9.97134	0.0016
Jones (1991)	F(1, 1,170)	13.76600	0.0002

Source: Authors' calculations.

4. Analysis of Results

This section examines the descriptive statistics and regression results.

4.1. Descriptive Statistics

Table 5 gives descriptive statistics for the dependent and explanatory variables. These are calculated only for those observations for which values for the dependent variables were available. The mean values of DAC using the Kothari, Kasznik, Dechow, and Jones models are 0.0035, 0.0000, 0.0254, and 0.0253, respectively. About 55 percent of the sample firms are audited by one of the Big Four auditors. Almost 31 percent have CEO duality, while 68 percent have separated the roles of CEO and chair. The mean board size is 7.98, which is near the minimum requirement for the board of directors under Clause II, Section 174 of the Companies Ordinance 1984.

Table 5: Descriptive statistics

Variable	Observations	Mean	SD	Min.	Max.
DAC_Kothari	986	0.0035	0.1461	–0.7200	0.7217
DAC_Kasznik	986	0.0000	0.1270	–0.3555	1.8224
DAC_Jones	986	0.0253	0.2150	–4.6217	1.8688
DAC_Dechow	986	0.0254	0.2014	–3.4098	1.8735
DIROWN	967	0.2801	0.2771	0.0000	0.9775
INSTOWN	968	0.3637	0.2521	0.0000	0.9817
BIG5OWN	698	0.6267	0.2070	0.0000	0.9972
BSIZE	986	7.9899	1.5969	7.0000	15.0000
CEO	986	0.3093	0.4625	0.0000	1.0000
AUDQ	980	0.5500	0.4977	0.0000	1.0000
CONC	966	7.2110	1.2290	3.3262	10.9868
ROA	986	0.0971	0.1317	–0.3004	1.9046
AGE	986	2.1552	0.8056	1.0000	3.0000
GROWTH	986	0.1976	0.3868	–0.2758	11.2394
MB	929	1.3790	2.2779	–13.0000	13.0000
LEVG	986	0.5452	0.2049	0.0017	0.9996
VOL	986	0.0579	0.0864	0.0014	1.1882
FSIZE	986	7.9058	1.5910	2.8622	12.2456

Source: Authors' calculations.

On average, directors, their spouses, children, and other relatives hold 28 percent of common equity in firms while institutional shareholders hold almost 36.4 percent. Shah et al. (2009) report a similar level of institutional ownership for Pakistani firms. Of 426 firm-year observations, institutional investors hold stock equal to 50 percent or more; out of 423 firm-year observations, managers account for 50 percent or more ownership. The mean value of concentration is 7.24 while firms' average leverage ratio is 54.5 percent. The sample firms are profitable with a mean ROA of 9.7 percent. Their average size is 7.7 log million.

The correlation coefficients are presented in Table 6, which shows that there is no serious multicollinearity problem: none of the coefficients among the explanatory variables is more than 0.7. This is verified by the variance inflation factor, which should not exceed 10. The correlation coefficients show that DAC is positively related to director ownership and audit quality in three models, and negatively correlated with institutional ownership, the ownership percentage of the five largest shareholders, and the concentration of ownership.

Table 6: Correlations matrix

	DAC				DIROWN	INSTOWN	BIG5OWN	BSIZE	CEO	AUDQ	CONC	ROA	AGE	GROW	MB	LEVG	VOL
Kothari	1.00																
Kasznik	0.46	1.00															
Jones	0.62	0.43	1.000														
Dechow	0.80	0.48	0.930	1.000													
DIROWN	0.08	−0.10	0.001	0.030	1.00												
INSTOWN	−0.09	0.02	−0.052	−0.080	−0.62	1.00											
BIG5OWN	−0.10	0.06	−0.038	−0.060	−0.11	0.12	1.00										
BSIZE	−0.06	0.08	0.010	−0.017	−0.24	0.25	0.03	1.000									
CEO	0.00	−0.04	0.010	−0.001	0.10	−0.11	−0.04	−0.200	1.00								
AUDQ	−0.02	0.22	0.010	0.010	−0.19	0.15	0.04	0.200	−0.23	1.00							
CONC	−0.08	0.01	−0.001	−0.020	−0.40	0.30	−0.09	0.300	−0.10	0.27	1.00						
ROA	0.11	0.77	0.151	0.190	−0.15	0.04	0.03	0.120	−0.08	0.30	0.10	1.00					
AGE	−0.01	−0.02	0.040	0.010	0.05	0.01	0.10	−0.001	0.101	−0.01	−0.01	−0.01	1.00				
GROWTH	0.07	0.06	0.060	0.060	−0.04	0.00	0.02	0.020	−0.04	0.07	−0.02	0.03	−0.06	1.00			
MB	−0.06	0.25	0.050	0.030	−0.24	0.09	0.10	0.145	−0.01	0.26	0.16	0.34	0.07	0.00	1.00		
LEVG	0.01	−0.17	0.080	0.040	−0.01	−0.10	−0.03	0.120	−0.00	0.01	0.08	−0.16	0.04	−0.05	0.15	1.00	
VOL	−0.00	0.02	−0.001	−0.010	−0.00	−0.05	0.04	−0.010	−0.11	0.07	−0.02	−0.00	0.04	0.00	0.02	−0.06	1.00
FSIZE	−0.04	0.04	0.030	0.010	−0.28	0.25	−0.04	0.380	−0.16	0.29	0.67	0.17	−0.00	0.16	0.11	0.08	−0.10

Source: Authors’ calculations.

4.2. Regression Results

The results of the regression analysis are presented in Tables 7, 8, 9, and 10 using the accruals models of Kothari et al. (2005), Kasznik (1999), Dechow et al. (1995), and Jones (1991), respectively. DAC is regressed on several explanatory and control variables. The explanatory power of these models ranges from 10 percent (Jones model) to 68.7 percent (Kasznik model) as denoted by the R^2 value. Overall, the regression models are highly significant. The low value of R^2 in some of the models shows that only a small part of the variability of DAC is explained by the variability of the independent variables. However, this number is acceptable for any study employing DAC as a proxy for earnings management (Peasnell et al., 2000b).

In each table, columns (1) to (7) give different regression estimates; the ownership variables and highly correlated variables were entered separately in order to eliminate any over-identification. All the regressions include year and industry dummies. Apart from the institutional ownership regression, all the other models were estimated using fixed effects. The choice of a fixed effects model is based on the Hausman test results reported in Table 3. The test compares the coefficients of fixed and random effects models for systematic differences. If the coefficients of both models are systematically different, the null hypothesis of no difference is rejected. As shown in Table 3, the p-value of the Hausman test for all four models is below 10 percent, thus supporting the use of fixed effects.

As explained earlier, we find that institutional ownership is endogenously determined with DAC (see Table 4) and thus use the 2SLS technique to resolve the endogeneity issue. We use cash to total assets and fixed assets to total assets as instruments for institutional ownership in the first-stage 2SLS regression.

The results of the four models in Tables 7 to 10 show that director ownership has a positive impact on DAC. This relationship is statistically significant in three models and insignificant in the Jones (1999) model. DIROWN has a positive sign, which is in line with our hypothesis that, as the directors' ownership in a firm increases, they become more powerful and can influence corporate decisions more easily. This supports the entrenchment hypothesis as well as prior evidence from Pakistan that director ownership is associated with lower dividend payments (Abdullah et al., 2011) and lower firm performance (Abdullah et al., 2012).

Table 7: Results for DAC regressed on ownership and control variables (Kothari et al. model)

Variable	(1) DIR	(2) INST 2SLS	(3) BIG5	(4) AUDQ	(5) BSIZE	(6) CEO	(7) CONC
ROA	0.293***	0.249***	0.293***	0.279***	0.286***	0.285***	0.291***
	(0.075)	(0.048)	(0.082)	(0.075)	(0.075)	(0.075)	(0.074)
AGE	−0.011*	−0.000	−0.002	−0.008	−0.009	−0.009	−0.010
	(0.006)	(0.007)	(0.008)	(0.006)	(0.006)	(0.006)	(0.006)
GROWTH	0.030***	0.021	0.028***	0.030***	0.029***	0.030***	0.029***
	(0.010)	(0.015)	(0.008)	(0.011)	(0.011)	(0.011)	(0.011)
MB	−0.004	0.000	−0.005	−0.004	−0.004	−0.004	−0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
LEVG	0.076***	−0.008	0.100***	0.078***	0.082***	0.079***	0.078***
	(0.024)	(0.034)	(0.032)	(0.024)	(0.024)	(0.024)	(0.024)
FSIZE	0.001	0.008	−0.002	−0.001	0.001	0.000	
	(0.005)	(0.006)	(0.006)	(0.005)	(0.004)	(0.004)	
VOL	0.037	−0.035	0.015	0.047	0.054	0.052	0.030
	(0.053)	(0.069)	(0.061)	(0.052)	(0.052)	(0.052)	(0.051)
LOSS	0.002	−0.005	0.005	0.007	0.006	0.006	0.003
	(0.017)	(0.018)	(0.019)	(0.017)	(0.016)	(0.016)	(0.016)
DIROWN	0.035**						
	(0.016)						
INSTOWN		−0.397***					
		(0.121)					
BIG5OWN			−0.047				
			(0.030)				
AUDQ				0.006			
				(0.010)			
BSIZE					−0.004		
					(0.003)		
CEO						0.002	
						(0.009)	
CONC							−0.004
							(0.004)
Constant	−0.074*	0.068*	−0.061	−0.058	−0.045	−0.065	−0.038
	(0.044)	(0.040)	(0.056)	(0.042)	(0.047)	(0.043)	(0.042)
Observations	908	907	655	921	927	927	909
R^2	0.155		0.173	0.143	0.145	0.144	0.151
Industry and year dummies	Yes		Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors adjusted for clustering at the firm level are reported in parentheses beneath the coefficients of the explanatory variables. Statistical significance is denoted by ***, **, and * at 1, 5, and 10 percent, respectively.
***Source*:** Authors' calculations.

The next most important finding is the negative association between institutional ownership and DAC. The coefficient of INSTOWN is negative and statistically significant at the 1 percent level in all four models. This finding supports our hypothesis (H1) that institutional investors play an important role in monitoring the activities of managers, using their knowledge and dominant ownership stake in doing so. This finding is in line with the literature on the role of institutional investors in Pakistan. For example, Abdullah et al. (2011) find that institutional investors in Pakistan use their power to force entrenched managers to pay out dividends.

Of the other ownership variables, none is statistically significant in any model except for ownership concentration (CONC), which is statistically significant and negatively related to DAC only in the Kasznik (1999) model in Table 8. The ownership concentration of the five largest shareholders (BIG5OWN) carries the expected negative sign in three models, but is statistically insignificant. One reason for its nonsignificance may be that the largest shareholders play an effective role in monitoring only when they are external. If they are part of the management or family group, then their role is similar to that of entrenched managers. Since our data does not allow us to differentiate between external and internal block holders, the variable BIG5OWN may have mixed these two roles.

The coefficients of the other ownership variables—audit quality (AUDQ), board size (BSIZE), and CEO duality (CEO)—are all insignificant. This may relate to managers' control over the selection of board members and decisions, in turn leading to ineffective monitoring (Kosnik, 1987) and/or the lack of fair disclosure by the corporation.

Among the control variables, ROA has a positive and statistically significant coefficient in all the models. This implies that firms with higher earnings manage their earnings to a larger degree. Older firms are seen to engage less in earnings management. The coefficient of AGE is negative in most models and statistically significant. Older firms take on less risk and enjoy a more sound reputation, which helps them avail external finance more easily and at a lower cost. This, in turn, makes earnings management a less attractive option for them.

Table 8: Results for DAC regressed on ownership and control variables (Kasznik model)

Variable	(1) DIR	(2) INST 2SLS	(3) BIG5	(4) AUDQ	(5) BSIZE	(6) CEO	(7) CONC
ROA	0.745***	0.841***	0.745***	0.739***	0.744***	0.744***	0.736***
	(0.035)	(0.021)	(0.041)	(0.035)	(0.035)	(0.035)	(0.035)
AGE	–0.005**	0.000	–0.004	–0.005*	–0.005*	–0.005*	–0.006**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
GROWTH	0.011	0.006	0.009	0.011	0.010	0.010	0.008
	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.007)
MB	0.000	0.002	–0.000	–0.000	–0.000	–0.000	–0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
LEVG	0.011	–0.034**	0.020	0.013	0.013	0.012	0.010
	(0.011)	(0.015)	(0.014)	(0.012)	(0.012)	(0.012)	(0.011)
FSIZE	–0.005**	0.002	–0.005**	–0.004	–0.003	–0.003	
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	
VOL	0.049**	0.090***	0.080***	0.058***	0.061***	0.061***	0.055**
	(0.019)	(0.031)	(0.029)	(0.022)	(0.023)	(0.022)	(0.021)
LOSS	–0.007	0.012	–0.003	–0.003	–0.004	–0.004	–0.002
	(0.006)	(0.008)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
DIROWN	0.012*						
	(0.007)						
INSTOWN		–0.175***					
		(0.054)					
BIG5OWN			0.007				
			(0.011)				
AUDQ				0.006			
				(0.004)			
BSIZE					–0.000		
					(0.002)		
CEO						0.002	
						(0.004)	
CONC							–0.005**
							(0.002)
Constant	–0.048***	–0.021	–0.065***	–0.055**	–0.057**	–0.060***	–0.049***
	(0.019)	(0.018)	(0.025)	(0.023)	(0.022)	(0.022)	(0.018)
Observations	908	907	655	921	927	927	909
R^2	0.659	0.665	0.687	0.645	0.644	0.644	0.654
Industry and year dummies	Yes		Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors adjusted for clustering at the firm level are reported in parentheses beneath the coefficients of the explanatory variables. Statistical significance is denoted by ***, **, and * at 1, 5, and 10 percent, respectively.
Source: Authors' calculations.

Table 9: Results for DAC regressed on ownership and control variables (Dechow et al. model)

Variable	(1) DIR	(2) INST 2SLS	(3) BIG5	(4) AUDQ	(5) BSIZE	(6) CEO	(7) CONC
ROA	0.440***	0.705***	0.400***	0.416***	0.426***	0.424***	0.446***
	(0.079)	(0.059)	(0.093)	(0.080)	(0.083)	(0.082)	(0.076)
AGE	−0.012*	0.006	−0.006	−0.009	−0.010	−0.010	−0.009
	(0.007)	(0.009)	(0.009)	(0.007)	(0.007)	(0.007)	(0.006)
GROWTH	0.031***	0.018	0.032***	0.031***	0.031**	0.031***	0.034**
	(0.011)	(0.018)	(0.012)	(0.011)	(0.012)	(0.011)	(0.015)
MB	−0.002	0.001	−0.004	−0.003	−0.003	−0.003	−0.003
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
LEVG	0.060*	0.056	0.100**	0.060*	0.061**	0.061*	0.062*
	(0.034)	(0.043)	(0.048)	(0.032)	(0.030)	(0.032)	(0.034)
FSIZE	0.008	0.010	0.010	0.008	0.010	0.010	
	(0.009)	(0.007)	(0.013)	(0.010)	(0.008)	(0.009)	
VOL	−0.032	0.116	−0.034	−0.016	−0.011	−0.011	−0.055
	(0.051)	(0.086)	(0.070)	(0.054)	(0.055)	(0.054)	(0.059)
LOSS	0.014	0.017	0.031	0.021	0.019	0.019	0.009
	(0.021)	(0.022)	(0.026)	(0.020)	(0.020)	(0.020)	(0.018)
DIROWN	0.033**						
	(0.016)						
INSTOWN		−0.437***					
		(0.151)					
BIG5OWN			−0.014				
			(0.033)				
AUDQ				0.011			
				(0.012)			
BSIZE					0.000		
					(0.006)		
CEO						−0.004	
						(0.009)	
CONC							−0.002
							(0.005)
Constant	−0.141*	−0.020	−0.165	−0.139*	−0.147	−0.144**	−0.063
	(0.074)	(0.049)	(0.107)	(0.072)	(0.091)	(0.069)	(0.047)
Observations	908	907	655	921	927	927	909
R^2	0.156		0.158	0.145	0.146	0.146	0.150
Industry and year dummies	Yes		Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors adjusted for clustering at the firm level are reported in parentheses beneath the coefficients of the explanatory variables. Statistical significance is denoted by ***, **, and * at 1, 5, and 10 percent, respectively.
Source: Authors' calculations.

Table 10: Results for DAC regressed on ownership and control variables (Jones model)

Variable	(1) DIR	(2) INST 2SLS	(3) BIG5	(4) AUDQ	(5) BSIZE	(6) CEO	(7) CONC
ROA	0.580***	0.733***	0.324***	0.579***	0.572***	0.577***	0.587***
	(0.103)	(0.056)	(0.075)	(0.105)	(0.106)	(0.104)	(0.099)
AGE	−0.001	0.021**	−0.004	0.001	−0.001	−0.000	0.002
	(0.006)	(0.009)	(0.008)	(0.006)	(0.006)	(0.006)	(0.006)
GROWTH	0.011	−0.004	0.011	0.010	0.012	0.011	0.012
	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)	(0.012)	(0.014)
MB	−0.005*	0.001	−0.003	−0.006*	−0.006*	−0.006*	−0.005*
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
LEVG	0.086**	0.052	0.079*	0.081**	0.078**	0.082**	0.090**
	(0.037)	(0.043)	(0.044)	(0.034)	(0.032)	(0.034)	(0.037)
FSIZE	0.012	0.014**	0.015	0.011	0.010	0.011	
	(0.012)	(0.007)	(0.015)	(0.012)	(0.009)	(0.011)	
VOL	0.019	0.073	−0.002	0.027	0.021	0.028	−0.013
	(0.050)	(0.081)	(0.063)	(0.050)	(0.054)	(0.051)	(0.063)
LOSS	0.012	0.003	0.033	0.014	0.014	0.014	0.004
	(0.026)	(0.021)	(0.027)	(0.023)	(0.023)	(0.024)	(0.018)
DIROWN	0.026						
	(0.018)						
INSTOWN		−0.510***					
		(0.156)					
BIG5OWN			−0.010				
			(0.026)				
AUDQ				−0.005			
				(0.014)			
BSIZE					0.006		
					(0.007)		
CEO						0.008	
						(0.009)	
CONC							−0.006
							(0.007)
Constant	−0.196**	−0.052	−0.203*	−0.184**	−0.215*	−0.190**	−0.068
	(0.093)	(0.046)	(0.121)	(0.085)	(0.111)	(0.082)	(0.052)
Observations	1,184	1,181	826	1,202	1,210	1,210	1,188
R^2	0.153		0.100	0.146	0.148	0.147	0.146
Industry and year dummies	Yes		Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors adjusted for clustering at the firm level are reported in parentheses beneath the coefficients of the explanatory variables. Statistical significance is denoted by ***, **, and * at 1, 5, and 10 percent, respectively.
Source: Authors' calculations.

Similarly, the variable GROWTH has a positive coefficient and is statistically significant. This confirms the argument above that younger and growing firms are more likely to manage their earnings. LEVG is positively associated with earnings management in almost all the models and is statistically significant in most cases. This indicates that firms with higher debt financing are more likely to be involved in earnings management, which helps them reduce the volatility of their reported net incomes and, in turn, renew their loans.

The other control variables are either insignificant or have different coefficient signs in different models. For example, firm size (FSIZE) has a negative coefficient in the Kasznik model (Table 8), but a positive and insignificant coefficient in the Dechow (Table 9) and Jones models (Table 10). None of the other control variables have statistically significant coefficients.

4.3. Robustness Checks

To determine the robustness of the results, we start by calculating the average DAC for all four models and then check if the managerial and institutional ownership variables still yield results that are consistent with the baseline results. Next, we test for the nonmonotonic influence of managerial ownership on DAC and also whether the global financial crisis of 2008 had any major impact on the regression results (see Table 11).

Teshima and Shuto (2008) provide theoretical and empirical evidence in support of the nonmonotonic influence of managerial ownership on DAC. They show that, at lower and higher levels of managerial ownership, the alignment of interest between managers and shareholders is more pronounced, resulting in lower scope for earnings management. At an intermediate level of managerial ownership, the entrenchment effect (see Section 2) is more dominant, which results in greater earnings management. The authors add quadratic and cubic terms of the managerial ownership percentage to the DAC regressions.

To test for this possibility, we use the average of the accruals calculated using the four models: not reporting the results for each model individually saves space. The average accruals are then regressed on the director ownership percentage, its squared term, and cubic term. These terms are added gradually to different regressions, the results of which are reported in columns (1), (2), and (3) in Table 11.[4]

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[4] This methodology is borrowed from Teshima and Shuto (2008).

Table 11: Robustness checks using average accruals

Variable	(1) Average accruals	(2) DIROWN2	(3) DIROWN3	(4) INST	(5) Crisis
ROA	0.454***	0.456***	0.456***	0.614***	0.454***
	(0.062)	(0.062)	(0.062)	(0.044)	(0.060)
AGE	−0.010**	−0.010*	−0.009*	0.004	−0.010**
	(0.005)	(0.005)	(0.005)	(0.007)	(0.005)
GROWTH	0.027***	0.027***	0.027***	0.017	0.026***
	(0.009)	(0.009)	(0.009)	(0.013)	(0.008)
MB	−0.002	−0.002	−0.002	0.001	−0.002
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
LEVG	0.057**	0.057**	0.058**	0.028	0.056**
	(0.025)	(0.024)	(0.024)	(0.032)	(0.026)
FSIZE	0.004	0.004	0.005	0.007	0.005
	(0.007)	(0.007)	(0.006)	(0.005)	(0.006)
VOL	0.007	0.008	0.010	0.081	0.010
	(0.035)	(0.035)	(0.036)	(0.064)	(0.034)
LOSS	0.008	0.008	0.008	0.012	0.007
	(0.015)	(0.015)	(0.015)	(0.017)	(0.014)
DIROWN	0.027**	0.059	0.131		0.027**
	(0.013)	(0.043)	(0.120)		(0.013)
DIR2		−0.042	−0.261		
		(0.050)	(0.329)		
DIR3			0.168		
			(0.234)		
CRD					0.006
					(0.008)
INSTOWN				−0.342***	
				(0.112)	
Constant	−0.111**	−0.116**	−0.123**	−0.013	−0.117**
	(0.052)	(0.052)	(0.049)	(0.037)	(0.058)
Observations	908	908	908	907	908
R^2	0.192	0.193	0.193	0.030	0.189
Industry and year dummies	Yes	Yes	Yes		Yes (no year dummy)

Source: Authors' calculations.

The results show that director ownership maintains its positive sign and statistical significance. However, there is no evidence of a nonmonotonic relationship between director ownership and DAC. These findings lead us to conclude that the entrenchment hypothesis holds in Pakistan as opposed to the alignment-of-interest hypothesis.

Similarly, the results reported in column (4) of Table 11 show that institutional ownership is negatively related to DAC—as was the case in Tables 7 to 10. The results for the other explanatory variables are also consistent with those given in Tables 7 to 10. Finally, column (5) reports the results of the regression where average DAC is the dependent variable and director ownership is the main independent variable with other control variables and a crisis-year dummy denoted by CRD. The dummy variable takes the value of 1 for the years 2007 and 2008, and is 0 otherwise.

The purpose of this regression is to find out whether the global financial crisis has had any impact on our findings. CRD has a positive coefficient and is statistically insignificant. Moreover, director ownership and the other variables maintain their signs and statistical significance. These results suggest that the crisis has had no impact on DAC.

5. Conclusion and Policy Implications

The aim of this study was to investigate the impact of corporate governance and ownership structure on earnings management for a sample of companies listed on the KSE from 2003 to 2010. Discretionary accruals were used as a proxy for earnings management and estimated using four well-known models: Jones (1991), Dechow et al. (1995), Kasznik (1999), and Kothari et al. (2005). The variable DAC was regressed on several corporate governance and ownership structure variables, along with a sufficiently large set of control variables.

The results indicate that discretionary accruals increase monotonically with the percentage ownership of directors, their spouses, children, and other family members. This supports the view that managers who are more entrenched in a firm can easily influence corporate decisions and manipulate accounting figures in a way that best serves their own interests. This finding is consistent with prior research evidence on the role of dominant directors in expropriating external minority shareholders in Pakistan.

Further, our results indicate that institutional investors play a significant role in preventing managers from engaging in earnings management. We find no evidence that CEO duality, the size of the auditing firm, the number of members on the board of directors, and ownership concentration influence discretionary accruals. Among the control variables, firms that are more profitable, are growing, or have higher leverage actively manage their earnings while older firms do not.

Although we have used four different models to ensure our results are not biased, it is possible that accrual models using financial statement data might not accurately divide accruals into discretionary and nondiscretionary components (Siregar & Utama, 2008). The study's second limitation is that its findings can be generalized for nonfinancial firms only in Pakistan, given that the country's corporate governance environment is different from those elsewhere. Finally, in the absence of organized data on corporate governance and ownership structure, certain variables (such as family ownership and board independence) could not be included.

This research could be extended in several ways. Although we have used institutional ownership as a measure of the stock held by all institutions, future studies could separate intuitional ownership into financial and nonfinancial institutional ownership. Further, financial institutional ownership could be broken down into ownership by banks, insurance companies, mutual funds, and pension funds, etc., to determine how each group of institutions plays a unique role.

Future studies could also use board independence, board meetings, auditor tenure, and family ownership to measure their impact on discretionary accruals. Finally, developing a corporate governance index that takes into account the different clauses of the PCCG would help evaluate the effectiveness of the code in constraining earnings management practices.

In view of our findings, we recommend that the SECP develop a framework that eliminates managers' dominance over the selection of board members and other corporate decisions that might hurt the interests of minority shareholders. The SECP should also ensure free and fair availability of all financial and nonfinancial data in companies' annual reports. Finally, it should ensure that all firms' annual reports include comprehensive profiles of their board members and CEO so that shareholders can distinguish between executive and nonexecutive board members and highlight their academic and professional experience.

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Value-at-Risk and Expected Stock Returns: Evidence from Pakistan

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Abstract

This study investigates whether exposure to downside risk, as measured by value-at-risk (VaR), explains expected returns in an emerging market, i.e., Pakistan. We find that portfolios with a higher VaR are associated with higher average returns. In order to explore the empirical performance of VaR at the portfolio level, we use a time series approach based on 25 size and book-to-market portfolios. Based on monthly portfolio data for October 1992 to June 2008, the results show that VaR has greater explanatory power than the market, size, and book-to-market factors.

Keywords: Value-at-risk, emerging market, Fama-French factors.

JEL classification: C32, G32.

1. Introduction

The most important implications of the capital asset pricing model (CAPM) (see Sharpe, 1964; Lintner, 1969; Black, Jensen, & Scholes, 1972) are that (i) the expected return on a risky asset is linearly and positively related to its systematic risk, and (ii) only the asset's beta captures cross-sectional variations in expected stock returns; other variables have no explanatory power. However, the empirical evidence of the last few decades suggests that many alternative risk and nonrisk variables are able to explain average stock returns. These include size (Banz, 1981), the ratio of book equity to market equity (Fama & French, 1992, 1993, 1995, 1996; Stattman, 1980; Rosenberg, Reid, & Lanstein, 1985; Chan, Hamao, & Lakonishok, 1991), the price/earnings ratio (Basu, 1977), leverage (Bhandari, 1988), liquidity (Pastor & Stambaugh, 2003), and value-at-risk (VaR) (Bali & Cakici, 2004; Chen, Chen, & Chen, 2010).

Bali and Cakici (2004) investigate the relationship between portfolios sorted by VaR[1] and expected stock returns and find that VaR,

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[1] The k-day VaR on day t with probability $1 - \alpha$ is defined as prob. $[p_{t-k} - p_t \leq \text{VaR}(t, k, \alpha)] = 1 - \alpha$ where p_t is the day t price of the asset. VaR is based on both the mean and variance of returns, so it is not exactly a measure of risk but rather a measure of value-at-risk.

size, and liquidity explain the cross-sectional variation in expected returns, while beta and total volatility have almost no explanatory power at the stock level. Furthermore, the strong positive relationship between average returns and VaR is robust for different investment horizons and loss-probability levels.

VaR is a popular measure of risk value among finance practitioners and regulators of banks and financial institutions because it provides a single number with which to quantify the monetary loss associated with a portfolio exposed to market risk with a certain probability. If portfolios sorted by VaR result in higher returns associated with a higher VaR, then this can prove to be extremely valuable information for investors, portfolio managers, and financial analysts who can construct and recommend profitable portfolio strategies accordingly. The Basel II accord on banking supervision also recommends using VaR to measure the market risk exposure of banking assets. It is, therefore, an equally useful measure for market regulators and policymakers, making it important to investigate the asset pricing implications of VaR as a risk factor.

Apart from Bali and Cakici's (2004) pioneering study on the US and a recent study on Taiwan by Chen et al. (2010), there are no empirical studies on this aspect of asset pricing in the context of emerging and developed markets. The major objective of our study is to test whether the maximum likely loss as measured by VaR can explain the cross-sectional and time variations in average returns in Pakistan as an emerging market.

We have selected Pakistan for this analysis because it typifies an emerging market, exhibiting features such as higher returns associated with higher volatility, lower liquidity, a relatively high market concentration, and infrequent trading of many stocks.[2] Additionally, given that determining the validity of an economic or financial theory or model requires testing it under different conditions, this study aims to contribute to the literature by testing the relationship between VaR and expected returns accordingly. Our analysis reveals that constructing VaR as the common risk factor enables a better explanation for time variations in average portfolio returns sorted by size and book-to-market factors as compared to the Fama-French common factors.

[2] Khawaja and Mian (2005) elaborate further on some features of the market; Iqbal (2012) provides an overview of the stock market in Pakistan.

2. Literature Review

Over the last six decades, downside risk has been studied from the perspective of explaining asset returns. The concept of measuring downside risk dates back to Markowitz (1952) and Roy (1952). Markowitz (1952) provides a quantitative framework for measuring portfolio risk and return. The study utilizes mean returns, variances, and covariances to develop an efficient frontier on which every portfolio maximizes the expected return for a given variance or minimizes the variance for a given expected return.

Roy (1952) explains the same equation as Markowitz, connecting the portfolio variance of returns to the variance of returns of the constituent securities. As Markowitz (1959) points out, investors are interested in minimizing the downside risk because this would help them make better decisions when faced with nonnormal security return distributions. Consequently, he suggests assessing downside risk using (i) a semivariance computed from the mean return or below-mean semivariance (SV_m) and (ii) a semivariance computed from a target return or below-target semivariance (SV_t). The two measures compute a variance using only the returns below the mean return (SV_m) or target return (SV_t). In addition, the study compares several risk measures, including standard deviation, expected value of loss, expected absolute deviation, probability of loss, and maximum loss.

Quirk and Saposnik's (1962) study establishes the theoretical dominance of the semivariance over the variance. Mao (1970) argues in favor of using the semivariance given that investors will be interested specifically in the downside risk. Bawa (1975) and Fishburn (1977) identify the lower partial moment as a general family of below-target risk measures (one of which is the SV_t) that describe below-target risk in terms of risk tolerance. Bawa and Lindenberg (1977), whose study develops a mean lower partial moment (MLPM) model based on downside risk, present the CAPM as a special case of the MLPM, pointing out that the latter must explain the data at least as well as the CAPM. Harlow and Rao (1989) provide empirical support for the Bawa-Lindenberg downside risk model.

Nawrocki's (1999) study of downside risk differentiates between the two types of semivariance risk measures presented by Markowitz (1959). Eftekhari and Satchell (1996) and Claessens, Dasgupta, and Glen (1995) observe nonnormality in emerging markets. Bekaert, Erb, Harvey, and Viskanta (1998) note that skewness and kurtosis are significant risk factors for emerging market equities. Harvey and Siddique (2000) and Bekaert and Harvey (2002), respectively, argue that skewness is a significant risk factor in both developed and emerging markets.

Estrada (2000, 2002) investigates different risk measures and finds that semi-standard deviation is the relevant measure of risk for emerging markets. Dittmar (2002) determines the influence of a security's skewness and kurtosis on investors' expected returns. Bali and Cakici (2004), Bali, Gokcan, and Liang (2007), and Bali, Demirtas, and Levy (2009) consider VaR an alternative risk factor that helps explain the cross-section of stock returns. Chung, Johnson, and Schill (2006) argue that a set of co-moments taken together may be more reliable than individual co-moments. Ang, Chen, and Xing (2006) demonstrate how the downside beta term helps explain cross-sectional variations in average stock returns.

Iqbal, Brooks, and Galagedera (2010) evaluate the CAPM and MLPM for an emerging market over the period September 1992 to April 2006. Their empirical results support both models when performed against an unspecified alternative, but support the CAPM when an MLPM alternative is specified. Blitz, Pang, and van Vliet (2013) study the significant effects of volatility in emerging markets. De Groot, Pang, and Swinkels (2012) demonstrate the significant presence of value, momentum, and size effects in frontier emerging markets over the period 1997 to 2008; the authors argue that transaction costs or risk do not adequately explain these three market factors.

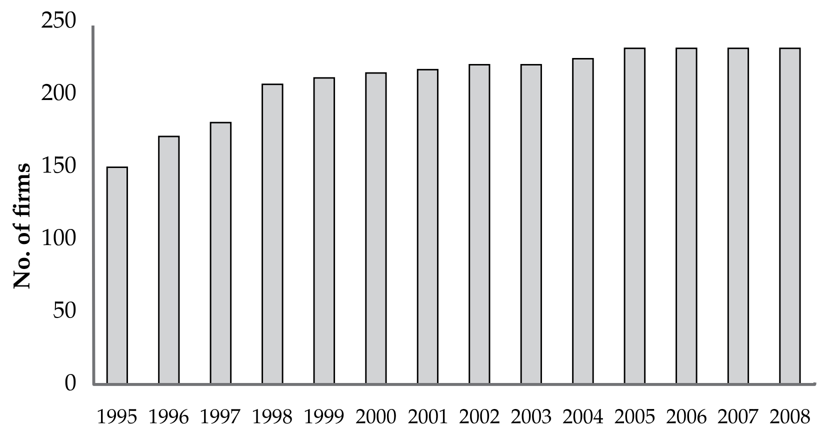
The disadvantage of the MLPM, which measures the relationship between asset returns and downside movement in the market, is that it yields a regression-based estimate, which may not be easily understood by common investors. The VaR, on the other hand, is a monetary value that readily captures downside risk. Accordingly, this study focuses on providing empirical evidence on the efficacy of VaR as a risk measure for Pakistan's emerging market. In addition to providing time series evidence, we carry out a cross-sectional regression analysis of VaR and average portfolio returns sorted with respect to VaR. This differentiates the study from Bali and Cakici (2004), for example, who do not provide estimates for the cross-sectional relationship between VaR and expected returns.

3. Data, Sample Selection, and Variables

Our primary source of data is the Karachi Stock Exchange (KSE)—the largest of Pakistan's three stock exchanges. Conducting asset-pricing tests based on daily data is problematic, given that daily returns tend to be nonnormal and that stocks are traded infrequently in this market. We have, therefore, used monthly data on continuously compounded stock returns for 231 stocks traded on the KSE from October 1992 to June 2008 (see Appendix 1).

The number of firms in the sample varies over the sample period. Figure 1 shows the number of firms at the end of December for each year of the sample period. We have 149 firms in the first year and 231 stocks at the end of June 2008, which provides us with a reasonable volume of data for analysis. The sample includes both financial and nonfinancial firms across all sectors of the KSE. As with other studies that use price databases, firm survival may be an issue, implying that the data overstates the importance of certain factors in such cases. In order to minimize this likelihood, we have applied a smaller level of significance—1 percent instead of 5 and 10 percent—in the statistical tests conducted.

Figure 1: Number of firms included in the sample over the sample period



The variables employed include: (i) size, (ii) systematic risk (beta), (iii) book-to-market equity, and (iv) VaR. These are explained below.

Following the literature, we measure firm size using the natural logarithm of the market value of equity, i.e., the stock price multiplied by the number of shares outstanding as of the sample selection date (each December).

In constructing systematic risk (beta), we follow Fama and French (1992) and sort all the sample stocks by size to determine the KSE size quintile breakpoints, based on which the stocks are allocated into five size portfolios. We then subdivide each size quintile into another five portfolios based on pre-ranking betas for all the sample stocks. The pre-ranking betas are calculated using two to five years' (as available) data on the monthly returns ending in December of year t based on the market model. In all, 162 post-ranking monthly returns for each of the 25 portfolios are computed for the period January 1995 to June 2008.

Following Fama and French (1992), we estimate the pre-ranking betas as the sum of the slopes yielded by regressing the monthly return on the current and previous months' market returns:

$$R_{jt} = \beta_{0j} + \beta_{1j} R_{mt} + \beta_{2j} R_{mt-1} + u_{jt} \quad (1)$$

where R_{jt} is the monthly return on stock j in period t, $\beta_{1j} + \beta_{2j}$ is the pre-ranking beta for stock j, R_{mt} is the monthly return on the KSE value-weighted index in period t, and u_{jt} is the residual series from the time series regression.

Book-to-market equity or BE/ME is the ratio of the book value of equity plus deferred taxes to the market value of equity. This study uses each firm's market price and equity data as of the end of December for each year to compute its BE/ME. Given the absence of reliable historical data on book values, we have employed December 2000 values (which fall roughly in between the sample period) to construct book-to-market portfolios.

In order to construct portfolios sorted by VaR, we sort the sample stocks by 99, 95, and 90 percent VaR levels and obtain the average returns and average VaR for each decile portfolio. The VaR is estimated using the historical simulation method.[3] The mean and cutoff return for each confidence level is estimated using 24–60 monthly returns (as available). The 99, 95, and 90 percent confidence level VaRs are then measured by the lowest, third lowest, and sixth lowest observations drawn from these monthly returns in December of each year, starting from 1995.

4. Methodology

This section explains how the relationship between VaR and expected returns is determined.

4.1. VaR and the Cross-Section of Expected Returns

In order to capture the relationship between VaR and expected returns, we investigate whether stock portfolios with a higher maximum likely loss (as measured by VaR) earn higher expected returns. Starting from 1995 through December of each subsequent year, we sort the sample of 232 KSE stocks by 99, 95, and 90 percent VaR levels to determine the

[3] There are several parametric and nonparametric methods of estimating VaR; see Iqbal, Azher, and Ijaz (2013) for a comparison of predictive abilities. Examining the sensitivity of the study's results to different VaR estimates could be an interesting direction for future research.

decile breakpoint for each VaR stock. Based on these breakpoints, we then allocate the stocks among 99, 95, and 90 percent VaR deciles. Decile 1 comprises the 10 percent of stocks with the lowest VaR; decile 10 represents those stocks with the highest VaR. We also compute the equally weighted average returns for the stocks in each decile. The portfolios are rebalanced every December for the subsequent years.

4.2. VaR and Time Series Variations in Expected Returns

Given the drawbacks of the CAPM, Fama and French (1992) have developed an alternative asset-pricing model, which we employ to study the usefulness of the VaR factor. Fama and French (1993) study the common risk factors in stock returns using six portfolios formed by sorting the stocks by size (ME) and BE/ME. Following this method, we rank the 232 sample stocks for January of each year *t* from 1995 to June 2008 according to size. The median stock size is used to divide the stocks into two groups: small (S) and big (B). The stocks are sorted separately into three portfolios based on the breakpoints for the bottom 30 percent (L), the middle 40 percent (M), and the top 30 percent (H). Thus, we construct six portfolios (S/L, S/M, S/H, B/L, B/M, and B/H) from the intersection of the two ME groups and the three BE/ME groups.

The Fama and French small-minus-big (SMB) factor is constructed as the difference between the average return on a portfolio of three small-cap stocks, i.e., (S/L + S/M + S/H)/3, and the average return on a portfolio of three big-cap stocks, i.e., (B/L + B/M + B/H)/3. The high-minus-low (HML) factor is constructed as the difference between the average return on two high-BE/ME portfolios, i.e., (S/H + B/H)/2, and the average return on two low-BE /ME portfolios, i.e., (S/L + B/L)/2.

Following Fama and French (1993, 1995, 1996), we use the excess market return over the risk-free return (RM-RF) as a measure of the market factor in stock returns. The RF is constructed using the 30-day repo rate obtained from DataStream. The excess returns on the 25 portfolios sorted by size and BE/ME are employed as dependent variables in the time series regressions.

In order to examine the empirical performance of VaR based on the 25 Fama and French (1993) portfolios, we follow Bali and Cakici (2004) and construct an HVaRL factor (high VaR minus low VaR), which is meant to mimic the risk factor in returns related to VaR and is defined as the difference between the simple average of the returns on high VaR and low VaR portfolios. The construction of the 95 percent VaR portfolios is similar to that of Fama and French's size portfolios: for December of each year *t* from 1995 through June 2008, we rank 232 stocks by their 95 percent VaR level. The median 95 percent VaR is used to divide the selected stocks into two groups: high VaR and low VaR.

4.3. Regression Analysis With Several Factors

We carry out a series of regressions to ascertain the role of the various factors (RM-RF, SMB, HML, and HVaRL) in explaining returns. These include (i) one-factor models (which use RM-RF, SMB, HML, or HVaRL as a single explanatory variable at a time), (ii) two-factor models (which use RM-RF along with SMB, HML, or HVaRL), (iii) three-factor models (which use RM-RF along with SMB and HML, or SMB and HVaRL, or HML and HVaRL), and (iv) four-factor models (which use RM-RF, SMB, HML, and HVaRL).

5. Empirical Results

This section presents the results of each regression analysis.

5.1. VaR and the Cross-Section of Expected Returns

Table 1 presents the average returns on the VaR portfolios for all ten deciles as well as the estimated regression coefficients $\hat{\alpha}$ and $\hat{\beta}$, corresponding t-statistics, and R^2 values. The cross-sectional regression of average portfolio returns on the average VaR of the portfolios is given as:

$$R_j = \alpha + \beta VaR_j + u_j \quad (2)$$

$j = 1, 2, \ldots 10$

As Table 1 shows, when portfolios are formed according to their 99, 95, and 90 percent VaR, average stock returns are positively correlated with VaR. In other words, stocks with a higher maximum likely loss (measured by VaR) generally yield higher average returns. From the lowest to the highest 1 percent VaR decile, the monthly average return on VaR portfolios increases from 0.96 to 7.83 percent, which amounts to an 82.45 percent annual return differential. This increase is not monotonic: for example, moving from the eighth to the ninth decile portfolio using the 99 percent VaR results in a lower average return.

The overall evidence supporting a positive risk-return relationship is fairly strong. This is in contrast to Bali and Cakici (2004) who estimate an annual return differential of only 11.52 percent between the highest and lowest VaR portfolios. Our result is, however, consistent with the general observation that emerging markets yield higher returns than developed markets. The result is also important from an investment allocation perspective.

We find a similarly strong positive relationship between average returns and VaR, using the 95 and 90 percent confidence levels. The results show that, the greater a portfolio's potential losses as captured by VaR, the higher will be the expected return. Portfolios of higher-VaR stocks appear to yield higher returns than lower-VaR portfolios.

To gauge the statistical significance of the relationship between the average VaR and average returns on the VaR portfolios, we regress the average returns from the decile portfolios on the average VaR for the 99, 95, and 90 percent levels, respectively. The results indicate that the VaR coefficients are highly significant with a theoretically consistent positive sign. The R^2 values range from 83 to 86 percent.

Table 1: Average monthly portfolio returns, August 1992–June 2008

Decile	99% VaR	Return %	95% VaR	Return %	90% VaR	Return %
Low VaR	2.85	0.96	0.32	1.03	0.74	1.66
2	17.72	2.39	10.85	3.42	5.88	0.82
3	21.67	4.07	13.95	1.92	9.13	4.08
4	25.16	3.73	16.03	2.88	11.08	3.65
5	28.57	3.38	17.87	4.74	12.59	4.03
6	31.89	5.23	20.36	5.57	14.10	4.32
7	35.44	5.14	22.48	5.43	16.09	4.46
8	40.45	5.89	25.34	5.47	18.20	6.62
9	47.64	4.68	28.62	6.19	20.64	6.39
High VaR	60.68	7.83	34.76	6.48	24.51	7.09
Coefficient	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha}$	$\hat{\beta}$
	0.93	0.11	0.94	0.18	0.75	0.27
t-statistic	2.45**	8.04*	1.95***	9.79*	1.07	6.76*
R^2	0.86		0.83		0.86	

Note: *, **, and *** = significant at 1, 5, and 10 percent, respectively. We obtain R^2 by regressing a cross-section of the average returns to the ten deciles on a constant and the average VaR of the portfolios. The t-statistics are based on heteroskedasticity-consistent standard errors and tested to determine if the estimated coefficients are significantly different from 0.
Source: Authors' calculations.

5.2. VaR and Time Series Variations in Expected Stock Returns

Panel A of Table 2 provides some descriptive statistics for RM-RF, SMB, HML, and HVaRL at a 95 percent confidence level. The normality of the Fama-French and VaR factors is rejected in all cases. However, the time series sample is large enough to justify statistical tests asymptotically.

Panel B calculates the correlation between RM-RF, SMB, HML, and HVaRL in order to determine the direction and magnitude of the relationship between HVaRL and the three Fama-French factors. There is a positive correlation of 0.59 and 0.53 between the market and HVaRL factors and between HML and HVaRL, respectively. The size factors, however, are weak correlates of HVaRL. Overall, the correlation between HVaRL and the Fama-French factors is not very large, making it possible to estimate any independent influence on portfolio returns without fear of collinearity.

Table 2: Descriptive statistics and Pearson correlation coefficients for HVaRL and Fama-French factors

	Descriptive statistics			
Panel A	**RM-RF**	**SMB**	**HML**	**HVaRL**
Observations	162	162	162	162
Mean	0.003	-0.007	-0.006	-0.011
Median	0.006	-0.008	-0.005	-0.016
Maximum	0.240	0.126	0.186	0.217
Minimum	-0.416	-0.162	-0.135	-0.142
Standard deviation	0.097	0.046	0.048	0.052
Skewness	-0.510	-0.010	0.294	0.730
Kurtosis	4.800	3.943	4.579	5.450
	Pearson correlation coefficients			
Panel B	**HVaRL**	**RM-RF**	**SMB**	**HML**
HVaRL	1.000			
RM-RF	0.590	1.000		
SMB	-0.019	-0.586	1.000	
HML	0.533	0.393	-0.041	1.000

Source: Authors' calculations.

Table 3 shows the correlation between returns for the 25 portfolios and HVaRL, RM-RF, SMB, and HML. RM-RF and HVaRL capture more common variation in stock returns on average than SMB and HML.

Table 3: Correlation of 25 portfolio returns with RM-RF, SMB, HML, and HVaRL

Portfolio	HVaRL	RM-RF	SMB	HML
S1BM1	0.603	0.317	0.282	0.011
S1BM2	0.640	0.462	0.097	0.311
S1BM3	0.258	0.377	-0.033	0.405
S1BM4	0.551	0.425	0.109	0.499
S1BM5	0.574	0.231	0.373	0.529
S2BM1	0.405	0.295	0.160	0.057
S2BM2	0.522	0.545	-0.068	0.216
S2BM3	0.434	0.335	0.165	0.351
S2BM4	0.586	0.569	0.010	0.396
S2BM5	0.745	0.521	-0.002	0.576
S3BM1	0.482	0.558	-0.250	0.236
S3BM2	0.382	0.493	-0.117	0.230
S3BM3	0.512	0.514	-0.082	0.274
S3BM4	0.694	0.685	-0.168	0.462
S3BM5	0.730	0.718	-0.286	0.580
S4BM1	0.566	0.521	-0.094	0.294
S4BM2	0.633	0.589	-0.198	0.500
S4BM3	0.497	0.596	-0.266	0.384
S4BM4	0.658	0.673	-0.221	0.508
S4BM5	0.746	0.830	-0.482	0.555
S5BM1	0.301	0.573	-0.510	-0.013
S5BM2	0.611	0.820	-0.460	0.282
S5BM3	0.592	0.903	-0.541	0.378
S5BM4	0.562	0.759	-0.394	0.317
S5BM5	0.654	0.942	-0.573	0.491
Average	0.557	0.570	-0.142	0.353

Note: S1BM1 denotes a portfolio that belongs to the smallest size quintile and the lowest BE/ME quintile. The other portfolios are similarly labeled.
Source: Authors' calculations.

5.3. *Regression Analysis With Several Factors*

This section presents the results of the four- and three-factor models (see Appendix 2 for the results of the one- and two-factor models).

5.3.1. Four-Factor Model

Table 4 presents the parameter estimates, averages, t-statistics, adjusted R^2 values, and standard errors of estimates for the time series regression of excess stock returns on the four factors RM-RF, SMB, HML, and HVaRL (with a 95 percent confidence level).

Table 4: Four-factor model: Regression of excess stock returns on RM-RF, SMB, HML, and HVaRL

BE/ME quintile

Size quintile	Low	2	3	4	High	Low	2	3	4	High
	RM-RF slope (average = 0.485)					**t-statistics**				
Small	0.562*	0.518*	0.680*	0.476*	0.424*	6.01	4.84	4.94	4.66	3.32
2	0.437*	0.588*	0.366*	0.581*	0.302*	4.56	6.27	4.78	7.45	2.78
3	0.372*	0.531*	0.443*	0.517*	0.407*	3.97	5.49	4.92	6.66	4.77
4	0.349*	0.235*	0.331*	0.408*	0.495*	4.13	3.20	4.45	5.41	6.16
Big	0.413*	0.577*	0.732*	0.564*	0.846*	3.78	8.86	13.26	7.45	17.98
	HVaRL slope (average = 0.432)									
Small	1.167*	0.793*	-0.547**	0.245	0.634*	7.87	4.67	-2.51	1.51	3.14
2	0.354**	0.335**	0.061	0.191	1.117*	2.33	2.25	0.51	1.55	6.49
3	0.391**	0.018	0.316**	0.521*	0.779*	2.63	0.12	2.22	4.23	5.76
4	0.460*	0.460*	0.193	0.415*	1.148*	3.44	3.95	1.64	3.47	9.00
Big	0.421**	0.463*	0.219**	0.305**	0.370*	2.43	4.48	2.51	2.54	4.96
	SMB slope (average = 0.328)									
Small	1.327*	0.861*	0.772*	0.830*	1.658*	8.42	4.77	3.33	4.82	7.72
2	0.796*	0.593*	0.685*	0.734*	0.412**	4.93	3.75	5.31	5.59	2.25
3	0.028	0.450*	0.409*	0.337**	-0.111	0.18	2.76	2.70	2.58	-0.77
4	0.283**	0.007	0.033	0.143	-0.762*	1.99	0.06	0.27	1.13	-5.62
Big	-0.616*	-0.124	-0.15	-0.003	-0.360*	-3.34	-1.14	-1.62	-0.02	-4.55
	HML slope (average = 0.084)									
Small	-1.040*	-0.16	0.753*	0.505*	0.866*	-8.14	-1.09	4.00	3.62	4.97
2	-0.418*	-0.247***	0.183***	0.098	0.592*	-3.20	-1.93	1.76	0.92	4.00
3	-0.119	-0.028	-0.066	0.142	0.499*	-0.94	-0.22	-0.54	1.34	4.28
4	-0.072	0.294*	0.170***	0.289*	0.493*	-0.63	2.93	1.68	2.81	4.49
Big	-0.614*	-0.230**	0.005	-0.074	0.283*	-4.11	-2.59	0.07	-0.72	4.40
	Adjusted R^2 (average = 0.518)					**SSE**				
Small	0.642	0.484	0.262	0.441	0.574	0.06	0.07	0.10	0.07	0.09
2	0.296	0.411	0.323	0.509	0.613	0.07	0.07	0.05	0.05	0.08
3	0.340	0.277	0.350	0.614	0.686	0.07	0.07	0.06	0.05	0.06
4	0.377	0.488	0.397	0.571	0.833	0.06	0.05	0.05	0.05	0.06
Big	0.430	0.711	0.822	0.593	0.920	0.08	0.05	0.04	0.05	0.03

Note: *, **, and *** = significant at 1, 5, and 10 percent, respectively. The table reports statistics for the period January 1995 to June 2008.
Source: Authors' calculations.

The table shows that the slope coefficients of RM-RF are positive and highly significant (with p-values of less than 0.01). It is worth noting that 22 of the 25 slopes for HVaRL are significant and, barring one, all have the correct positive sign. Ten of these slopes are significant at 1 percent, especially for the largest book-to-market quintile portfolios. The number of significant coefficients corresponding to HVaRL is higher than those for the size and book-to-market factors; its average coefficient is also much larger. The four-factor model yields a greater average adjusted R^2 value (0.518) than the other models.

These results are in line with the findings of Bali and Cakici (2004). The smaller size portfolios appear to be strongly related to average portfolio returns compared to portfolios comprising larger sizes. Thus, smaller firms may require higher returns for the greater risk with which they are associated. The signs of the HML factor are not stable.

5.3.2. Three-Factor Model

In order to gauge the importance of the VaR factor, we consider if it can serve as a substitute for any of the Fama-French factors. Tables 5, 6, and 7 present panel estimates from the three-factor model in which the excess returns on 25 portfolios were regressed on RM-RF along with (i) SMB and HML, (ii) HVaRL and SMB, or (iii) HVaRL and HML.

Table 5 indicates that all the RM-RF coefficients are highly significant. The size and book-to-market factors follow in importance with fewer significant coefficients. The average adjusted R^2 value is 0.485, which is slightly lower than that for the four-factor model, including VaR.

Compared to HML, most of the SMB slope coefficients are statistically significant, implying strong size effects but slightly weak book-to-market effects during the testing period; this is consistent with Chen et al. (2009). Once SMB and HML are added to the one-factor model, the average adjusted R^2 value increases from 0.359 (Table A1 in Appendix 2) to 0.485 (Table 5), which shows that the factors SMB and HML also help explain the time series variation. These findings are consistent with Fama and French (1993), Al-Mwalla (2012), Al-Mwalla and Karasneh (2011), and Mirza (2008).

Table 5: Three-factor model: Regression of excess stock returns on RM-RF, SMB, and HML (panel A)

BE/ME quintile

Size quintile	Low	2	3	4	High	Low	2	3	4	High
	RM-RF slope (average = 0.656)					**t-statistics**				
Small	1.023*	0.831*	0.464*	0.573*	0.674*	11.89	9.34	4.25	7.15	6.58
2	0.577*	0.720*	0.390*	0.656*	0.742*	7.60	9.71	6.54	10.73	7.80
3	0.526*	0.539*	0.567*	0.723*	0.714*	7.06	7.15	7.97	11.33	9.76
4	0.530*	0.416*	0.407*	0.571*	0.948*	7.79	6.94	6.98	9.38	12.29
Big	0.579*	0.760*	0.818*	0.685*	0.993*	6.67	14.10	18.68	11.38	25.18
	SMB slope (average = 0.534)									
Small	1.880*	1.237*	0.513**	0.946*	1.959*	11.33	7.20	2.43	6.12	9.91
2	0.963*	0.752*	0.714*	0.825*	0.942*	6.58	5.25	6.20	6.99	5.13
3	0.213	0.459*	0.559*	0.585*	0.258***	1.49	3.16	4.07	4.75	1.83
4	0.501*	0.225***	0.125	0.339*	-0.217	3.82	1.95	1.11	2.89	-1.46
Big	-0.416**	0.094	-0.046	0.141	-0.184**	-2.49	0.91	-0.55	1.22	-2.43
	HML slope (average = 0.207)									
Small	-0.706*	0.067	0.596*	0.575*	1.048*	-4.98	0.46	3.31	4.35	6.21
2	-0.317**	-0.151	0.201**	0.152	0.912*	-2.53	-1.24	2.05	1.51	5.81
3	-0.007	-0.023	0.023	0.291*	0.722*	-0.06	-0.19	0.20	2.77	5.99
4	0.059	0.426*	0.226**	0.408*	0.822*	0.53	4.30	2.35	4.07	6.47
Big	-0.493*	-0.097	0.068	0.012	0.389*	-3.45	-1.10	0.95	0.13	5.98
	Adjusted R^2 (average = 0.485)					**SSE**				
Small	0.504	0.416	0.237	0.436	0.550	0.08	0.08	0.10	0.07	0.09
2	0.276	0.396	0.327	0.505	0.512	0.07	0.07	0.05	0.05	0.08
3	0.316	0.282	0.334	0.572	0.622	0.07	0.07	0.06	0.06	0.07
4	0.334	0.440	0.391	0.541	0.749	0.06	0.05	0.05	0.05	0.07
Big	0.412	0.676	0.816	0.579	0.908	0.08	0.05	0.04	0.05	0.04

Note: *, **, and *** = significant at 1, 5, and 10 percent, respectively. The table reports statistics for the period January 1995 to June 2008.
Source: Authors' calculations.

Table 6 shows that adding HVaRL and SMB to the one-factor model yields significant coefficients for RM-RF, while HVaRL captures slightly more time variation in the test portfolios than SMB. Five of the HVaRL slope coefficients and eight of the SMB slope coefficients are insignificant. All the HVaRL coefficients have the correct positive sign while some of the SMB coefficients have a negative sign.

Table 6: Three-factor model: Regression of excess stock returns on RM-RF, HVaRL, and SMB (panel B)

BE/ME quintile

Size quintile	Low	2	3	4	High	Low	2	3	4	High
	RM-RF slope (average = 0.493)					**t-statistics**				
Small	0.465*	0.503*	0.751*	0.524*	0.505*	4.21	4.74	5.25	4.98	3.72
2	0.398*	0.565*	0.383*	0.590*	0.357*	4.07	6.02	5.01	7.63	3.17
3	0.361*	0.529*	0.436*	0.531*	0.453*	3.89	5.52	4.90	6.87	5.09
4	0.342*	0.262*	0.347*	0.435*	0.541*	4.10	3.52	4.68	5.69	6.41
Big	0.355*	0.555*	0.732*	0.557*	0.873*	3.12	8.45	13.42	7.43	17.70
	HVaRL slope (average = 0.465)									
Small	0.765*	0.731*	-0.256	0.440*	0.969*	4.60	4.56	-1.19	2.78	4.74
2	0.192	0.239***	0.132	0.229***	1.346*	1.30	1.69	1.15	1.96	7.93
3	0.345**	0.007	0.291**	0.576*	0.972*	2.46	0.05	2.16	4.95	7.23
4	0.433*	0.574*	0.259**	0.527*	1.338*	3.44	5.10	2.32	4.57	10.50
Big	0.183	0.374*	0.221*	0.276**	0.480*	1.07	3.77	2.69	2.45	6.45
	SMB slope (average = 0.335)									
Small	1.241*	0.848*	0.834*	0.871*	1.729*	6.64	4.71	3.44	4.89	7.52
2	0.761*	0.572*	0.700*	0.743*	0.460**	4.60	3.60	5.40	5.67	2.41
3	0.018	0.448*	0.403*	0.349*	-0.070	0.12	2.76	2.67	2.67	-0.47
4	0.277***	0.031	0.047	0.166	-0.721*	1.96	0.25	0.38	1.29	-5.04
Big	-0.666*	-0.143	-0.150	-0.009	-0.337*	-3.46	-1.29	-1.62	-0.07	-4.04
	Adjusted R^2 (average = 0.494)					**SSE**				
Small	0.494	0.483	0.191	0.398	0.510	0.08	0.07	0.10	0.07	0.10
2	0.254	0.401	0.314	0.509	0.576	0.07	0.07	0.05	0.05	0.08
3	0.341	0.281	0.353	0.612	0.651	0.07	0.07	0.06	0.05	0.06
4	0.380	0.463	0.390	0.552	0.813	0.06	0.05	0.05	0.05	0.06
Big	0.373	0.701	0.823	0.594	0.910	0.08	0.05	0.04	0.05	0.03

Note: *, **, and *** = significant at 1, 5, and 10 percent, respectively. The table reports statistics for the period January 1995 to June 2008.
Source: Authors' calculations.

Interestingly, in Table 7, HVaRL captures greater time variation than RM-RF and SMB as indicated by their significant coefficients. Only three of the HVaRL coefficients are insignificant compared to five and ten, respectively, in the case of RM-RF and SMB. The average adjusted R^2 value is 0.476. Again, while the HML factor carries both signs, HVaRL has a robust positive sign in all cases.

Table 7: Three-factor model: Regression of excess stock returns on RM-RF, HVaRL, and HML (panel C)

BE/ME quintile

Size quintile	Low	2	3	4	High	Low	2	3	4	High
	RM-RF slope (average = 0.346)					**t-statistics**				
Small	0.001	0.154***	0.353*	0.125	-0.277*	0.02	1.92	3.54	1.64	-2.64
2	0.100	0.337*	0.076	0.270*	0.127	1.40	4.92	1.31	4.52	1.65
3	0.360*	0.341*	0.270*	0.374*	0.454*	5.50	4.92	4.19	6.75	7.59
4	0.229*	0.232*	0.317*	0.347*	0.818*	3.83	4.51	6.09	6.56	13.25
Big	0.674*	0.630*	0.795*	0.565*	0.999*	8.50	13.76	20.43	10.67	28.50
	HVaRL slope (average = 0.571)									
Small	1.725*	1.155*	-0.222	0.594*	1.331*	10.82	7.12	-1.10	3.84	6.28
2	0.688*	0.584*	0.349*	0.499*	1.291*	4.72	4.22	2.97	4.14	8.27
3	0.403*	0.207	0.488*	0.663*	0.732*	3.04	1.48	3.75	5.91	6.06
4	0.579*	0.463*	0.207***	0.475*	0.828*	4.80	4.45	1.97	4.44	6.64
Big	0.162	0.410*	0.156**	0.304*	0.219*	1.01	4.44	1.99	2.84	3.09
	HML slope (average = 0.101)									
Small	-0.969*	-0.113	0.795*	0.550*	0.956*	-6.33	-0.73	4.10	3.70	4.69
2	-0.375*	-0.215	0.220***	0.137	0.614*	-2.68	-1.62	1.95	1.19	4.10
3	-0.118	-0.004	-0.044	0.16	0.493*	-0.93	-0.03	-0.36	1.49	4.25
4	-0.056	0.294*	0.172***	0.297*	0.452*	-0.49	2.95	1.71	2.89	3.78
Big	-0.647*	-0.237*	-0.002	-0.074	0.263*	-4.21	-2.67	-0.03	-0.73	3.87
	Adjusted R^2 (average = 0.476)					**SSE**				
Small	0.484	0.413	0.215	0.362	0.416	0.08	0.08	0.10	0.08	0.10
2	0.192	0.362	0.207	0.415	0.603	0.07	0.07	0.06	0.06	0.08
3	0.344	0.247	0.325	0.600	0.686	0.06	0.07	0.06	0.05	0.06
4	0.365	0.491	0.401	0.570	0.801	0.06	0.05	0.05	0.05	0.06
Big	0.393	0.711	0.820	0.595	0.910	0.08	0.05	0.04	0.05	0.03

Note: *, **, and *** = significant at 1, 5, and 10 percent, respectively. The table reports statistics for the period January 1995 to June 2008.
Source: Authors' calculations.

It is interesting to note that the three-factor model captures slightly more common variation in terms of the adjusted R^2 value when using HVaRL with SMB or HML: the average adjusted R^2 value increases from 0.485 (Table 5) to 0.494 (Table 6).

6. Conclusion

Investigating the asset-pricing implications of VaR as a risk factor can be a difficult task, especially in the context of emerging markets where economic and political conditions may be volatile. However, VaR is now widely applied in the financial world and is popular among risk managers, banks, and financial institutions that wish to determine whether their investors are compensated adequately in terms of high returns. Our main aim has been to investigate the role of VaR at three different confidence levels (10, 5, and 1 percent) in Pakistan as an emerging market for the period August 1995 to June 2008.

The study compares the explanatory power of VaR with that of the size and book-to-market factors by adopting both a cross-sectional and time series approach. It also investigates the asset-pricing implications of downside risk as measured by VaR and examines the cross-section of expected returns for decile portfolios sorted by the VaR (10, 5, and 1 percent) of each stock. Portfolios with a higher VaR are found to yield a higher average return; the VaR factor thus significantly explains the cross-sectional variations in expected returns. As a measure of downside risk, therefore, VaR is associated with higher returns.

We also evaluate the performance of VaR at the portfolio level by using a time series regression approach. This involves applying one-, two-, three-, and four-factor models where the monthly returns associated with a portfolio constructed by sorting stocks with respect to size and book-to-market are regressed on the returns for a market portfolio of stocks as well as size, book-to-market, and VaR factors. Our empirical results show that VaR captures substantial time variation in stock returns in the one-factor and two-factor models. More importantly, it gains additional explanatory power after controlling for the characteristics of RM-RF, SMB, and HML in the four-factor model.

Overall, our results imply that VaR is better able to capture cross-sectional and time series variations than size and book-to-market factors in Pakistan's emerging market. Currently, it is implemented by the State Bank of Pakistan and the Securities and Exchange Commission of Pakistan, primarily to supervise the risk exposure of banks, brokerage houses, and investment companies. Our results suggest that VaR could serve as a useful measure for quantifying the downside risk exposure of equity securities in Pakistan.

The study could be extended to compare VaR with other measures of risk such as beta, downside beta, lower partial moment, and liquidity. In addition, the analysis could be extended to examine the sensitivity of the relationship between expected returns and VaR to various parametric and nonparametric methods of estimating VaR.

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Appendix 1

List of firms used in the study

No.	Firm	No.	Firm
1.	Abbott Labs (Pak.)	33.	Bosicor Pakistan
2.	ABN Amro Bank (Pak.)	34.	Capital Assets Leasing
3.	Adamjee Insurance	35.	Central Insurance
4.	Agriauto Industries	36.	Century Insurance
5.	Al Abid Silk	37.	Century Paper
6.	Al Zamin Leasing Corp.	38.	Cherat Cement
7.	Al-Abbas Cement	39.	Clariant Pakistan
8.	Al-Ghazi Tractors	40.	Colgate Palmolive
9.	Al-Khair Gadoon	41.	Crescent Commercial Bank
10.	Allied Bank	42.	Crescent Steel
11.	Al-Mazeen Mutual Fund	43.	Crescent Textiles
12.	Al-Noor Modaraba Management	44.	D G Khan Cement Company
13.	American Life Insurance	45.	Dadabhoy Cement
14.	Arif Habib Securities	46.	Dadabhoy Sack
15.	Askari Bank	47.	Dadex Eternit
16.	Askari Leasing	48.	Dandot Cement
17.	Atlas Honda	49.	Dawood Capital Management
18.	Atlas Insurance	50.	Dawood Hercules
19.	Attock Cement Pakistan	51.	Dawood Lawrencepur
20.	Attock Petroleum	52.	Dewan Automotive Engineering
21.	Attock Refinery	53.	Dewan Cement
22.	Azgard Nine	54.	Dewan Farooque Motors
23.	Balochistan Glass	55.	Dewan Mushtaq Textiles
24.	Bank Al Habib	56.	Dewan Salman Fiber
25.	Bank Al-Falah Limited	57.	Dewan Sugar
26.	Bank of Punjab	58.	Dewan Textile Mills
27.	Bannu Woolen Mills	59.	Dreamworld
28.	Bata Pakistan	60.	East West Insurance
29.	Bestway Cement	61.	Ecopack
30.	Bhanero Textiles	62.	EFU General Insurance
31.	BOC Pakistan	63.	EFU Life Assurance
32.	Bolan Castings	64.	English Leasing

No.	Firm	No.	Firm
65.	Engro Chemicals	101.	Ibrahim Fibers
66.	Escorts Investment Bank	102.	ICI Pakistan
67.	Faisal Spinning Mills	103.	Ideal Spinning Mills
68.	Fateh Textile Mills	104.	Indus Motors
69.	Fauji Cement Limited	105.	Inter Asia Leasing
70.	Fauji Fertilizer	106.	International General Insurance
71.	Fauji Fertilizer Bin Qasim	107.	International Industries
72.	Faysal Bank	108.	International Multi Leasing
73.	Fazal Textile Mills	109.	Invest Capital Investment Bank
74.	Fecto Cement	110.	Investec Mutual Fund
75.	Ferozsons Laboratories	111.	Investec Securities
76.	First IBL Modaraba	112.	J K Spinning Mills
77.	First Interfund Modaraba	113.	J O V & Co.
78.	First Tristar Mod	114.	Jahangeer Siddiqui
79.	Gadoon Textiles	115.	Japan Power Generation
80.	Gammon Pakistan	116.	Javedan Cement
81.	Gatron Industries	117.	JDW Sugar Mills
82.	Gauhar Engineering	118.	JS Global Capital
83.	General Tyre and Rubber Co.	119.	JS Value Fund
84.	Ghani Glass	120.	Karachi Electric Supply Corp.
85.	Gharibwal Cement	121.	Karam Ceramics
86.	Gillette Pakistan	122.	KASB Modaraba
87.	GlaxoSmithKline Pakistan	123.	Khalid Siraj Textiles
88.	Gul Ahmed Textile Mills	124.	Kohat Cement
89.	Gulistan Spinning Mills	125.	Kohinoor Energy
90.	Gulistan Textile Mills	126.	Kohinoor Mills
91.	Habib ADM	127.	Kohinoor Spinning Mills
92.	Habib Metro Bank	128.	Kohinoor Textile Mills
93.	Habib Modaraba First	129.	Kot Addu Power
94.	Habib Sugar	130.	Lakson Tobacco
95.	Hala Enterprises	131.	Liberty Mills
96.	Hayeri Construct	132.	Lucky Cement
97.	Hinopak Motors	133.	Mandviwala Mauser
98.	Honda Atlas Cars	134.	Maple Leaf Cement
99.	Hub Power	135.	Mari Gas
100.	Huffaz Seamless Pipe	136.	MCB Bank

No.	Firm
137.	Meezan Bank
138.	Mehmood Textiles
139.	Millat Tractors
140.	Mirpurkhas Sugar
141.	Modaraba Al-Mal
142.	Murree Brewery
143.	Mustehkam Cement
144.	MyBank
145.	Nakshbandi Industries
146.	National Bank of Pakistan
147.	National Refinery
148.	Nestle Pakistan
149.	New Jubilee Insurance
150.	New Jubilee Life Insurance
151.	NIB Bank
152.	Nimir Industrial Chemicals
153.	Nishat (Chunian)
154.	Nishat Mills
155.	Noon Sugar Mills
156.	Oil and Gas Development Corp.
157.	Orix Investment Bank
158.	Orix Leasing Pak.
159.	Otsuka Pakistan
160.	Packages
161.	Pak Elektron
162.	Pak Suzuki Motor
163.	Pakistan Cement
164.	Pakistan Engineering
165.	Pakistan Hotels Dvpr.
166.	Pakistan Insurance
167.	Pakistan International Airlines
168.	Pakistan International Container Terminal
169.	Pakistan National Shipping
170.	Pakistan Oilfields
171.	Pakistan Petroleum

No.	Firm
172.	Pakistan PTA
173.	Pakistan Refinery
174.	Pakistan Services
175.	Pakistan State Oil
176.	Pakistan Synthetic
177.	Pakistan Tobacco
178.	Paramount Spinning Mills
179.	PICIC Growth Fund
180.	PICIC Investment Fund
181.	Pioneer Cement
182.	Prudential Dis. House
183.	PTCLA
184.	Quality Textile Mills
185.	Rafhan Maize Products
186.	Rupali Polyester
187.	S G Fibers
188.	Saif Textile Mills
189.	Samin Textile Mills
190.	Sana Industries
191.	Sanofi-Aventis
192.	Sapphire Fibers
193.	Sapphire Textile Mills
194.	Saudi Pak Commercial Bank
195.	Sazgar Engineering
196.	Searle Pakistan
197.	Security Investment Bank
198.	Security Paper
199.	Service Industries
200.	Shabir Tiles
201.	Shadman Cotton Mills
202.	Shaffi Chemical Industries
203.	Shaheen Insurance
204.	Shahtaj Sugar Mills
205.	Shakarganj Mills
206.	Shell Pakistan
207.	Siemens Engineering

No.	Firm
208.	Sitara Chemical Industries
209.	Soneri Bank
210.	Southern Electric Power
211.	Standard Chartered Modaraba
212.	Sui Northern Gas
213.	Sui Southern Gas
214.	Sunshine Cotton Mills
215.	Syed Match Co.
216.	Taj Textile Mills
217.	Telecard
218.	Thal
219.	Tri-Pack Films
220.	Tri-Star Polyester

No.	Firm
221.	Trust Investment Bank
222.	Trust Modaraba
223.	Unicap Modaraba
224.	Unilever Pakistan
225.	Unilever Pakistan Foods
226.	United Bank
227.	United Sugar Mills
228.	Wazir Ali Industries
229.	Worldcall Telecom
230.	Wyeth Pakistan
231.	Zeal Pakistan Cement

Appendix 2

Results obtained from one-factor and two-factor models

One-factor model

Table A1 gives the estimates and averages obtained from the one-factor model in which the excess returns on 25 portfolios are regressed separately on RM-RF, SMB, HML, and HVaRL. It is evident from the table that, when these factors are employed individually, RM-RF captures more common variation in stock returns than HVaRL, SMB, or HML. All the market slopes are statistically significant. The average slope coefficient of RM-RF is 0.547. HVaRL captures a greater degree of time series variation in portfolio returns, even when used alone. These findings are consistent with Bali and Cakici (2004) and Chen et al. (2009). All the slope coefficients are statistically significant at the 1 percent level. The average slope of HVaRL is 1.002 and the t-statistics range from 3.38 to 14.14. The average adjusted R-squared value is 0.322.

The results also show that the portfolios with the highest book-to-market value are more sensitive to changes in HVaRL and have larger statistically significant coefficients than the other portfolios. Relative to the other factors, HVaRL has a higher degree of explanatory power for the portfolios in the large-cap stock quintile than SMB and HML. Specifically, the average adjusted R-squared value for HVaRL is 0.322 while the corresponding range for SMB and HML is 0.078–0.148, respectively.

SMB, which mimics the factor in returns related to size, has less explanatory power than HVaRL and HML. Nine of the slope coefficients are statistically insignificant and 18 of the adjusted R-squared values are less than 0.1. As expected, the SMB slopes are related to size: in every BE/ME for SMB, the slopes generally decrease from smaller to larger size quintiles. HML, when used alone, explains the large difference in contrast to SMB: three of its slope coefficients are statistically insignificant and 11 of the adjusted R-squared values are less than 0.1. Clearly, the slopes for HML are systematically related to BE/ME. In every size quintile of stocks, the HML slopes generally increase from lower to higher BE/ME quintiles.

Table A1: One-factor model: Regression of excess stock returns on RM-RF, SMB, HML, and HVaRL

BE/ME quintile

Size quintile	Low	2	3	4	High	Low	2	3	4	High
	RM-RF slope (average = 0.547)					**t-statistics**				
Small	0.361*	0.498*	0.436*	0.420*	0.329*	4.31	6.69	5.21	6.02	3.07
2	0.246*	0.480*	0.230*	0.455*	0.655*	4.00	8.34	4.66	8.83	7.82
3	0.465*	0.406*	0.416*	0.616*	0.781*	8.65	7.28	7.72	12.04	13.06
4	0.402*	0.436*	0.416*	0.555*	1.168*	7.82	9.33	9.68	11.57	18.78
Big	0.600*	0.714*	0.844*	0.647*	1.120*	8.99	18.40	26.81	14.93	35.69
	Adjusted R^2 (average = 0.359)					**SSE**				
Small	0.099	0.214	0.140	0.180	0.050	0.10	0.09	0.10	0.09	0.13
2	0.085	0.299	0.114	0.323	0.272	0.08	0.07	0.06	0.06	0.10
3	0.314	0.244	0.267	0.472	0.513	0.07	0.07	0.07	0.06	0.07
4	0.272	0.348	0.365	0.452	0.686	0.06	0.06	0.05	0.06	0.08
Big	0.331	0.677	0.817	0.580	0.888	0.08	0.05	0.04	0.05	0.04
	HVaRL slope (average = 1.002)					**t-statistics**				
Small	1.255*	1.272*	0.551*	1.002*	1.493*	9.54	10.58	3.38	8.36	8.86
2	0.615*	0.852*	0.541*	0.865*	1.731*	5.59	7.80	6.13	9.10	14.14
3	0.741*	0.581*	0.760*	1.152*	1.471*	6.97	5.25	7.55	12.14	13.35
4	0.803*	0.861*	0.639*	1.002*	1.943*	8.63	10.24	7.31	10.91	14.01
Big	0.587*	0.987*	1.029*	0.889*	1.443*	4.04	9.76	9.28	8.59	10.88
	Adjusted R^2 (average = 0.322)					**SSE**				
Small	0.360	0.410	0.061	0.301	0.326	0.09	0.08	0.11	0.08	0.11
2	0.159	0.272	0.186	0.338	0.554	0.07	0.07	0.06	0.06	0.08
3	0.229	0.143	0.259	0.478	0.526	0.07	0.07	0.07	0.06	0.07
4	0.315	0.394	0.247	0.424	0.550	0.06	0.06	0.06	0.06	0.09
Big	0.088	0.371	0.347	0.313	0.423	0.10	0.07	0.07	0.07	0.09
	SMB slope (average = -0.280)					**t-statistics**				
Small	0.653*	0.213	-0.082	0.218	1.087*	3.67	1.21	-0.44	1.36	5.05
2	0.268**	-0.126	0.226**	0.012	-0.008	2.01	-0.87	2.08	0.10	-0.04
3	-0.432*	-0.201	-0.139	-0.315**	-0.649*	-3.27	-1.51	-1.05	-2.16	-3.75
4	-0.152	-0.304**	-0.385*	-0.379*	-1.416*	-1.21	-2.55	-3.52	-2.85	-6.92
Big	-1.107*	-0.834*	-1.054*	-0.700*	-1.420*	-7.50	-6.54	-8.08	-5.41	-8.78
	Adjusted R^2 (average = 0.078)					**SSE**				
Small	0.072	0.003	-0.005	0.005	0.132	0.10	0.10	0.11	0.09	0.13
2	0.018	-0.001	0.020	-0.006	-0.006	0.08	0.08	0.06	0.08	0.12
3	0.057	0.008	0.001	0.022	0.075	0.08	0.08	0.08	0.09	0.10
4	0.003	0.033	0.066	0.042	0.225	0.07	0.07	0.06	0.08	0.12

Size quintile	Low	2	3	4	High	Low	2	3	4	High
Big	0.255	0.206	0.286	0.149	0.321	0.09	0.08	0.08	0.08	0.10
	HML slope (average = 0.712)					**t-statistics**				
Small	0.037	0.683*	0.948*	0.996*	1.510*	0.21	4.20	5.63	7.34	7.94
2	0.106	0.394*	0.485*	0.645*	1.469*	0.81	2.88	4.86	5.50	9.00
3	0.404*	0.389*	0.455*	0.846*	1.283*	3.15	3.06	3.70	6.66	9.01
4	0.464*	0.750*	0.547*	0.852*	1.589*	3.96	7.35	5.40	7.48	8.44
Big	-0.013	0.506*	0.724*	0.554*	1.190*	-0.08	3.79	5.22	4.29	7.16
	Adjusted R^2 (average = 0.148)					**SSE**				
Small	-0.006	0.094	0.160	0.247	0.278	0.11	0.10	0.10	0.08	0.12
2	-0.002	0.043	0.123	0.154	0.332	0.08	0.08	0.06	0.07	0.10
3	0.052	0.049	0.073	0.212	0.332	0.08	0.08	0.07	0.08	0.09
4	0.084	0.248	0.149	0.255	0.304	0.07	0.06	0.06	0.07	0.11
Big	-0.006	0.077	0.140	0.098	0.238	0.10	0.08	0.08	0.08	0.10

Note: *, **, and *** = significant at 1, 5, and 10 percent, respectively. The table reports statistics for the period January 1995 to June 2008.
Source: Authors' calculations.

Two-factor model

In order to determine the relative efficacy of the VaR factor, we consider a set of two-factor models in which the monthly returns on the 25 portfolios are regressed on RM-RF along with SMB, HML, or HVaRL. The results are given in Table A2. Interestingly, the RM-RF and HVaRL two-factor model captures a greater degree of time variation in portfolio returns than the other two-factor models.

Panel A of the table gives the results of the excess stock returns regressed on RM-RF and HVaRL. When used alone, RM-RF has a low degree of explanatory power in terms of the adjusted R-squared value. However, when HVaRL is added to the regression, both variables capture a larger time series variation. RM-RF, when used alone, yields an average adjusted R-squared value of 0.359 (Table A1). In the two-factor regressions (Table A2, panel A), the average adjusted R-squared value is 0.452. The t-statistics for the RM-RF slopes are generally greater than 2.

As expected, 22 of the 25 HVaRL coefficients are statistically significant at the 1 percent level. The t-statistic ranges from –0.7 to 10.0. Panel B of Table A2 gives the regression results for the portfolios with RM-RF and SMB. The betas for stocks are all between 0 and 2. Six of the SMB slope coefficients are insignificant and the average adjusted R-squared value is 0.454.

Table A2: Two-factor model: Regression of excess stock returns on RM-RF and HVaRL or SMB or HML

BE/ME quintile

Panel A: RM-RF and HVaRL

Size quintile	Low	2	3	4	High	Low	2	3	4	High
	RM-RF slope (average = 0.352)					t-statistics				
Small	-0.056	0.147***	0.400*	0.158**	-0.220**	-0.64	1.85	3.86	2.00	-1.99
2	0.078	0.324*	0.089	0.278*	0.164**	1.07	4.74	1.54	4.68	2.04
3	0.353*	0.340*	0.267*	0.384*	0.483*	5.43	4.96	4.18	6.94	7.73
4	0.225*	0.249*	0.327*	0.365*	0.844*	3.81	4.77	6.29	6.78	13.23
Big	0.635*	0.616*	0.795*	0.561*	1.015*	7.68	13.29	20.63	10.67	27.94
	HVaRL slope (average = 0.614)									
Small	1.315*	1.107*	0.113	0.826*	1.735*	8.09	7.48	0.58	5.62	8.42
2	0.529*	0.493*	0.443*	0.558*	1.550*	3.90	3.88	4.08	5.05	10.37
3	0.353*	0.205	0.469*	0.731*	0.941*	2.92	1.61	3.95	7.10	8.09
4	0.555*	0.588*	0.280*	0.601*	1.019*	5.04	6.04	2.90	6.00	8.59
Big	-0.111	0.310*	0.155**	0.272*	0.330*	-0.72	3.60	2.16	2.79	4.89
	Adjusted R^2 (average = 0.452)					SSE				
Small	0.357	0.415	0.136	0.311	0.339	0.09	0.08	0.10	0.08	0.11
2	0.160	0.355	0.193	0.413	0.563	0.07	0.07	0.06	0.06	0.08
3	0.345	0.252	0.328	0.597	0.653	0.06	0.07	0.06	0.06	0.06
4	0.368	0.466	0.393	0.550	0.784	0.06	0.05	0.05	0.05	0.06
Big	0.329	0.700	0.821	0.597	0.902	0.08	0.05	0.04	0.05	0.04

Panel B: RM-RF and SMB

Size quintile	Low	2	3	4	High	Low	2	3	4	High
	RM-RF slope (average = 0.714)					t-statistics				
Small	0.827*	0.850*	0.629*	0.732*	0.964*	10.08	10.75	6.27	9.73	9.52
2	0.489*	0.678*	0.446*	0.698*	0.995*	7.12	10.26	8.32	12.78	10.69
3	0.524*	0.532*	0.574*	0.804*	0.914*	7.93	7.96	9.09	13.86	12.72
4	0.547*	0.534*	0.470*	0.684*	1.175*	9.04	9.49	8.92	12.05	15.27
Big	0.442*	0.732*	0.837*	0.688*	1.100*	5.55	15.27	21.48	12.89	28.40
	SMB slope (average = 0.596)									
Small	1.670*	1.257*	0.690*	1.118*	2.272*	9.70	7.59	3.28	7.09	10.69
2	0.869*	0.706*	0.774*	0.871*	1.214*	6.03	5.10	6.88	7.60	6.22
3	0.211	0.452*	0.566*	0.672*	0.473*	1.53	3.22	4.27	5.52	3.14
4	0.519*	0.352*	0.192***	0.461*	0.027	4.10	2.98	1.74	3.87	0.17
Big	-0.563*	0.065	-0.026	0.145	-0.068	-3.37	0.65	-0.32	1.30	-0.85
	Adjusted R^2 (average = 0.454)					SSE				
Small	0.430	0.419	0.189	0.373	0.444	0.08	0.08	0.10	0.08	0.10
2	0.251	0.393	0.313	0.501	0.411	0.07	0.07	0.05	0.05	0.09
3	0.320	0.286	0.338	0.554	0.539	0.07	0.07	0.06	0.06	0.07

Size quintile	Low	2	3	4	High	Low	2	3	4	High
4	0.337	0.379	0.373	0.496	0.684	0.06	0.06	0.05	0.06	0.08
Big	0.372	0.676	0.816	0.581	0.888	0.08	0.05	0.04	0.05	0.04

Panel C: RM-RF and HML

Size quintile	Low	2	3	4	High	Low	2	3	4	High
	RM-RF slope (average = 0.484)					**t-statistics**				
Small	0.418*	0.433*	0.299*	0.268*	0.044	4.62	5.40	3.44	3.86	0.44
2	0.267*	0.478*	0.161*	0.391*	0.439*	3.99	7.61	3.09	7.14	5.47
3	0.457*	0.391*	0.388*	0.535*	0.631*	7.80	6.44	6.63	10.03	10.92
4	0.369*	0.344*	0.367*	0.462*	1.018*	6.63	7.24	8.01	9.46	16.76
Big	0.713*	0.729*	0.833*	0.639*	1.052*	10.31	17.26	24.30	13.52	33.50
	HML slope (average = 0.324)									
Small	-0.297	0.3365**	0.7084*	0.781*	1.474*	-1.61	2.06	4.00	5.51	7.11
2	-0.107	0.011	0.357*	0.332**	1.117*	-0.79	0.09	3.37	2.99	6.84
3	0.038	0.076	0.145	0.418*	0.779*	0.33	0.62	1.22	3.86	6.63
4	0.169	0.475*	0.253*	0.482*	0.775*	1.49	4.92	2.72	4.85	6.28
Big	-0.584*	-0.077	0.058	0.043	0.349*	-4.15	-0.90	0.84	0.45	5.47
	Adjusted R^2 (average = 0.405)					**SSE**				
Small	0.108	0.229	0.213	0.307	0.275	0.10	0.09	0.10	0.08	0.12
2	0.083	0.294	0.168	0.355	0.434	0.08	0.07	0.06	0.06	0.09
3	0.310	0.241	0.269	0.514	0.616	0.07	0.07	0.07	0.06	0.07
4	0.278	0.431	0.390	0.520	0.747	0.06	0.05	0.05	0.06	0.07
Big	0.393	0.677	0.816	0.577	0.905	0.08	0.05	0.04	0.05	0.04

Note: *, **, and *** = significant at 1, 5, and 10 percent, respectively. The table reports statistics for the period January 1995 to June 2008.
Source: Authors' calculations.

HML, when used together with RM-RF, captures a smaller degree of time series variation in stock returns compared to SMB. As panel C shows, ten of the HML coefficients are statistically insignificant and the average adjusted R-squared value is 0.405. As in Table A1, the slopes of SMB and HML are related to, respectively, size and BE/ME. In every BE/ME quintile, the SMB slopes generally decrease from smaller to larger size quintiles. In every size quintile of stocks, the HML slopes generally increase from negative values for the lowest BE/ME quintile to positive values for the highest BE/ME quintile.

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An Impact Assessment of Expected Future Turmoil Risk on FDI: A Panel Data Analysis of Developing Countries

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Abstract

This paper uses foreign direct investment (FDI) data from 39 developing countries for the period 2002–11 to explore whether the expected future turmoil risk of a country plays a significant role in determining FDI. It concludes that countries for which the expected future turmoil risk is very high are likely to have lower FDI inflows than countries for which the expected future turmoil risk is low, keeping all other factors constant. The results also illustrate that GDP per capita, democratic accountability, religious tension, and FDI inflows in the previous period are important determinants of FDI in developing countries.

Keywords: Political risk, foreign direct investment, expected future turmoil risk.

JEL classification: C23, C33, F21, F23.

1. Introduction

Foreign direct investment (FDI) is seen as an engine of growth, especially for developing countries, which are keen to attract FDI in order to increase their investable resources and capital formation. FDI is also a means of transferring technology, innovative capacity, and managerial and operational skills to developing economies. It has become an important source of private external finance for developing economies because it is more resilient to economic crises as opposed to short-term credit and portfolio investments, which may be reversed quickly due to changes in the economic environment or investor perceptions. The share of FDI in GDP has also increased substantially for developing countries, from a low 0.1 percent in 1980 to 2.8 percent in 2012 (United Nations Conference on Trade and Development [UNCTAD], n.d.). FDI in developing economies has increased considerably over the last 25 years, rising from US$ 296 billion in 1980 to US$ 7,744 billion in 2012 (UNCTAD, n.d.).

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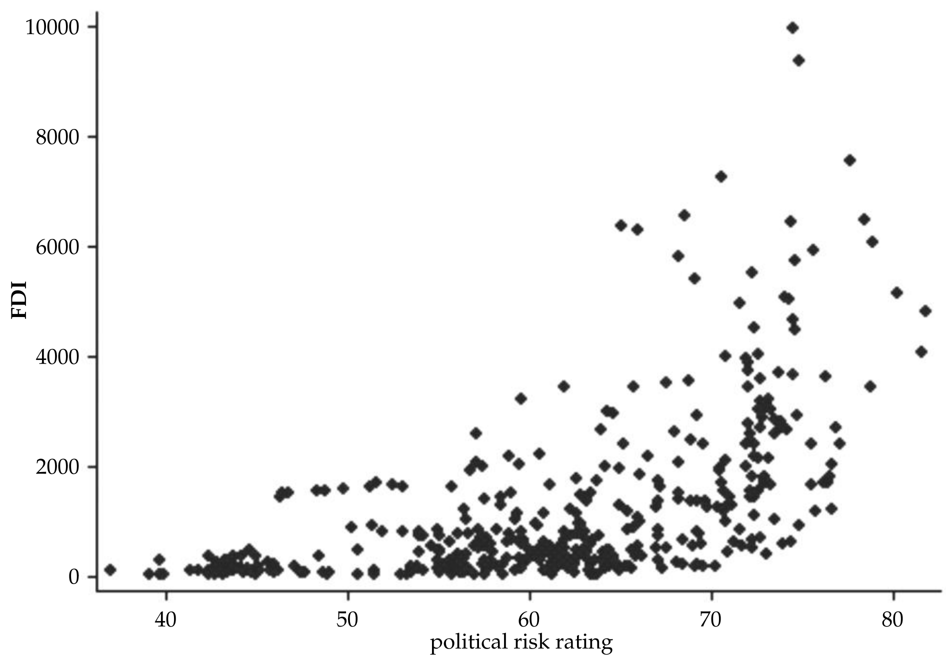
Multinational corporations (MNCs) take various economic and political factors into account when deciding where to invest, such as the expected returns to investment, how easily they can exit the host country if the security of their property is threatened, infrastructure availability, market size and growth, and the host country's macroeconomic stability and level of political risk.

According to a survey of 602 senior multinational executives, conducted by the Economist Intelligence Unit in 2007, political risk is seen as a greater obstacle to investment than corruption and infrastructural constraints. The Multilateral Investment Guarantee Agency (2012) suggests that, in the medium term, investors are most wary of political risk when making decisions about FDI. Figure 1 illustrates the positive correlation between FDI inflows per capita and the political risk rating variable from the Political Risk Services (PRS) Group's International Country Risk Guide. The relationship indicates that a higher political risk rating will induce positive FDI inflows, i.e., countries with a lower level of political risk are likely to attract more FDI inflows.

Figure 1: FDI per capita and political risk rating



While the definition of political risk remains widely debated, Weston and Sorge (1972, p. 60) characterize it comprehensively as the

> … Risks that can arise from actions of national governments which interfere with or prevent business transactions or change the terms of agreement or cause confiscation of wholly or partially foreign owned property.

Today, political risk has become a greater cause for concern for investors following the liberalization of various FDI regimes in the 1990s. Recent global developments such as terrorist threats, economic crises, and developing countries' desire to control their natural resources have led to an increase in investor perceptions of political risk. Moreover, turbulent economic conditions in Europe, the Middle East, and the US, and the global shift in FDI toward emerging and developing countries (which accounted for 40 percent of FDI in 2011) have amplified investors' concerns about political risk.

Hashmi and Guvenli (1992) note that US multinationals are likely to face increasing risk in two areas: delays in profit repatriation and unilateral changes in rules by governments. US multinationals are expected to face an increasing number of threats, which is likely to affect their ability to conduct business in host countries. However, Sethi (1986) argues that the bargaining power of developing countries will decline in the future, which will lead to a decrease in future political risk.

Wilkins and Minor (2001) emphasize the need to view political risks in the 21st century from a new perspective:

> Today's political risks are not the classic risks associated with communist takeovers or postcolonial outbursts of anti-foreign sentiment. They are more subtle, arising from legal and regulatory changes, government transitions, environmental and human rights issues, currency crisis and terrorism. Because these risks are subtle (often occurring at the same time as the government is declaring the country "open for business") they are often hard to manage.

Dunning (1973) suggests that economic variables such as market size and growth, cost factors, and investment climate are the prime indicators of FDI inflows, while political variables are less important. Agarwal (1980) considers other economic factors such as investment incentives, infrastructure, market distances, economic stability, and market growth as the main determinants of FDI flows, and finds mixed results regarding the impact of political stability on FDI. Within the framework of survey studies, Robinson (1961), Basi (1963), Swansbrough (1972), and Root (1978) underscore the negative link between political instability and FDI inflows. Reuber, Crookell, Emerson, and Gallais-Hamonno (1973) and Piper (1971), however, observe that political variables are of minimal importance to investors.

Among cross-country studies on the subject, Levis (1979) finds a negative relationship between FDI and political instability, while Bennett and Green (1972), Green and Cunningham (1975), and Kobrin (1976) suggest that this relationship stands up to scrutiny. Agarwal (1980) notes that the inconsistency of the results emerges not only due to the different types of data and analytical methods, but also because the definition of political instability varies across different studies. Moreover, political instability does not always increase political risk for FDI, for example, in the case of a shift of power from an extreme left-wing government to a right-wing dictatorship. Gastanaga, Nugent, and Pashamova (1998) use a sample of 22 developing countries to illustrate how stronger institutional indicators such as lower corruption and better contract enforcement lead to a greater inflow of FDI.

Schneider and Frey (1985) argue that, in developing countries, FDI is determined by both economic and political factors such that economies at a higher level of development—signaled by a higher GDP per capita and a lower balance of payments—are likely to attract more FDI, while political instability and the amount of bilateral aid flowing in from the West are the most important political determinants of the direction of FDI. The authors conclude that an investor in an industrialized economy will tend to invest in a developing economy if the return expected from the latter is greater than that expected at home or in other industrialized countries. In many cases, economic conditions might seem to be favorable but investment may not take place due to hostile political conditions. This implies that it is important to consider both economic and political indicators of FDI.

The theory of international production suggests that foreign investors have a long-term horizon while making an investment decision in a host country. Jensen and Young (2008) and Li (2006) observe that FDI is often seen as a long-term decision because disinvestment is costly. Firms rely heavily on the expected probability of political violence; rational expectations and uncertainty on the part of foreign investors affects the ways in which political violence influences investment behavior (Li, 2006).

The literature thus presents an interesting puzzle regarding the impact of political risk and stability on FDI inflows, given the conflicting results yielded by econometric studies and survey evidence. It is important to study the relationship between political risk and FDI in order to gain a better theoretical understanding of international production. This paper attempts to augment the literature by examining how expectations of various future political scenarios affect FDI inflows in developing countries—in doing so, we also employ a unique measure of expected future turmoil risk.

Li's (2006) analysis of the impact of predicted occurrences of anticipated and unanticipated scenarios focuses on three extreme forms of political violence: civil war, interstate war, and transnational terrorism. The study suggests that anticipated political violence might render an otherwise attractive investment location undesirable, thereby reducing reinvestment. The changes in investment decisions that occur before the event happens, however, may end up having little effect on FDI inflows after the event has actually taken place.

While Li (2006) considers extreme forms of political violence, the measures of expected future turmoil risk in this paper take into account not only expected scenarios that might lead to a state of war, but also scenarios involving occasional acts of violence and other obstacles that could seriously hinder business operations.

This paper builds on the following elements. First, political risk in the host country is an important variable in investment decisions. Second, forward-looking investors constantly anticipate the effect of turmoil risk in the host country. Third, expected future turmoil risk comprises four degrees: low, moderate, high, and very high. We aim to combine the behavior of forward-looking investors with respect to political risk with other economic and political determinants of FDI to illustrate whether the expected future political scenario of a country is a significant determinant of FDI or if economic and other political determinants remain the key indicators of FDI as shown by previous studies.

2. Methodology

This section describes the data and variables used, and specifies the study's model.

2.1. Data and Variables

The analysis spans the period 2002 to 2011 for a sample of 39 developing countries.[1] Busse and Hefeker (2007) use the political risk indicators provided by the International Country Risk Guide for a sample of 82 developing countries, and conclude that government stability, law and order, internal and external conflict, ethnic tension, bureaucratic quality and, to a lesser extent, democratic accountability and corruption determine the investment decisions of MNCs. However, data on expected future turmoil risk was available for only 39 of the 82 countries and the political risk country reports that contain information on expected future turmoil risk were not available before 2002. This paper uses a recent dataset and adds a new aspect to the subject by incorporating a unique measure of expected future turmoil risk and assessing its impact on FDI.

FDI net inflows, i.e., inflows net of outflows per capita, serve as the dependent variable and are measured in US dollars at current prices and exchange rates. Per capita values are used to account for the relative country size. FDI refers to foreign investments for which MNCs possess 10 percent or more of an enterprise in a host country. Given that this threshold is arbitrary and the FDI data does not include investment that is financed through equity or debt in the local market, it is possible that the model might underestimate the true value of investment by MNCs. If this bias is uniform across the sample, however, then the results are not likely to change, although the size of the coefficients may be overestimated. The data on FDI has been taken from the UNCTAD database.

Information on the political risk indicators is taken from the PRS Group's International Country Risk Guide and Country Risk Report, which provide data on 12 risk indicators, including political risk and other institutional indicators that are used to compute the political risk rating of a country. The relationship between the political risk rating and FDI is expected to be strong and positive. Kolstad and Villanger (2008), Singh and Jun (1995), and Harms (2002) have also used composite political economy indices. The 12 indicators that are used to compute the political risk rating are explained below.

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[1] The country sample includes Algeria, Argentina, Bolivia, Brazil, Bulgaria, Cameroon, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Ecuador, Egypt, Guatemala, Guinea, Haiti, Honduras, India, Indonesia, Kenya, Malaysia, Mexico, Morocco, Nicaragua, Oman, Pakistan, Panama, Paraguay, Peru, the Philippines, Russia, Sri Lanka, Thailand, Tunisia, Turkey, Uruguay, Venezuela, Zambia, and Zimbabwe.

1. *Government stability*: the government's ability to carry out its policies and remain in office (measured on a scale of 0–12).
2. *Socioeconomics*: socioeconomic constraints to government action or factors that may amplify social discontent and thus weaken the political regime (measured on a scale of 0–12).
3. *Internal conflict*: the degree of political violence in the country and its actual or potential consequences for governance, e.g., terrorism or civil war (measured on a scale of 0–12).
4. *Investment profile*: factors related to the risk of investment, such as expropriation or delays in profit repatriation or payment (measured on a scale of 0–12).
5. *Corruption*: the level of corruption in the country (measured on a scale of 0–6).
6. *External conflict*: the risk to the government from foreign action, ranging from diplomatic pressure to violent external conflicts (measured on a scale of 0–12).
7. *Religious tension*: associated with attempts by one or more religious sects to dominate society and/or governance, to replace civil law with religious law, or to reduce the influence of other religions over the political process (measured on a scale of 0–6).
8. *Law and order*: the strength and impartiality of the legal system (measured on a scale of 0–6).
9. *Ethnic tension*: the extent of tension among ethnic groups arising from racial, national, or language divides (measured on a scale of 0–6).
10. *Democratic accountability*: the responsiveness of the government to its citizens with regard to civil liberties and political rights (measured on a scale of 0–6).
11. *Bureaucratic quality*: the institutional strength and quality of the bureaucracy, which acts to decrease the probability of policy revisions when governments change (measured on a scale of 0–4).
12. *Military in politics*: the political influence of the military, which could signal that the government is not functioning efficiently and effectively and, therefore, that the country's environment for foreign businesses is unfavorable (measured on a scale of 0–6).

The higher the value of these indicators, the lower will be the political risk,[2] where the total number of points is 100. The reason for including a composite index for political risk is that disaggregated indices can contain measurement errors, which may even out when the individual indices are combined. Disaggregated indices also vary less within countries over time, which makes them problematic to use. However, the major disadvantage of using a composite index such as this is that it does not provide useful policy implications because it contains numerous elements of the political system. The relationship between the political risk rating and FDI is expected to be positive: a higher index reflects lower risk.

To strike a balance between minimizing measurement errors and insufficient variation and obtaining meaningful policy measures, the political risk index is disaggregated into components that reveal distinct political economy characteristics and, hence, are more useful for determining policy implications. The index of institutional quality, for instance, includes socioeconomic conditions, government stability, corruption, bureaucratic quality, and law and order. Kolstad and Villanger (2008), Wei (2000), and Habib and Zurawicki (2002) suggest that various aspects of institutional quality are important in determining FDI.

The political stability index is computed by combining the indices for internal conflict, external conflict, religious tension, ethnic tension, and the military's political influence. Tuman and Emmert (1999) and Kolstad and Tøndel (2002) note that aspects of stability have a significant link with aggregate FDI. The model also includes an index for the risk associated with the country's investment profile, such as contract viability, profit repatriation, and payment delays. The relationship between these indices and FDI is expected to be positive.

Harms and Ursprung (2002) and Kolstad and Villanger (2008) draw a link between democracy and FDI. Accordingly, our model includes the index for democratic accountability. The relationship between democracy and FDI can be positive or negative: as Rodrik (1991) observes, democratic institutions can also be associated with unstable policies, e.g., when governments change in the normal course of an election or when time-inconsistent policies are introduced. Li and Resnick (2003) show that, after

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[2] According to the International Country Risk Guide's methodology, if the points awarded are less than 50 percent of the total, then that component is considered very high-risk. If the points fall within 50 and 60 percent, the component is considered high-risk. If the points are in the range of 70–80 percent, then the component is considered to carry a moderate risk. Points in the 80–100 percent range represent a low level of risk. Similar criteria are set for the composite political risk rating.

taking into account a property rights measure, democracy decreases FDI inflows. The index for religious tension is included in the model to determine whether the involvement of religion in politics is a significant cause for concern among investors.

The PRS Group's country risk reports include information on each country's five-year forecasted turmoil risk. A dummy variable to account for the level of expected future turmoil risk is created using this data. The PRS Group defines "turmoil" as actions that might threaten or harm people or property, carried out by political groups or foreign governments operating within the country or externally.

The PRS Group is widely accepted as the most independent system of political risk forecasting and it presents different categories of forecasted turmoil risk, which have been used in this paper. The categorical variables created to measure the level of forecasted five-year turmoil risk range from low to moderate to high and very high. These variables are defined below:

- *Low risk*: discontent is expressed peacefully with a very low probability of political violence, which almost never affects MNCs.
- *Moderate risk*: occasional acts of terrorism, riots, political upheaval, labor unrest, or other forms of political violence.
- *High risk*: levels of political violence that may seriously hinder business operations.
- *Very high risk*: conditions that may lead to a state of war.

The model also includes other explanatory variables that are expected to have a relationship with FDI. GDP per capita, for instance, accounts for market size and is the most significant indicator of FDI inflows (Chakrabarti, 2001). The size of a market is likely to indicate the attractiveness of a location when an MNC is aiming to produce for the local market. GDP per capita is, therefore, expected to have a strong positive relationship with FDI. GDP is measured in current US dollars and the data has been obtained from the UNCTAD database.

Trade openness, which is also likely to have a strong impact on FDI inflows, is measured as the ratio of imports and exports to GDP. The relationship between trade openness and FDI is somewhat ambiguous: high trade barriers tend to attract horizontal FDI, while low trade barriers are associated with vertical FDI. Chakrabarti (2001) suggests, however, that trade openness and FDI are likely to have a positive relationship. The data on imports and exports is measured in US dollars at current prices and has been obtained from the UNCTAD database.

We include a lagged FDI variable to account for the fact that MNCs are likely to invest in countries that already have a substantial FDI inflow. The lagged FDI variable is, therefore, a significant determinant of FDI (Gastanaga et al., 1998; Jensen, 2003) and the relationship between FDI in the previous period and current period is expected to be strong and positive. Additionally, including a lagged dependent variable on the right-hand side of the model helps reduce the problem of autocorrelation.

Countries with a consistent macroeconomic policy are also seen as a more viable option for investment: for example, inflation can be linked to monetary or fiscal policy imbalances and, hence, a lower inflation rate may be seen as reflecting an adequate macroeconomic policy. The variable for inflation denotes some negative values, which implies that it has to be transformed.[3] Including the inflation rate also deflates all values given in current dollars. The data on the inflation rate has been taken from the World Development Indicators database. The inflation rate is expected to have a negative relationship with FDI inflows.

2.2. Model Specification

Table A1 in Appendix 1 provides descriptive statistics for the variables incorporated in the model. The initial regression employs fixed rather than random effects (see Table A2 in Appendix 1) based on the results of the Hausman test. However, this yields alarming results because the signs for political risk rating, institutional quality, political stability, investment profile, and religious tension are counterintuitive. Fixed effects assume that all the control variables and political risk indicators are exogenous, which is unrealistic.

We test for error autocorrelation by computing the Bhargava Durbin-Watson statistic, which is less than 1 for all regressions, indicating positive first-order serial correlation. The presence of autocorrelation implies that some or all of the estimated coefficients are biased, which could severely affect the interpretation of the impact of the independent variables on FDI. However, adding the lagged FDI variable to the right-hand side of the equation reduces this problem significantly. We employ a dynamic panel specification for this purpose.

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[3] The transformation equation is as follows: $y = \ln(x + \sqrt{x^2 + 1}$

Using the Arellano-Bond/Blundell-Bover GMM estimator—designed for small T and large N panels, a dynamic left-hand side variable, independent variables that are not strictly exogenous, and heteroskedasticity and autocorrelation within, but not across, individuals—allows us to control for the endogenous variables in the model. The inclusion of trade openness and GDP per capita in the regression analysis may lead to reverse causality. This would imply that trade openness affects FDI while higher FDI inflows are likely to lead to an increase in trading volume. Similarly, higher FDI is likely to increase the capital stock by introducing new technologies, thus raising GDP growth rates and hence GDP per capita.

The Arellano-Bond/Blundell-Bover GMM estimator addresses the issue of autocorrelation, making our estimates more reliable. Busse and Hefeker (2007) also employ this estimator when regressing the political risk indicators given in the International Country Risk Guide on FDI inflows for 82 developing countries from 1984 to 2003.

The benchmark regression model is written as

$$ln\ FDI_{it} = B_0 + B_1\ ln\ GDP_{it} + B_2\ ln\ trade\ openness_{it} + B_3\ political_{it} + B_4\ very\ high_{it-1} + B_5\ high_{it-1} + B_6\ moderate_{it-1} + B_7\ FDI_{it-1} + B_8\ ln\ inflation_{it} + \varepsilon_{it}$$

Here, *political* denotes the indicators of political risk and institutions, while *very high*, *high*, and *moderate* indicate the corresponding levels of expected future turmoil risk. The political variables are added to the model one by one due to their correlation. FDI, GDP, and trade openness are transformed by taking the log to base 10, which is necessary to ensure the variables are normally distributed.

The model includes the lagged variables for very high, high, and moderate levels of expected future turmoil risk. The country risk reports and the risk forecasts that are used to create dummy variables for the given categories of expected future turmoil risk for a particular year are published in December. This implies that investors will consider the previous year's risk forecasts when making an investment decision. For example, the risk report for Haiti for 2011 was published in December 2011, meaning that investors will consider the forecasted five-year turmoil risk level for 2010 in order to make investment decisions for 2011.

3. Empirical Results and Analysis

This section presents the results of the study.

3.1. Analysis and Results

The results of the dynamic panel estimation are reported in Table 1. The lagged FDI variable is significant at the 1 percent level in all the models estimated; this is the strongest level of significance and implies that a multinational's own success and the experience of other multinationals in the host country are strong indicators for future investment. In model 1, a one-percent increase in FDI in the previous period is expected to bring about a 0.68 percent increase in FDI in the current period, ceteris paribus.

The lagged variable for very high expected future turmoil risk has a negative relationship with FDI in all the models and is significant at the 5 percent level, indicating that countries with very high levels of expected future turmoil risk tend to have lower FDI inflows than countries with low levels of expected future turmoil risk, ceteris paribus. For example, in model 1, keeping all other factors constant, a country with a very high level of expected future turmoil risk has 16 percent lower FDI inflows than a country with a low level of expected future turmoil risk. Holding all other explanatory variables constant, on average the FDI inflows of a country with a very high level of expected future turmoil risk are 14.7 percent lower than the FDI inflows of a country with a low level of expected future turmoil risk (see Appendix 2 for the calculation of this proportionate difference).

This finding illustrates the forward-looking nature of investors and confirms the hypothesis that, even if current economic and political conditions seem favorable, expectations of a bleak political scenario (such as the threat of riots that might harm life and property) will deter investors from investing in that country. Turbulent political conditions are also likely to create hurdles for the daily operations of businesses and may also make it difficult for firms to exit the host country. Li (2006) supports this result and shows that anticipated events such as civil war, interstate war, and transnational terrorism are likely to render a site less attractive, limit expansion, and induce pre-emptive divestment.

GDP per capita maintains a positive relationship with FDI in all the models; GDP is significant at the 5 percent level in models 1 and 4 and at the 10 percent level in the other models. In other words, countries at a higher level of development, as indicated by a higher GDP per capita, received larger FDI inflows during 2003–11, ceteris paribus. The significance of the variable shows that a higher GDP per capita may signal higher investment returns and attract more FDI. For example, in model 1, an increase in GDP per capita of 1 percent will increase FDI inflows by 0.46 percent, keeping all other factors fixed.

The relationship between trade openness and FDI inflows is negative in all the models and significant only in model 1 when the composite political risk rating is added. The relationship derived in model 1 indicates that lower trade barriers tend to deter multinationals from investing in developing countries because an open economy is likely to be more competitive than one with higher barriers to trade, which would protect the output of foreign firms in the local market against their competitors' imports.

In model 1, an increase in trade openness of 1 percent will decrease FDI inflows by 0.35 percent, keeping all other factors fixed However, the results obtained from the other models support the findings of Busse and Hefeker (2007), who argue that FDI inflows in developing countries are unaffected by trade openness. Kolstad and Villanger (2008) also show that FDI inflows in the services industry are market seeking and unaffected by the trade openness of the host country.

Democratic accountability has a positive and significant relationship with FDI. The results indicate that a one-unit increase in democratic accountability will increase FDI inflows by 2.2 percent, ceteris paribus. Guerin and Manzocchi (2009), Harms and Ursprung (2002), Jensen (2003), and Busse (2004) also support the hypothesis that democratic countries are more likely to attract FDI.

The index for religion tension is significant at the 10 percent level and indicates that a lower risk of religious tension will have a positive impact on FDI. Keeping all other explanatory variables and factors fixed, an increase in this index of one unit will increase FDI by 4.9 percent. This result is in contrast to Busse and Hefeker (2007), who find that religious tension is an insignificant determinant of FDI.

It is important to note, however, that we have employed a relatively recent dataset and the corresponding analysis shows that investors have now become more concerned about religious involvement in politics: the level of religious tension does, therefore, matter to MNCs hoping to invest in developing countries. The onset of terrorism in the 21st century due to religious extremism in developing countries also explains why religion tension has become an important element of multinational investment decisions. High levels of religious activism are likely to hinder firms' operations and threaten their property and personnel, making such locations less attractive to multinationals.

The sign of the investment profile variable is as expected but is insignificant, which is surprising given that it includes elements such as the expropriation of assets and the ability to repatriate profits. Since the GMM estimator takes first differences and lags as instruments, this implies that improvements in the investment profile in previous periods are not closely linked to recent increases in FDI inflows.

Table 1: Arellano-Bond/Blundell-Bover dynamic panel estimation, 2002–11

Dependent variable: ln FDI

Explanatory variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Lagged FDI (LlnFDI)	0.68*** (4.98)	0.67*** (4.99)	0.67*** (4.88)	0.482*** (3.01)	0.65*** (4.68)	0.66*** (4.53)
Lagged moderate expected future turmoil risk (MOD)	-0.03 (-0.80)	-0.033 (-1.26)	-0.035 (-1.36)	-0.027 (-0.81)	-0.034 (-1.22)	-0.035 (-1.34)
Lagged high expected future turmoil risk (HIGH)	-0.014 (-0.300)	-0.15 (-0.33)	-0.14 (-0.31)	-0.059 (-1.18)	-0.02 (-0.39)	-0.010 (-0.27)
Lagged very high expected future turmoil risk (VHIGH)	-0.160** (-1.97)	-0.186** (-1.98)	-0.190** (-2.20)	-0.13* (-1.70)	-0.175** (-2.30)	-0.166** (-2.10)
Log of GDP per capita (GDP)	0.46** (2.05)	0.37* (1.69)	0.38* (1.73)	0.686** (2.62)	0.40* (1.70)	0.36* (1.71)
Log of trade openness (TRADE)	-0.35* (-1.65)	-0.29 (-1.44)	-0.27 (-1.43)	-0.37 (-1.56)	-0.29 (-1.46)	-0.28 (-1.48)
Inflation rate (LNINFLATION)	-0.05 (-0.77)	-0.06 (-0.81)	-0.08 (-0.88)	-0.04 (-0.71)	-0.06 (-0.82)	-0.07 (-0.77)
Political risk rating (POLRISK)	0.017 (1.190)					
Institutional quality (INSTIT)		0.008 (0.820)				
Political stability (POLST)			0.009 (0.560)			
Democratic accountability (DEMOC)				0.022** (2.270)		
Investment profile (INVEST)					0.025 (1.220)	
Religious tension (RELIG)						0.049* (1.770)
Groups	39	39	39	39	39	39
Instruments	25	25	25	25	25	25
Hansen test χ^2 (18)	24.85	26.06	27.15	26.89	28.60	25.75
Hansen p-values	0.0014	0.09	0.089	0.056	0.065	0.13
AB test (z-values)	-0.0400	-0.05	-0.060	-0.020	-0.080	-0.01

Note: The results of the regression refer to one-step estimates; z-values are reported in parentheses; ***, **, and * = significant at 1, 5, and 10 percent, respectively.
Source: Author's calculations.

The table employs difference GMM rather than system GMM. Although the latter improves efficiency, it also uses more instruments; given that the sample comprises 41 countries, system GMM is not an appropriate choice. The equation also employs robust standard errors and the Hansen statistic to test the validity of the instruments used.

The consistency of the Arellano-Bond/Blundell-Bover estimator requires the absence of second-order autocorrelation. The z-values of the Arellano-Bond (AB) test given in Table 1 clearly indicate that the null hypothesis of no second-order autocorrelation is not rejected. Hence, there is no second-order autocorrelation in the model; autocorrelation of order one is always rejected (not reported). Since the p-value of the Hansen test is greater than the 5 percent level of significance, we do not reject the null hypothesis that the instruments are exogenous. We can therefore conclude that the instruments employed are valid and exogenous

3.2. Robustness Checks

To test the robustness of the results obtained, we run several regressions using all permutations of the explanatory variables (see Table A3 in Appendix 1 for the regression results for model 1). GDP per capita, very high expected future turmoil risk, lagged FDI, democratic accountability, and religious tension remain significant at the same level in all the regressions.

We also test whether the regression results obtained are sensitive to small changes in the sample size. For this purpose, Brazil, Russia, India, and China (BRIC)—the largest countries in the sample in terms of economy and population—are excluded. The new sample now contains 35 countries, most of which are small developing countries. The sample is altered in this way to determine whether our results are applicable to relatively small developing countries.

Once the BRIC countries have been removed from the sample, model 1 shows that GDP per capita is significant at the 10 percent level while very high expected future turmoil risk and lagged FDI remain significant at the 5 percent and 1 percent level, respectively (see Table A4 in Appendix 1 for the regression results). The magnitude of the impact of GDP per capita on FDI does not differ drastically from the initial results.

In model 2, lagged FDI and very high expected future turmoil risk are both significant at the 1 percent level while GDP per capita is significant at the 10 percent level. Surprisingly, moderate future expected turmoil risk becomes significant after excluding the BRIC countries: after controlling for institutional quality, the variable is significant at the 10 percent level, suggesting that countries with a moderate level of expected future turmoil risk are likely to have 3.7 percent lower FDI inflows than those with a low level of expected future turmoil risk, ceteris paribus.

Model 3 shows that lagged FDI, very high expected future turmoil risk, and GDP remain significant at the 1 percent, 5 percent, and 10 percent level, respectively. Moderate expected future turmoil risk was insignificant in the initial regression, but after controlling for political stability, it becomes significant at the 10 percent level. This suggests that countries with a moderate level of expected future turmoil risk are likely to have 4 percent less FDI than countries with a low level of expected future turmoil risk, ceteris paribus.

In model 4, GDP per capita becomes insignificant while very high expected future turmoil risk, lagged FDI, and democratic accountability remain significant. Moderate expected future turmoil risk, which was initially insignificant, is now significant at the 10 percent level. Countries with a moderate level of expected future turmoil risk are likely to have 4.1 percent less FDI than those with a low level of expected future political risk, keeping all other factors constant.

In model 5, lagged FDI and very high expected future turmoil risk are significant at the 1 percent level, while GDP per capita is significant at the 10 percent level. Moderate expected future turmoil risk is now also significant at the 10 percent level, suggesting that countries with a moderate level of expected future turmoil risk are likely to have 4.2 percent less FDI than those with a low level of expected future turmoil risk, ceteris paribus.

In model 6, lagged FDI and very high expected future turmoil risk are significant at the 1 percent level. Moderate expected future turmoil risk, which was previously insignificant, becomes significant at the 10 percent level. Countries with a moderate level of expected future turmoil risk are expected to have 4.7 percent lower FDI inflows than countries with a low level of expected future turmoil risk, ceteris paribus. Finally, religious tension is now significant at the 5 percent level.

Summing up, the models present evidence of a link between very high expected future turmoil risk and FDI that is robust to changes in sample size and variables. The relationship between FDI inflows and religious tension is also robust to changes in variables and sample size. Some regressions reveal an inverse relationship between moderate expected future turmoil risk and FDI. Given that the sample now contains relatively small developing countries, even occasional incidents of violence, labor unrest, and political upheaval may cause concern among investors deciding whether to invest in such countries. GDP per capita is robust to most changes in sample size and variables, but the level at which it is significant varies.

The results support the case that multinationals are discouraged by undemocratic regimes and more likely to be attracted to countries that maintain their citizens' political freedom. There is also a strong case for the hypothesis that multinationals tend to be attracted to countries with high FDI inflows, given that lagged FDI is robust to all changes in the sample and explanatory variables.

4. Conclusion

The study's results reveal that investors take into consideration not only the expected returns on their investment, which may depend on GDP per capita as an indicator of market size, but also on the expected level of future turmoil risk. Foreign investment in the previous period is also a significant determinant of current FDI inflows. The analysis confirms that economies that already host other MNCs and have the potential to absorb the output of additional MNCs producing for the local market are more likely to attract FDI.

The most important finding is that investors are likely to be wary of countries with very high levels of expected future turmoil risk, i.e., conditions that might lead to a state of war. War often results in regime changes, which are generally associated with the expropriation of assets and breaches of contract between MNCs and former regimes to the detriment of foreign investors. Political violence that leads to a state of war is likely to cause an economic recession in the host country, damage its infrastructure, and impose financial constraints on the government as it tries to tackle these issues, often exhausting substantial financial and human resources in the process.

The study provides strong evidence that religious tension is another important determinant of FDI. Attempts by one or more religious groups to replace civil law may threaten the host country's economic conditions and the security of investors' assets. An increase in religious tension in the host country is thus likely to dampen FDI inflows. In this study, the composite political risk rating has no statistically significant impact on FDI inflows, although we do find evidence that a more democratic regime is likely to induce FDI inflows.

In order to boost investor confidence, governments should invest in the means of eradicating the root cause of political turmoil. In some developing countries, certain social groups may retaliate and join anti-government forces to oppose the prevailing social inequality, thereby increasing the chances of civil war. To minimize this risk, governments should allocate greater funds to education, employment, and other civic facilities in order to remove anti-government sentiments and decrease the probability of a regime change.

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Appendix 1

Table A1: Descriptive statistics of variables

Variable	N	Mean	SD	Min.	Max.
Democratic	390	3.795	1.537	0.00	6.00
FDI	390	1,242	1,546	11.72	9,945
High	390	0.288	0.453	0.00	1.00
Institution	390	20.01	4.227	8.70	30.50
Political	390	26.84	3.775	16.00	32.90
Investment	390	7.707	2.242	1.00	11.50
Moderate	390	0.459	0.499	0.00	1.00
Religion	390	4.419	1.462	0.00	6.00
Very high	390	0.0293	0.169	0.00	1.00
Rating	390	61.67	9.518	37.00	81.80
GDP	390	3,802	3,603	287.90	23,421
Trade openness	390	95.40	90.08	19.00	600.0
Inflation	390	8.060	7.630	-21.44	74.30

Source: Author's calculations.

The variables used in Tables A2 to A4 are listed below:

- Lln FDI = lagged FDI
- Moderate = moderate expected future turmoil risk
- High = high expected future turmoil risk
- Very high = very high expected future turmoil risk
- Rating = political risk rating
- Ln GDP = log of GDP per capita
- Trade = log of trade openness
- Ln inflation = inflation rate
- Institution = institutional quality
- Political = political stability
- Democratic = democratic accountability
- Investment = investment profile
- Religion = religious tension

Table A2: Panel data analysis with fixed effects

Dependent variable: ln FDI

Independent variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Ln GDP	3.42	4.12	3.56	3.45	3.26	4.22
	(19.21)***	(18.50)***	(18.12)***	(20.90)***	(20.15)***	(21.90)***
Trade	0.156	0.146	0.167	0.190	0.117	0.143
	(1.05)	(1.50)	(1.23)	(1.15)	(1.344)	(1.12)
Rating	-0.007					
	(-1.06)					
Moderate	0.080	0.090	0.090	0.07	0.076	0.086
	(0.67)	(0.76)	(0.78)	(0.68)	(0.81)	(0.80)
High	0.076	0.156	0.11	0.11	0.104	0.106
	(0.88)	(0.56)	(0.92)	(1.01)	(0.78)	(0.99)
Very high	-0.366	-0.366	-0.377	-0.367	-0.378	-0.380
	(-2.67)**	(-2.59)*	(-2.18)**	(-1.67)*	(-2.21)**	(-2.16)**
Ln inflation	-0.06	-0.07	-0.08	-0.05	-0.06	-0.07
	(-0.66)	(-0.70)	(-0.71)	(-0.77)	(-0.88)	(-0.95)
Institution		-0.019				
		(-1.17)				
Political			-0.006			
			(-0.35)			
Democratic				0.059		
				(1.17)		
Investment					-0.189	
					(-1.17)	
Religion						-0.056
						(-1.01)
_Cons	-19.89	-18.88	-19.06	-19.19	-18.99	-19.156
	(20.12)***	(19.11)***	(12.71)***	(15.90)***	(14.89)***	(15.65)***
Groups	39	39	39	39	39	39
Observations	390	390	390	390	390	390
R2 (within)	0.61	0.61	0.61	0.62	0.61	0.63
R2 (between)	0.7405	0.7475	0.7460	0.7440	0.7506	0.7499
Bhargava DW stat.	0.428	0.457	0.458	0.490	0.476	0.445

Note: t-values are reported in parentheses; *** = significant at 1 percent, ** = significant at 5 percent, * = significant at 10 percent. The Hausman test result for model 1 is $\chi^2 = 113.79$ ($p = 0.00$), the assumption being that we reject the use of random effects.
Source: Author's calculations.

Tables A3 and A4 employ difference GMM rather than system GMM. Although the latter improves efficiency, it also uses more instruments; given that the sample comprises 41 countries, system GMM is not an appropriate choice. The equation employs robust standard errors and the Hansen statistic to test the validity of the instruments used. In accordance with Roodman (2009), who suggests that the standard treatment for endogenous variables is to use the second lag and above, we use the second lag and its first difference as instruments.

Table A3: Arellano-Bond/Blundell-Bover panel data estimation

Dependent variable: ln FDI

Independent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Lln FDI	0.67	0.678	0.568	0.771	0.579	0.621
	(4.54)***	(11.54)***	(4.15)***	(11.87)***	(6.78)***	(4.79)***
Moderate				-0.016	-0.027	-0.014
				(-0.82)	(-0.99)	(-0.77)
High				0.003	-0.008	-0.003
				(0.09)	(-0.24)	(-0.07)
Very high		-0.164	-0.178	-0.161	-0.141	-0.156
		(-2.74)**	(-2.89)***	(-2.81)**	(-1.82)*	(-2.67)**
Rating	0.009	0.008			0.001	0.006
	(1.45)	(1.20)			(0.22)	(1.04)
Ln GDP	0.726	0.567	0.89	0.79		0.99
	(2.50)**	(1.99)**	(2.42)**	(2.42)**		(3.09)**
Trade	-0.155			-0.107		0.056
	(-0.80)			(-0.32)		(0.23)
Ln inflation	-0.55		-0.16	-0.12		
	(-1.21)		(-0.99)	(-0.77)		
Groups	39	39	39	39	39	39
Instruments	22	23	24	24	11	18
Hansen test	28.90	24.99	22.99	20.29	21.23	23.45
Hansen p-values	0.069	0.080	0.047	0.095	0.020	0.047
AB test (z-values)	-0.070	-0.100	0.140	-0.050	-0.004	0.050

Note: The results of the regression refer to one-step estimates; z-values are reported in parentheses; *** = significant at 1 percent, ** = significant at 5 percent, * = significant at 10 percent.

Source: Author's calculations.

Table A4: Arellano-Bond/Blundell-Bover panel data estimation after excluding BRIC countries from sample

Dependent variable: ln FDI

Independent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Ln FDI	0.654	0.66	0.556	0.667	0.667	0.59
	(5.68)***	(6.70)***	(5.89)***	(7.09)***	(7.88)***	(4.77)***
Moderate	-0.033	-0.037	-0.040	-0.041	-0.042	-0.047
	(-1.66)	(-1.85)*	(-1.86)*	(-1.70)*	(-1.80)*	(-1.85)*
High	-0.020	-0.020	-0.012	-0.022	-0.021	-0.019
	(-0.50)	(-0.66)	(-0.39)	(-0.58)	(-0.81)	(-0.66)
Very high	-0.165	-0.166	-0.171	-0.182	-0.155	-0.166
	(-2.17)**	(-2.05)***	(-2.18)**	(-2.89)**	(-2.39)***	(-2.40)***
Rating	0.005					
	(1.03)					
Ln GDP	0.590	0.779	0.450	0.675	0.668	0.789
	(1.88)*	(1.89)*	(1.90)*	(1.34)	(1.76)*	(1.85)*
Trade	-0.040	-0.068	-0.054	-0.063	-0.094	-0.074
	(-0.24)	(-0.44)	(-0.31)	(-0.38)	(-0.58)	(-0.47)
Ln inflation	-0.04	-0.05	-0.09	-0.07	-0.08	-0.04
	(-0.78)	(-0.80)	(-1.01)	(-0.98)	(-0.99)	(-0.77)
Institution		0.008				
		(0.81)				
Political			0.016			
			(0.89)			
Democratic				0.018**		
				(2.05)		
Investment					0.028	
					(1.04)	
Religion						0.056
						(2.88)**
Groups	35	35	35	35	35	35
Instruments	25	25	25	25	25	25
Hausman test	23.19	24.22	23.39	23.79	24.22	23.39
Hansen p-values	0.129	0.166	0.174	0.168	0.134	0.170
AB test (z-values)	0.330	0.520	0.380	0.310	0.220	0.330

Note: The results of the regression refer to one-step estimates; z-values are reported in parentheses; *** = significant at 1 percent, ** = significant at 5 percent, * = significant at 10 percent.
Source: Author's calculations.

Appendix 2

We take the proportionate difference in FDI between countries with a very high level of expected future turmoil risk and a low level of expected future turmoil risk as follows:

> Log (FDI inflows of very high expected future turmoil risk) – log (FDI inflows of low expected future turmoil risk) = –16 percent
>
> Exponentiation and subtracting 1 yields:
>
> (FDI inflows of very high expected future turmoil risk – FDI inflows of low expected future turmoil risk)/FDI inflows of low expected future turmoil risk = exp (–0.16) – 1 = –0.147

This more accurate estimate implies that a country with a very high level of expected future turmoil risk has, on average, 16.63 percent lower FDI inflows than a country with a low level of expected future turmoil risk.

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The Growth and Employment Impacts of the 2008 Global Financial Crisis on Pakistan

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Abstract

This study examines the impact of the 2008 global financial crisis on economic growth and employment in Pakistan. We conduct a time series analysis of quarterly data for 1997–2011, applying the autoregressive distributed lag bounds-testing approach and an unrestricted error correction model. Our analysis suggests that the impact of the crisis was transmitted primarily through two channels—the financial sector and trade—with a corresponding negative effect on economic growth and employment. Of the two channels, the magnitude of the trade effect is larger than that of the financial sector.

Keywords: Financial crisis, financial stress, economic growth, cointegration.

JEL classification: C51, C43, O4, O16.

1. Introduction

The global financial crisis of 2008, caused by a liquidity shortfall in the US banking system, permeated quickly into other advanced economies, given the increasing interdependence of global financial markets. Its ripple effect ultimately filtered through into developing countries' financial markets. The crisis also had significant effects on the real global economy, accounting for its worst economic performance since the Great Depression: world output growth declined from 5.2 percent in 2007 to –0.6 percent in 2009 (Malik & Janjua, 2011). However, the impact of this global credit crunch has varied from region to region and even from country to country, depending on the degree of financial and economic integration.

At the time of the global financial crisis in 2008, Pakistan's current account balance had deteriorated,[1] while poor law and order combined with severe energy shortages had caused a sharp decline in investment.

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[1] From –0.4 percent of GDP in 2006 to –0.8 percent of GDP in 2008 (World Bank, 2010a).

This two-pronged effect adversely inflated the terms of trade and worsened the country's overall macroeconomic balance. Pakistan attempted to overcome these challenges by adjusting domestic fuel prices, reducing development spending, and tightening its monetary policy. With the emergence of the global financial crisis, there was a significant decline in foreign capital inflows, further hindering domestic investment. This reduced stock prices as well as foreign reserves, causing the exchange rate to depreciate. Meanwhile, the crisis triggered a significant setback to the real global economy and a reduction in global demand, both of which had severe consequences for Pakistan's economy. The fall in domestic demand as well as in the demand for exports adversely affected the manufacturing, agriculture, construction, and IT sectors.

The aim of this study is to show how these proximate effects were transmitted to the economy in terms of overall economic growth and employment. Our approach differs from that of other studies in at least two respects. First, rather than examining the implications of the crisis in a comparative setting—thereby ignoring the individual characteristics of different economies—we analyze the dynamic effects of the crisis on Pakistan's economy. Second, we employ a more comprehensive approach than most other studies have done.

The rest of the study is organized as follows. Section 2 briefly reviews the literature on the recent financial crisis. We focus not only on studies that explore the implications of the crisis for Pakistan's economy, but also on those relevant to other economies. Section 3 explores the major channels of transmission through which the global financial crisis affected Pakistan. Section 4 presents the estimation methodology, constructs the relevant variables, and describes the data used. Section 5 discusses the empirical findings of the analysis and Section 6 concludes the paper.

2. A Review of the Literature

The 2008 financial crisis has had serious implications for development goals and spurred considerable academic and policy research on the channels and consequences of the crisis. This section divides the existing literature into two categories: descriptive and empirical.

2.1. Descriptive Analysis of the Impact of the Financial Crisis

Characterized by high unemployment rates and the incidence of poverty, South Asia has been particularly vulnerable to international shocks. The World Bank (2009) reports that the region's real GDP growth rate decreased from 8.7 percent in 2007 to 6 percent in 2009. The study attributes this slowdown to the reduction in South Asian exports triggered by the financial crisis. However, the overall impact of the crisis was less severe than it might have been for two reasons. First, the South Asian economies are relatively closed.[2] Second, there was a corresponding decrease in global food and fuel prices, which partly mitigated the negative effects of the crisis.

The overall impact was different for different countries, depending on the fundamentals of the individual economy. Countries that entered the crisis with large external and internal imbalances (Pakistan, Sri Lanka, the Maldives) suffered the sharpest decline in economic growth. In contrast, India, Bangladesh, and Bhutan remained relatively secure due to their stronger macroeconomic indicators at the time. Additionally, while the crisis had an adverse impact on the inflow of remittances to other developing countries (World Bank, 2009),[3] its effect on South Asia was modest: remittances to the region contracted by 1.8 percent in 2009 compared to 7.5 percent in other developing countries.

The Asian Development Bank (2010) finds that both trade and remittances were badly affected by the crisis. In particular, exports from South Asia to the G7 countries fell sharply.[4] The International Monetary Fund (IMF) (2009) concludes that 26 low-income countries (LICs) were most vulnerable to the 2008 financial crisis; in most cases, the trade channel was primarily responsible for transferring the effects of the crisis.[5] Other factors that augmented its impact were the adverse effects on remittances, foreign direct investment (FDI), and the downturn in aid flows.

In addition to regional analyses, several studies have looked at the implications of the global financial crisis for individual countries. Amjad and Din (2010) characterize the implications of the crisis for Pakistan and suggest that regional cooperation bodies such as SAARC could prove to be the most effective forums for dealing with such external shocks. In a similar study, Mukherjee and Pratap (2010) identify three channels—the financial sector, trade, and the exchange rate—through which the crisis entered the Indian economy. These adverse effects translated into higher

[2] For instance, in South Asia, the share of private capital inflow in GDP is smaller than in other economies.
[3] Remittances declined due to the fall in global economic activity and the rise in unemployment in migrant host countries.
[4] The study finds that India's exports of gems/jewelry were seriously affected by the crisis.
[5] The demand for LIC exports declined significantly as a result of the crisis.

unemployment in India: for instance, some 300,000 workers lost their jobs in the gems and jewelry industry alone. In a sector- and state-wise analysis for India, Debroy (2009) concludes that agriculture and manufacturing were badly affected by the crisis: unemployment rates rose in both sectors while states such as Andhra Pradesh, Goa, Gujarat, Haryana, Karnataka, Maharashtra, Punjab, Tamil Nadu, and Uttar Pradesh were hit hardest.

In relation to the crisis, Ghosh (2010) argues that poor and small cultivators in India were seriously affected by the associated volatility in prices of agricultural outputs, declining bank credit, and reduced government subsidies for fertilizers. Moreover, the large decline in exports of textiles and garments, gems and jewelry, and metal products limited employment opportunities and reduced the wages of migrant workers. The decline in employment opportunities, coupled with the rising cost of food items, had severe implications for the consumption of goods and services, in particular for low-income groups in India.

2.2. *Empirical Analysis of the Impact of the Financial Crisis*

Most empirical studies on the global financial crisis find that it was responsible for retarding economic performance. Cevik, Dibooglu, and Kenc (2013), for instance, conclude that Turkey's financial stress index (FSI) was negatively and significantly related to the country's GDP growth, thereby demonstrating the negative consequences of the crisis.[6] Duttagupta and Barrera (2010) use a Bayesian vector autoregressive model to analyze the crisis and find that it had a negative and significant effect on Canada's GDP growth.[7]

Draz (2011) uses a time series dataset for the period 1950–2010 to compare the impact of the financial crisis on Pakistan and China. Applying the Chow Break Point test, he finds that the effect on China was larger than that on Pakistan, given that China is relatively more integrated with the world economy. In a similar study, Otobe (2011) compares the implications of the crisis for employment vulnerability in Cambodia and Mauritius. The study concludes that workers affiliated with the export sector were severely affected by the slowdown of the global economy, while female employment in particular became more vulnerable than male employment.

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[6] The FSI measures stress in the securities market, foreign exchange sector, and banking sector.

[7] See also Estevão and Tsounta (2010) who find that the estimated decline in Canada's growth rate was about one percentage point – primarily a result of the sharp decline in capital accumulation.

Among the empirical studies that have employed panel datasets, Moriyama (2010) uses quarterly data for 2001–09 to examine the impact of the financial crisis on six countries.[8] The study finds that the crisis had an adverse impact on exports, remittances, and capital inflows in the sample countries, as a result of which their growth rates fell. Malik and Janjua (2011) analyze cross-country data for three South Asian countries—Bangladesh, India, and Pakistan—using a similar technique to Moriyama (2010) to construct the FSI. Their study finds that almost half the decline in real GDP growth in these countries was caused by the global financial crisis. Both the static and dynamic analyses show that the FSI had a negative and significant effect on real GDP growth.

3. Channels of Transmission in Pakistan

The potential sectors through which the global financial crisis was transmitted to Pakistan's economy include trade, the financial sector, and remittances. These are discussed below.

3.1. Trade Channel

International trade has been a major contributor to economic growth in Pakistan since the mid-1980s. In the early 1980s, the country replaced its inward-looking import substitution policy with an outward-oriented export promotion strategy. With the subsequent export-led growth, the domestic economy's dependence on international demand increased significantly. Until the global financial crisis, exports accounted for around 15 percent of GDP and were a major source of foreign capital. Given its importance, trade may have been one of the channels through which the financial crisis affected the real sector. As Table 1 shows, both exports and imports declined sharply in 2009, the year after the crisis.

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[8] Egypt, Jordan, Lebanon, Morocco, Pakistan, and Tunisia.

Table 1: Export and import growth performance

Year	Exports (US$ million)	Growth rate of exports	Imports (US$ million)	Growth rate of imports
2001	9,202	7.39	10,729	4.07
2002	9,135	–0.73	10,340	–3.63
2003	11,160	22.17	12,220	18.18
2004	12,313	10.33	15,592	27.59
2005	14,391	16.88	20,598	32.11
2006	16,451	14.31	28,581	38.76
2007	16,976	3.19	30,540	6.85
2008	19,052	12.23	39,966	30.86
2009	**17,688**	**–7.16**	**34,822**	**–12.87**
2010	19,290	9.06	34,710	–0.32
2011	24,810	28.62	40,414	16.43
2012	23,641	–4.71	44,912	11.13

Source: Pakistan, Ministry of Finance (2013).

Given its trade structure, Pakistan relies heavily on advanced economies as export markets.[9] As Table 2 shows, 25 percent of Pakistan's exports were to the US in 2007. However, with the financial crisis, this share declined sharply to 19 percent in 2009. Pakistan's dependence on the US and European markets is likely to have left it more vulnerable to the financial crisis, which severely affected the latter economies. Overall, the growth of exports declined from 12.2 percent in 2008 to –7.2 percent in 2009.

Table 2: Pakistan's major export markets (% share)

Country	2005	2006	2007	2008	2009	2010	2011	2012
US	23.9	25.7	24.6	19.5	18.9	17.4	16.0	14.9
UK	6.2	5.4	5.6	5.4	4.9	5.3	4.9	5.0
Germany	4.8	4.2	4.1	4.3	4.2	4.1	5.1	4.5
Hong Kong	3.9	4.1	3.9	2.7	2.1	2.2	2.0	1.7
UAE	3.3	5.6	7.5	10.9	8.2	8.9	7.3	9.7

Source: Pakistan, Ministry of Finance (2013).

Like its exports, Pakistan's imports are highly concentrated in a few countries. The US, UK, Germany, Japan, and Saudi Arabia account for over 40 percent of Pakistan's total imports. Pakistan's imports from the US also declined sharply after the financial crisis (Table 3).

[9] Pakistan's trade with developing countries, especially within South Asia, is very limited and the US, UK, Germany, and UAE remain major markets for Pakistani exports.

Table 3: Pakistan's major import markets (% share)

Country	2005	2006	2007	2008	2009	2010	2011	2012
US	7.6	5.8	7.5	6.1	5.4	4.6	4.5	3.3
UK	2.6	2.8	2.3	1.9	2.6	1.6	1.2	1.3
Germany	4.4	4.7	3.9	3.2	3.8	3.4	2.3	2.5
Japan	7.0	5.6	5.7	4.6	3.6	4.4	4.1	4.3
Saudi Arabia	12.0	11.2	11.4	13.4	12.3	9.7	11.3	11.2

Source: Pakistan, Ministry of Finance (2013).

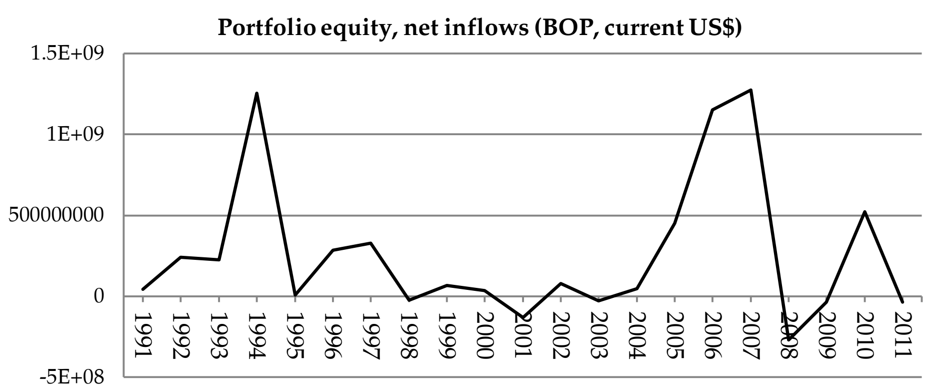
3.2. Financial Channel

As the region's second largest economy, Pakistan is relatively more integrated with the global financial system. This provides both opportunities and challenges: it may enhance growth but, at the same time, it also makes the domestic economy more vulnerable to external shocks. The risk to domestic financial systems can take three forms, i.e., the impact on volume, prices, and confidence levels.

3.2.1. Net Private Equity Flows

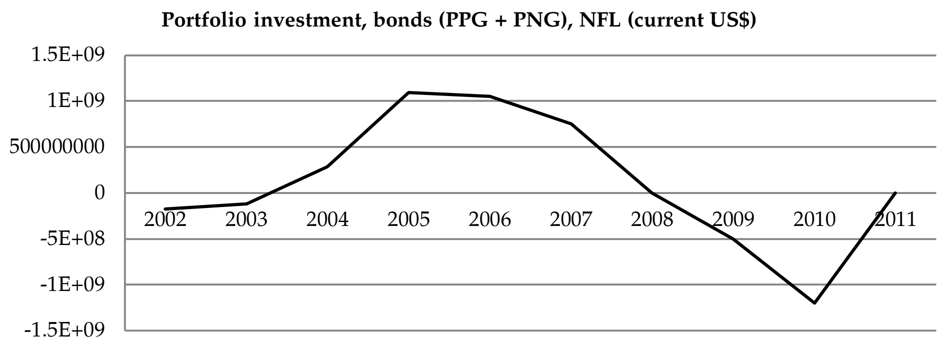
Equity flows comprise primarily portfolio investment and FDI. As Figure 1 shows, the equity market was severely affected by the financial crisis: equity inflows declined from a peak in 2007 to a low in 2008. Due to its poor market structure for corporate bonds, Pakistan relies on equity markets and bank financing for external capital. Figure 2 shows that the global financial crisis also had a severe impact on the bonds market, which declined continuously over 2008–2010 from its peak in 2007.

Figure 1: Portfolio investment (equity)



Source: World Bank, World Development Indicators.

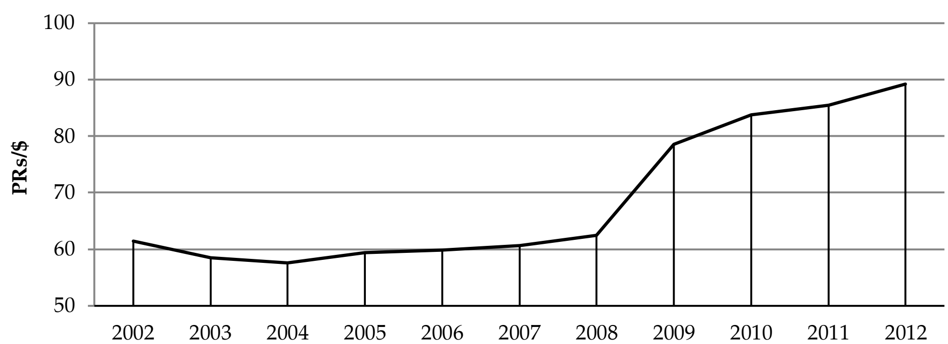
Figure 2: Portfolio investment (bonds)



Source: World Bank, World Development Indicators.

The large withdrawal of funds by foreign portfolio investors, coupled with the higher demand for foreign exchange among Pakistani entrepreneurs, put immense pressure on the Pakistani rupee, leading to devaluation. The exchange rate appreciated from US$ 60.6 in 2007 to US$ 78.5 in 2009 (Figure 3). The rupee depreciation made external borrowing more expensive, with severe implications for Pakistan's corporate sector, which relies heavily on external capital.

Figure 3: Exchange rate to the US$ (annual average)

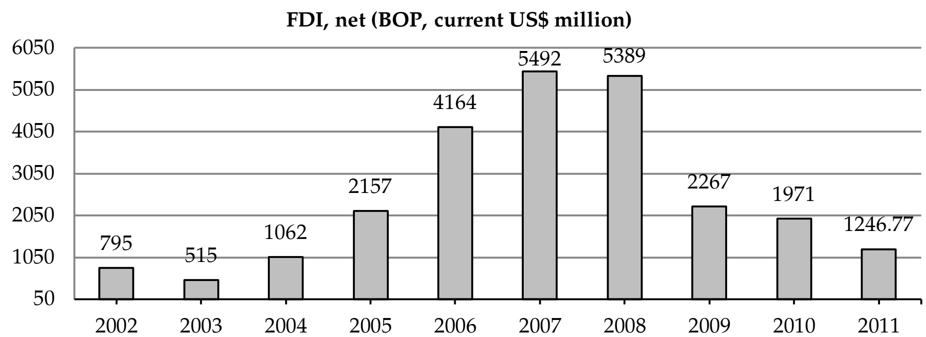


Source: Pakistan, Ministry of Finance (2013).

3.2.2. FDI

Although FDI inflows to Pakistan increased significantly (from US$ 2,157 million in 2005 to US $5,492 million in 2007) as a result of economic liberalization and privatization, they declined in 2009 following the financial crisis and global economic slowdown. This, in turn, had severe implications for employment generation and technological diffusion.

Figure 4: Net FDI

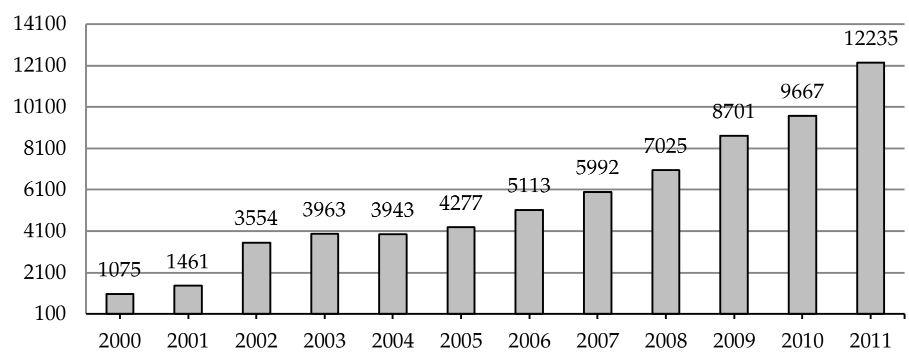


Source: World Bank, World Development Indicators.

3.3. Remittances

Remittances are a key source of foreign exchange earnings in Pakistan and have bolstered its economic development for many years. Remittances have grown steadily since 2007 (Figure 5), given that most of Pakistan's migrant workers are based in the Middle East and were not as affected by the crisis as migrant workers in the US, European Union, and Canada.

Figure 5: Workers' remittances, receipts (BOP, current, US$ million)



Source: World Bank, World Development Indicators.

4. Methodology

This section provides a theoretical framework for the study, describes the data used, and explains how the variables are constructed and the model estimated. As stated earlier, the 2008 global financial crisis led to a significant reduction in global aggregate demand with adverse consequences for aggregate demand in Pakistan. In order to determine the aggregate impact on GDP, we analyze the trends in the components of aggregate demand for different years, i.e. before, during, and after the crisis. This will enable us to estimate the impact of the crisis on unemployment by estimating the employment growth elasticity.

In the standard economic theory of national income, aggregate demand is given as follows:

$$Y = C + I + G + NX \quad (1)$$

where Y is the national income, C is consumption expenditure, I is total investment, G is government expenditure, and NX is net exports. Given its weak production base and small export volumes, Pakistan's domestic component of aggregate demand is much higher than the external component. According to the International Labour Organization (2009), household consumption in Pakistan is five times larger than its exports. Consumption expenditure decreased on two fronts as a result of the financial crisis: (i) the fall in output resulted in a reduction in employment, and (ii) Pakistan experienced a reduction in exports. Both these had adverse consequences for household purchasing power. The corresponding increase in inflation also reduced consumption. Collectively, total private consumption expenditure declined by about 11.3 percent in 2008/09 (Malik & Janjua, 2011).

The other main components of aggregate demand are gross fixed capital formation and government expenditure.[10] Growth in gross capital formation fell sharply from 36.1 percent in 2005/06 to 15.7 percent in 2006/07, rising negligibly to 0.7 percent in 2009/10. However, government final consumption expenditure rose consistently during the crisis period. Growth in external demand (net exports) declined sharply during this time and was reflected in the lower productivity of Pakistan's export-led industries in particular and overall industrial production in general.

Following the IMF (2009) and Malik and Janjua (2011), we estimate the baseline model below to investigate the impact of the financial crisis on growth and unemployment in Pakistan:

$$Y_t = \beta_0 + \beta_1 FSI_t + \beta_2 EXP_t + \beta_3 X_t + \varepsilon_t \quad (2)$$

[10] Gross capital formation and government expenditure account for 22 and 12 percent of aggregate demand, respectively, in Pakistan (World Bank, 2010a).

where Y_t is real GDP at time t; FSI_t captures financial stress in the foreign exchange market, stock market, and banking sector;[11] EXP_t denotes the exports-to-GDP ratio and captures the impact of the financial crisis through the trade channel; X_t is the vector of control variables; and ε_t denotes the error term. Our first step is to estimate the impact of the crisis on GDP growth and use the elasticity of growth and unemployment to predict the impact of the financial crisis on unemployment.

Although the data used is drawn from official secondary sources, we construct most of the variables (indexes) in this analysis ourselves. A detailed definition of these variables and the methodology used in constructing them is presented below. The quarterly data spans 1997–2011 and was taken from the State Bank of Pakistan, the World Bank, and the International Financial Statistics database. GDP growth remains the dependent variable throughout the analysis. In order to calculate quarterly GDP estimates, we use the techniques given by Kemal and Arby (2004).[12] We also use the consumer price index and the world price index on the basis of 2005. The FSI is measured using the methodology proposed by Malik and Janjua (2011).

In order to estimate equation 2, we use the bounds testing approach proposed by Pesaran, Shin, and Smith (2001), which is based on the unrestricted error correction model (UECM). This autoregressive distributed lag (ARDL) cointegration approach has some key advantages over those suggested by Engle and Granger (1987), Johansen (1988), and Johansen and Juselius (1990). First, it resolves the endogeneity problem associated with Engle and Granger (1987) and Johansen (1988). Second, it enables us to estimate both the long- and short-run parameters simultaneously. Third, unlike Pesaran et al. (2001), most other cointegration approaches require the variables to be integrated of the same order. Finally, this approach is also feasible when the sample size is small.[13] The long-run cointegration equation for GDP is defined as

$$LY_t = \beta_0 + \beta_1 LFSI_t + \beta_2 LEXP_t + \beta_3 LCPI_t + \beta_4 LOP_t + \varepsilon_t \qquad (3)$$

Before carrying out a formal cointegration analysis, we need to check the stationary properties of the data. Table 4 summarizes the results

[11] See Appendix for the construction of the FSI.
[12] These estimates are derived from an annual data series, using econometric and statistical techniques that follow the basic framework of Chow and Lin (1971), Litterman (1983), and Kemal and Arby (2004).
[13] Given the small number of observations, we employ the Pesaran et al. (2000) methodology as the most relevant technique for estimation.

of the unit root test. Based on the criteria of the augmented Dickey-Fuller (ADF) test, all the variables are integrated of order 1, except for the exports-to-GDP ratio, which is integrated of order 0.

Table 4: Results of ADF test

Variable	Level	First difference
GDP_t	0.224	–3.123
	(0.971)	(0.030)
CPI_t	4.077	4.077
	(1.000)	(0.000)
OP_t	1.758	–7.127
	(0.084)	(0.000)
EXP_t	–2.963	–
	(0.044)	
FSI_t	–1.579	–6.793
	(0.199)	(0.000)

Source: Authors' calculations.

The next step is to estimate the coefficients of the long-run cointegrating association and the UECM. The cointegration relationship for the aggregate demand function is estimated using the UECM as follows:

$$\Delta LY_t = \beta_0 + \sum_{i=0}^{n} \beta_{1i}\, \Delta LFSI_{t-i} + \sum_{i=0}^{n} \beta_{2i}\, \Delta LEXP_{t-i} + \sum_{i=0}^{n} \beta_{3i}\, \Delta LCPI_{t-i} + \sum_{i=0}^{n} \beta_{4-i}\, \Delta LOP_{t-i} + \sum_{i=0}^{n} \beta_{5i}\, \Delta LY_{t-i} + \beta_6 LY_{t-1} + \beta_7 LFSI_{t-1} + \beta_8 LEXP_{t-1} + \beta_9 LCPI_{t-1} + \beta_{10} LOP_{t-1} + \varepsilon_t \quad 4(4)$$

where Δ denotes the first difference, L is the natural log of the corresponding variables, t – 1 denotes the corresponding lag length, β_i represents the parameters, and ε_t is the error term.

5. Empirical Findings

The selection of lag length is important in the ARDL cointegration approach. We use three criteria to do so: the Akaike information criterion (AIC), the Schwarz Bayesian criterion (SBC), and the Hannan-Quinn criterion (HQC). The results are shown in Table 5. The AIC recommends a lag length of four while the SBC and HQC recommend a lag length of two. Based on the latter's results, we use two lags in our error correction model (ECM).

Table 5: Selection of lag length criteria

Lag	AIC	SBC	HQC
0	–2.74	–2.56	–2.67
1	–16.63	–15.54	–16.21
2	–17.54	–15.55*	–16.77*
3	–17.58	–14.68	–16.46
4	–17.98*	–14.18	–16.51

Source: Authors' calculations.

The bounds testing approach uses the Wald test for inferences: the values of the F-statistic are compared with the lower and upper bound critical values calculated by Pesaran et al. (2001). These values are given in Table 6 for a level of significance of 1 and 5 percent. As the results indicate, the value of the F-statistic is greater than that of the critical upper limit at both 1 and 5 percent. Hence, we reject the null hypothesis of no cointegration. Alternatively, there may exist a long-run relationship among the variables under analysis.

Table 6: Bounds test for cointegration analysis

Computed F-statistic = 16.7150		
Critical bound	**Lower bound**	**Upper bound**
Critical bound value at 1%	4.08	5.26
Critical bound value at 5%	2.97	3.92

Note: Computed, critical bound values obtained from Narayan (2005).

Having selected the prescribed lag length, we then estimate equation 4, applying the criterion of the general to specific method to determine if there is a significant relationship between the dependent variable and the explanatory variables. To check the model's goodness of fit, we employ the relevant diagnostic tests: the Lagrange Multiplier (LM) test for autocorrelation, the White heteroskedasticity test for heteroskedasticity, the Jarque-Bera test for normality, the cumulative sum (CUSUM) and cumulative sum-squared (CUSUMSQ) tests for structural stability, and the Ramsey RESET for model misspecification. The results of these tests indicate that our estimated models fit well (see Appendix). In addition, the CUSUM and CUSUMSQ tests rule out the possibility of structural instability (see Appendix). Table 7 gives the results of the ARDL UECM.

Table 7: Results of ARDL UECM

Variable	Coefficient	P-value for t
LY_{t-1}	0.008*	0.000
$LFSI_{t-1}$	0.005*	0.004
$LEXP_{t-1}$	–0.030*	0.000
$LCPI_{t-1}$	–0.034*	0.000
LOP_{t-1}	–0.003**	0.056
R^2	0.68	
DW statistic	2.07	
Log likelihood	252.89	
F-statistic	9.89	
	(0.000)	

Source: Authors' calculations.

The following equation shows the estimated coefficients of the determinants of real GDP:

$$\hat{L}Y_t = 0.63 * LFSI_t + 3.75 * LEXP_t + 4.25 * LCPI_t + 0.38 * LOP_t \tag{5}$$

The variable of interest, the FSI (FSI_t), has a negative coefficient (–0.63) and is statistically significant. Alternatively, this implies that an increase in financial stress has negative implications for GDP in the case of Pakistan. The transmission mechanism for this effect is that increases in the interest rate caused by financial stress decrease investment spending and, therefore, reduce aggregate demand. The relatively strong and significant growth elasticity of exports (3.75) implies that the financial crisis has affected the country's economy adversely through the exports channel. Inflation (CPI_t) also has a positive growth elasticity, which indicates that, in the long run, economic growth and inflation move in the same direction. Oil prices (OP_t) have an unexpected positive coefficient (0.38) that is statistically significant.

Overall, these findings suggest that the financial sector and trade (exports) are the main channels through which the 2008 global financial crisis was transmitted to Pakistan's economy. The long-run relationship between GDP and financial stress and exports is in accordance with the theory that an increase in financial stress and a reduction in exports will have a negative effect on GDP.

In addition to the long-run relationship, we employ an ECM to analyze the short-run dynamics (Table 8). As is evident from the table, the coefficient of error correction (ECT_{t-1}) is negative and significant, confirming the existence of a short-run relationship between the variables under consideration. As in the long-run model, FSI_t enters the short-run model with a negative sign and is significant. In the same manner, exports have a positive and significant sign. Both these variables are in accordance with our expectation. However, unlike in the long run, the coefficient of inflation is negative and statistically significant, indicating that, in the short run, inflation has a negative impact on GDP in the case of Pakistan.

Table 8: Short-run dynamics ECM

Dependent variable = real GDP

Variable	Coefficient	P-value for t
DLY_{t-1}	1.034*	0.000
$DLFSI_{t-1}$	–0.003*	0.009
$DLEXP_{t-1}$	0.004*	0.005
$DLCPI_t$	–0.006**	0.015
$DLOP_t$	–0.008**	0.021
ECT_{t-1}	–0.801*	0.000
R^2	0.64	
DW statistic	1.88	
Log likelihood	248.18	
F-statistic	14.80 (0.000)	

Source: Authors' calculations.

Thus far, we have analyzed the impact of the crisis on per capita GDP growth. To investigate its effects on unemployment in Pakistan, we compute the per capita growth elasticities of the FSI and export growth. The marginal effects of the FSI and export growth are –0.475 and 0.227, respectively, and their mean values are 0.151 and 3.27, respectively. Using the marginal effects and mean values, we compute the elasticity of per capita GDP growth with respect to FSI and export growth (Table 9).

Table 9: Elasticity of per capita GDP growth with respect to FSI and export growth

	Marginal impact	Mean value (FSI)	Elasticity
FSI	–0.475	0.151	–0.072
		Mean value (export growth)	
Exports-to-GDP ratio	0.227	3.270	0.742

Source: Authors' calculations.

Next, we compute the growth elasticity of unemployment, which measures the responsiveness of unemployment to economic growth. More precisely, it is the percentage change in unemployment that results from a 1 percent change in economic growth, and is computed by dividing the average growth of real GDP per capita by the average growth rate of unemployment for the corresponding period (1997–2011). Table 10 gives the growth elasticity of unemployment with respect to per capita GDP growth. In Pakistan, a 1 percent increase in per capita GDP growth reduces unemployment growth by 0.63 percent.

Table 10: Elasticity of unemployment with respect to GDP growth

Growth rate of unemployment	Average growth of real GDP	Growth elasticity of unemployment
–6.25	3.93	–0.63

Source: Authors' calculations.

Next, we use the elasticity measures of GDP growth with respect to the FSI and export growth and the percentage change in the FSI and export growth during 2007–11 to compute the change in GDP growth that resulted from changes in the FSI and export growth during this period. Table 11 shows that, in Pakistan, the FSI increased by 31.72 percent between 2007 and 2011. Using the estimated elasticity of growth with respect to the FSI, we find that this change in the FSI reduced GDP growth by 2.22 percent. Using the estimated growth elasticity of unemployment (–0.63), we estimate that unemployment increased by 1.39 percent due to the reduction in GDP growth. Hence, the financial stress brought about by the 2008 global financial crisis increased unemployment by about 1.4 percent during 2007–11.

Table 11: Impact of financial stress on unemployment

Percentage increase in FSI between 2007 and 2011	31.72
Elasticity of per capita GDP growth with respect to FSI	–0.07
Percent reduction in per capita GDP growth due to given change in FSI	2.22
Growth elasticity of unemployment	–0.63
Percentage increase in unemployment due to predicted reduction in growth	1.39

Source: Authors' calculations.

Similarly, we compute the impact of the crisis on unemployment through the trade channel. As Table 12 shows, growth in exports declined by 9 percent during 2009–11. Using the elasticity of per capita GDP growth with respect to the growth in exports (0.74) and the percentage reduction in export growth between 2007 and 2011 (0.09), we compute the change in growth of per capita GDP resulting from the change in export growth during this period (6.6 percent). Next, by employing the value of the growth elasticity of unemployment (–0.63), we find that a reduction in per capita GDP growth increases unemployment by 4.19 percent This increase in unemployment is estimated to occur solely as a result of the reduction in export growth.

The predicted impact of the trade channel on unemployment is twice as large as the impact of the financial sector. This implies that the impact of the global financial crisis was transmitted to Pakistan's economy primarily through international trade (exports), in turn affecting growth and unemployment.

Table 12: Impact of reduction in export growth on unemployment

Percentage reduction in export growth between 2007 and 2011	9.00
Elasticity of per capita GDP growth with respect to export growth	0.74
Percent reduction in growth of per capita GDP due to estimated reduction in export growth	6.60
Growth elasticity of unemployment	–0.63
Percentage increase in unemployment due to estimated reduction in growth of GDP	4.19

Source: Authors' calculations.

Both the financial sector and trade are the key channels through which the crisis affected Pakistan's economy. The percentage reduction in per capita GDP growth with respect to given changes in the FSI and export growth is 2.2 and 6.6, respectively. Similarly, the aggregate impact on unemployment resulting from these two channels is 5.58 percent during 2007–11. This indicates that around 6 percent of the increase in unemployment during 2007–11 was a consequence of the global financial crisis.

6. Conclusion

This study was motivated by the recent literature on the impact of the 2008 global financial crisis. We have assessed the impact of the crisis on economic growth and unemployment in Pakistan, using the ARDL bounds testing approach and UECM with real GDP as the dependent variable. Along with other control variables, the FSI and exports-to-GDP ratio were used to assess the impact of the crisis on GDP growth and employment through the financial and trade channels, respectively.

Our findings show that both the FSI and exports-to-GDP ratio have a significant impact on GDP in Pakistan, but that the magnitude of the trade effect is larger than that of the financial sector. Alternatively, one can argue that the financial crisis had a greater impact on the economy through exports compared with the financial sector. This is confirmed by our estimations, which suggest that both the GDP growth and unemployment elasticities are much higher in the case of the exports-to-GDP ratio than in the case of the FSI. The study finds that GDP growth declined by 8.8 percent while unemployment increased by 6 percent during 2007–11 as a consequence of the 2008 global financial crisis.

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Appendix

Construction of FSI

FSI = EMPI + stock returns + stock returns volatility + banking stability

where FSI is the financial stress index and EMPI is the exchange market pressure index.

$$EMPI_t = \frac{\Delta e_t - \mu_{\Delta e}}{\sigma_{\Delta e}} - \frac{(\Delta RES_t - \mu_{\Delta RES})}{\sigma_{RES}}$$

where Δe_t is the quarter over quarter change in the nominal exchange rate relative to the US$, ΔRES_t is the quarter over quarter change in total reserves minus gold, and μ and σ are the corresponding mean and standard deviation of the respective series.

Table A1: Diagnostic tests for long- and short-run estimates

Long-run estimates		Short-run estimates	
LM test	1.849	LM test	1.090
	(0.139)		(0.373)
Jarque-Bera test	25.408	Jarque-Bera test	15.970
	(0.251)		(0.162)
White test	0.919	White test	0.546
	(0.919)		(0.868)
Ramsey RESET	1.785	Ramsey RESET	1.561
	(0.188)		(0.217)

Note: Values in parentheses are probabilities.

Figure A1: CUSUM for UECM (stability test)

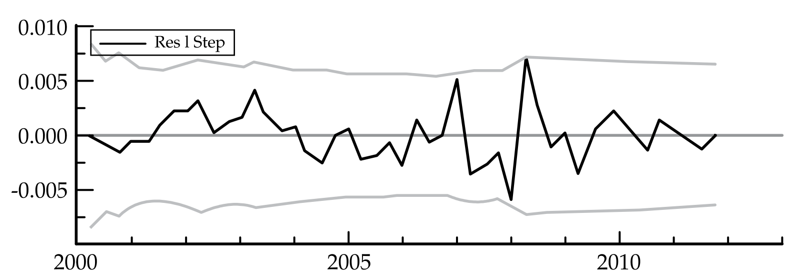
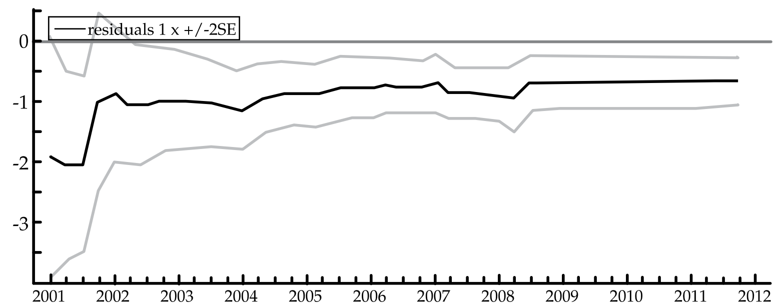


Figure A2: CUSUM of squares for UECM



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The Correlates of Educated Women's Labor Force Participation in Pakistan: A Micro-Study

Muhammad Zahir Faridi and Ayesha Rashid*

Abstract

This study attempts to determine the factors that affect educated women's decision to participate in the labor force. Based on a field survey conducted in the district of Multan, we find that a number of factors have a positive and significant impact on women's decision to work. These include women who fall in the age groups 35–44 and 45–54, the coefficients of all levels of education, the presence of an educated husband, marital status, family structure, and family expenditure. The presence of an educated father, being an educated married woman, location, distance from the district headquarters, the husband's employment status and income, and ownership of assets significantly reduces women's labor force participation. The results of the earnings equation show that variables such as women who live in an urban area and their level of education and experience are associated with a substantial increase in earnings with each additional year. The number of children has a negative and significant impact on women's earnings. The hours-of-work model shows that age and the number of completed years of education have a positive effect on working hours, while the number of dependents and the number of hours spent on household activities have a negative effect on working hours.

Keywords: Human capital, labor force participation, earnings function, time allocation, Punjab, Pakistan.

JEL classification: D00, J21.

1. Introduction

Labor force participation (LFP) is the act of participating in productive activities to generate income and meet certain social requirements. In Pakistan, the labor force includes all persons aged ten or above "who are working or looking for work for cash or [in] kind, one week prior to the date of enumeration" (Ejaz, 2007). LFP analyses help determine policies for employment and human resource development. Pakistan has a relatively low LFP rate because of the small percentage of

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women who participate in the workforce—an issue that is of major concern for the country's development prospects.

Female labor force participation (FLFP) contributes significantly to socioeconomic development because it provides households with a second source of income and can help reduce poverty. Given that about half of Pakistan's population comprises women, it is important to analyze their role in the labor market and in economic development. Over the past few years, many studies have focused on this area and underscored the significant positive association between FLFP and economic growth (see Ejaz, 2007; Faridi, Sharif, & Anwar, 2009; Faridi, Sharif, & Malik, 2011).

In Pakistan, as in many other developing countries, social and cultural norms often mean that women lag behind men in many respects. While women work longer hours than men, much of their work involves care-giving and looking after the household. Gender discrimination, social and cultural restrictions, workplace location, and family responsibilities all determine women's access to the labor market. The financial pressure of poverty or looking after a large family might push women into the labor force (Kazi & Raza, 1991), but factors such as education, training and experience serve to pull women into the labor force (Killingsworth & Heckman, 1986; Mincer & Polachek, 1974). Other variables such as family structure (either joint or nuclear), the education level of a woman's husband and/or parents, the availability of jobs, and workplace location are also potential determinants of FLFP (Faridi et al., 2011).

According to the Pakistan Bureau of Statistics (2012), the LFP rate has increased from 50.4 percent in 1999/2000 to 53.4 percent in 2010/11, while the employment-to-population ratio has increased from 46.8 percent (1999/2000) to 50.4 percent (2010/11). Although the FLFP has risen from 13.7 percent in 1999/2000 to 22.2 percent in 2010/11, women's contribution remains comparatively low vis-à-vis other South Asian countries. Women's participation rates also help us better understand the productive and reproductive roles of the female population.

The present study aims to determine why some educated women (both married and unmarried) are involved in earning activities while others are not. We analyze how various socioeconomic and demographic variables influence the participation decision of educated women in the district of Multan. Our sample consists of educated women both from rural and urban areas who have completed at least eight years of schooling.[1] Such women are expected to be free to choose whether or not to enter the labor market. We also estimate an earnings function and hours-of-work equation for educated women to analyze which factors affect their earnings and working hours.

The study is organized as follows. Section 2 reviews the literature at a national and international level. Section 3 describes the data and methodology used, including the sample design and data collection. Section 4 gives the variables selected and model construction. Section 5 presents the results of the estimation and Section 6 provides some concluding remarks and policy recommendations.

2. Literature Review

Apart from studies that have looked at FLFP issues at the national and international level, a number of authors have also discussed the economic theory of the household, which is relevant in this context. Becker (1965) and Gronau (1977), both of who pioneered research in this field, explain household behavior regarding time allocation as follows: an increase in the market wage rate reduces the level of work at home and has an intermediate effect on the time spent on leisure and on market production.

In a demographic survey of Sudan (1990/91), Maglad (1998) finds that FLFP is positively related to education and own wages and negatively related to the spouse's wage, asset ownership, and the presence of small children. Amin (1994) uses household survey data for Bangladesh (for 1992) and notes that FLFP is inversely related to income, *purdah* (female seclusion), and the patriarchal system and positively related to marital status, education, and age. Georgellis and Wall (2005), Le (2000), and Blanchflower find that education, health, experience, family background, and marital status are all highly significant factors in women's self-employment.

Mincer (1962) investigates the factors that influence women's labor market decisions in the context of the relationship between working hours and FLFP over time. He concludes that women's decision to participate in the labor force is negatively related to spousal earnings but positively related to their own earning power. The number of children also has a positive relationship with FLFP decisions. Additionally, educational activity is a vital component of the productive life of individuals.

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[1] This is because most rural women are likely to have completed only up to middle school.

Bover and Arellano (1995) analyze the determinants of the increase in FLFP in Spain during the 1980s. They observe that the business cycle has a significant effect on participation. Moreover, FLFP increases with higher levels of education and lower birth rates. These structural factors increase women's earning potential. If the prime age does not change in the future, FLFP increases as newer cohorts replace the old ones.

Azid, Aslam, and Chaudhary (2001) examine the factors that influence FLFP in Pakistan's cottage industries. Based on data collected through a field survey in Multan, they find that FLFP has a positive relationship with the number of children in a household, women's age and education, and poverty status, but a negative relationship with the number of under-five children. The coefficient of purdah is statistically insignificant because the cottage industry-level embroidery work in which the sampled women engage is different from other fields of work.

Naqvi and Shahnaz (2002) note that the number of children in a household and the presence of a female household head are negatively linked to women's economic participation. Although women's age and education level have a positive impact on FLFP, married women are less likely to participate. Older women, better educated women, women who are household heads, and women from smaller, financially stronger urban families are more likely to *choose* to participate, while younger women, poorly educated women, and women from larger families are more likely to be *compelled* to participate in the labor market.

In a study on Ghana, Sackey (2005) finds that both primary and post-primary schooling have a positive impact on FLFP and a negative impact on fertility. In addition, the gender gap in education has narrowed over the years and it is important for government policies to ensure that the gains of female education are sustained. Education is thus an important determinant of female human capital and productive employment.

Babalola and Akor (2013) analyze the factors that affect the labor participation decision of married women aged 18–60 in Adamawa state, Nigeria. The study finds that women's level of education is positively related to their FLFP while the spouse's employment status and household size have a negative effect. This implies that government policies should target female education, which clearly enhances female human capital development and productive employment.

Ahmad and Hafeez (2007) observe that women with a higher level of education are more likely to work for cash remuneration and to earn more per hour. Women living in joint families, women with fewer assets, and women whose husbands earn low incomes are positively associated with FLFP, while women whose husbands or parents are less educated are less likely to participate in the labor market. Factors that influence women's earnings include education, experience, training, the nature of occupation, and the distance from the central city. Their working hours are generally determined institutionally.

In her empirical study on Pakistan, Ejaz (2007) investigates the determinants of rural and urban FLFP and concludes that age, educational attainment, marital status, living in a nuclear family, fewer children, access to a vehicle, and the availability of childcare facilities increase FLFP. A larger number of children and the availability of home appliances are negatively related to FLFP.

Faridi, Sharif et al. (2009) estimate the socioeconomic and demographic determinants of FLFP and conclude that secondary and higher education, marital status, family structure, the presence of an educated spouse, and the number of children are positively related to women's participation in the workforce. Younger women (aged 15–24), women with household assets, women whose husbands are economically active, and women with children aged 0–6 are less likely to participate in the labor market.

Chaudhry, Faridi, and Anjum (2010) examine the impact of health and education on women's earnings in Vehari. They find that higher levels of education and better health and nutrition are positively related to women's earnings. Having a diploma or vocational training, however, are negatively related to earnings. Women engaged in formal employment earn less than those engaged in informal employment because they have lower-paid jobs. Women who are either married or divorced and live in an urban area earn more, while widows and single women living in a rural area earn less because they may not have permission to work outside their homes or may have fewer economic responsibilities.

Afzal and Bibi (2012) investigate the determinants of married women's FLFP in Wah Cantt. Their empirical study concludes that women's level of education, the number of children and dependents, family size, the spouse's income, monthly expenditures, the positive attitude of the spouse and family toward women working, and job satisfaction are positively associated with married women's FLFP.

Women's age, living with a spouse, the level of satisfaction with their role as a homemaker, family-imposed job restrictions, and the presence of other household earners have a negative relationship with FLFP. In addition, the inflation rate has a large effect on married women's FLFP.

The literature clearly shows that various factors have an important effect on women's decision to participate in the labor force. This study is significant in that, unlike other comparable studies, it has used improved reporting methods to collect data on women's labor participation decisions in rural and urban Multan. It not only highlights the problems and factors behind the low FLFP but also proposes recommendations to improve women's living standards and better utilize their resources for national development. This serves as an important contribution to the economic literature.

3. Data Sources and Methodology

The data for this study was collected through a field survey conducted in Multan, using a simple random sampling technique. The sample consists of 300 educated women—both participating (employed) and nonparticipating (unemployed) as well as married and unmarried—randomly selected from rural and urban areas of the district. The data was collected from the main residential areas in the north, south, east, west and central part of the selected area. The minimum criterion for being classified as "educated" was to have completed eight years of schooling.

The information on respondents and their household characteristics was collected using a questionnaire that focused on education, marital status, location, distance from the district headquarters, age, the education levels of close relatives, income, expenditure, and other demographic variables. We also collected data on women's earnings and the number of hours they allocated to the labor market and the household in order to estimate the earnings and hours-of-work equations for working women.

The analysis is carried out at two levels: apart from a statistical analysis of the data, we use two nonlinear models—a logistic probability (logit) model and a normal probability (probit) model—and a linear probability model (LPM) to carry out an econometric analysis of FLFP. To explain the qualitative nature of the dependent variable, we assign a value of 1 to participating women and 0 to nonparticipating women, where Y is the column vector of explanatory variables and X is the row vector of the corresponding regression parameters by α.

In order to examine the robustness of our results, we apply the following three models to study the correlates of FLFP decisions:

The LPM is given by

$$Y_i = \alpha X_i + \varepsilon_i$$

The probit model is given by

$$Y_i = \int_{-\infty}^{\infty} f(z)dz + \varepsilon_i$$

In the logit model, the probability of occurrence increases with x but never moves beyond the range 0–1 and there is a nonlinear relationship between the variables. The model assumes the following cumulative probability density function:

$$P_i = \frac{1}{1+e^{(-\beta X_t)}}$$

where P denotes the likelihood that i person will participate in the labor force, e is the exponential value, α is the row vector of the parameters, and X_i is the column vector of the variables.

From the logistic probability equation, we derive the following regression equation or logit model:

$$Ln\left[\frac{P_i}{1-P_i}\right] = Y_i = \alpha X_i + \varepsilon_i$$

In order to estimate the earnings function for women, we use the statistical earnings function of Mincer and Polachek (1974) and augment it to include other factors that affect women's earnings:

$$LNFEI_i = \alpha_0 + \sum_{j=1}^{k} \alpha_K X_{ki} + u_i$$

where ($LNFEI_i = lnW_i$) is the natural log of the earnings of the ith individual, X_{ki} represents the explanatory variables, and u_i is a random disturbance term.

Similarly, we estimate the hours-of-work equation using the OLS model in linear form:

$$MHW_i = \beta_0 + \sum_{j=1}^{k} \beta_K X_{ki} + u_i$$

where MHW_i denotes the hours of work per month, u_i is a random error term, and X_{ki} represents the explanatory variables.

4. Model Specification and Selection of Variables

In order to investigate the effect of different explanatory variables (Table 1) on FLFP, we estimate four models (all the variables are defined in Table 1):

The first model for FLFP is given below:

$$FLFP_i = \alpha + \beta_1 AGEI_i + \beta_2 AGEIII_i + \beta_3 AGEIV_i + \beta_4 AGEV_i + \beta_5 FA_i + \beta_6 BA_i + \beta_7 MST_i + \beta_8 HE_i + \beta_9 EDM_i + \beta_{10} EDF_i + \beta_{11} EDH_i + \beta_{12} MAS_i + \beta_{13} MRED_i + \beta_{14} FSP_i + \beta_{15} LCN_i + \beta_{16} DSN_i + \beta_{17} NDP_i + \beta_{18} HEM_i + \beta_{19} HIN_i + \beta_{20} OEM_i + \beta_{21} FEX_i + \beta_{22} ONH_i + \beta_{23} ONL_i + \beta_{24} LSK_i + \epsilon_i$$

In the second model, we take women's age in completed years as the independent variable while the other variables remain the same as in model 1:

$$FLFP_i = \alpha + \beta_1 AGE_i + \beta_2 FA_i + \beta_3 BA_i + \beta_4 MST_i + \beta_5 HE_i + \beta_6 EDM_i + \beta_7 EDF_i + \beta_8 EDH_i + \beta_9 MAS_i + \beta_{10} MRED_i + \beta_{11} FSP_i + \beta_{12} LCN_i + \beta_{13} DSN_i + \beta_{14} NDP_i + \beta_{15} HEM_i + \beta_{16} HIN_i + \beta_{17} OEM_i + \beta_{18} FEX_i + \beta_{19} ONH_i + \beta_{20} ONL + \beta_{21} LSK_i + \epsilon_i$$

The third model takes women's schooling in completed years as the independent variable while the other variables are the same as in model 1:

$$FLFP_i = \alpha + \beta_1 AGEI_i + \beta_2 AGEIII_i + \beta_3 AGEIV_i + \beta_4 AGEV_i + \beta_5 EDU_i + \beta_6 EDM_i + \beta_7 EDF_i + \beta_8 EDH_i + \beta_9 MAS_i + \beta_{10} MRED_i + \beta_{11} FSP_i + \beta_{12} LCN_i + \beta_{13} DSN_i + \beta_{14} NDP_i + \beta_{15} HEM_i + \beta_{16} HIN_i + \beta_{17} OEM_i + \beta_{18} FEX_i + \beta_{19} ONH_i + \beta_{20} ONL_i + \beta_{21} LSK_i + \epsilon_i$$

The fourth model includes women's age and schooling in completed years as explanatory variables while the other variables are the same as in model 1:

$FLFP_i = \alpha + \beta_1 AGE_i + \beta_2 EDU_i + \beta_3 EDM_i + \beta_4 EDF_i + \beta_5 EDH_i + \beta_6 MAS_i + \beta_7 MRED_i + \beta_8 FSP_i + \beta_9 LCN_i + \beta_{10} DSN_i + \beta_{11} NDP_i + \beta_{12} HEM_i + \beta_{13} HIN_i + \beta_{14} OEM_i + \beta_{15} FEX_i + \beta_{16} ONH_i + \beta_{17} ONL_i + \beta_{18} LSK_i + \epsilon_i$

4.1. Model Specification for Earnings Function

We use three specifications to measure the FLFP earnings function. The first model includes completed years of schooling:

$LNFEI_i = \alpha + \beta_1 EDU_i + \beta_2 EXPR_i + \beta_3 EXPR2_i + \beta_4 NCH_i + \beta_5 TCHR_i + \beta_6 LHW_i + \beta_7 EMB_i + \beta_8 WRD_i + \beta_9 COM_i + \epsilon_i$

The second model includes various levels of education and their interaction terms with experience:

$LNFEI_i = \alpha + \beta_1 FA_i + \beta_2 BA_i + \beta_3 MST_i + \beta_4 HE_i + \beta_5 FAEXP_i + \beta_6 BAEXP_i + \beta_7 MSTEXP_i + \beta_8 HEEXP_i + \beta_9 NCH_i + \beta_{10} TCHR_i + \beta_{11} LHW_i + \beta_{12} EMB_i + \beta_{13} WRD_i + \beta_{14} COM_i + \epsilon_i$

The third model introduces instrumental variables such as the spouse's level of education, location, and distance from the district headquarters for the years of schooling.

$LNFEI_i = \alpha + \beta_1 EXPR_i + \beta_2 EXPR2_i + \beta_3 EDH_i + \beta_4 LCN_i + \beta_5 DSN_i + \beta_6 NCH_i + \beta_7 TCHR_i + \beta_8 LHW_i + \beta_9 EMB_i + \beta_{10} WRD_i + \beta_{11} COM_i + \epsilon_i$

4.2. Hours-of-Work Equation

The hours-of-work equation also helps determine the female labor supply function as given below:

$MHW_i = \alpha + \beta_1 AGE_i + \beta_2 AGE2_i + \beta_3 EDU_i + \beta_4 DOC_i + \beta_5 LHW_i + \beta_6 EMB_i + \beta_7 WRD_i + \beta_8 COM_i + \beta_9 NDP_i + \beta_{10} HRH_i + \epsilon_i$

Table 1 defines the variables used in the above models.

Table 1: Definition of variables and their relationships

Variable	Description	Hypothesized relationship with FLP
FLFP	1 if woman participates in the labor force, otherwise 0.	
AGE	Woman's age in completed years	Positive
AGE2	Square of woman's age	Negative
AGEI	1 if woman is 15–24 years old, otherwise 0.	Negative/positive
AGEII	1 if woman is 25–34 years old, otherwise 0.	Positive
AGEIII	1 if woman is 35–44 years old, otherwise 0.	Positive
AGEIV	1 if woman is 45–54 years old, otherwise 0.	Positive
AGEV	1 if woman is 55–64 years old, otherwise 0.	Positive/negative
EXPR	Work experience in years	Positive
EXPR2	Square of work experience	Negative
EDU	Education in completed years	Positive
MAT	1 if woman has matriculated, otherwise 0.	Positive
FA	1 if woman has an FA, otherwise 0.	Positive
BA	1 if woman has a BA, otherwise 0.	Positive
MST	1 if woman has an MA, otherwise 0.	Positive
HE	1 if woman has a post-MA qualification, otherwise 0.	Positive
EDM	Mother's years of schooling	Positive
EDF	Father's years of schooling	Positive
EDUH	Husband's years of schooling	Positive
MAS	1 if woman is married, otherwise 0.	Negative
MRED	Interaction term (education × married woman)	Positive/negative
FSP	1 for a joint family system, otherwise 0.	Positive
LCN	1 if woman lives in an urban area, otherwise 0.	Positive/negative
DSN	Distance from district headquarter	Negative
NCH	Number of dependent's children	Positive/negative
NDP	Number of dependents (other than children)	Positive/negative
HEM	1 if husband is employed, otherwise 0.	Positive
HIN	Income of husband	Negative
OEM	1 if any other household member is employed, otherwise 0.	Negative
FEI	Woman's monthly income	Positive/negative
FEX	Monthly family expenditures	Positive
MHW	Hours worked per month	Positive
HRH	Hours spent on household activities	Negative/positive
ONH	1 if woman owns a house, otherwise 0.	Negative/positive
ONL	1 if woman owns land, otherwise 0.	Negative/positive
LSK	1 if woman owns livestock, otherwise 0.	Negative/positive

Variable	Description	Hypothesized relationship with FLP
TCHR	1 if woman works as a teacher, otherwise 0.	Negative/positive
DOC	1 if woman works as a doctor, otherwise 0.	Negative/positive
LHW	1 if woman works as a lady health worker, otherwise 0.	Negative/positive
EMB	1 if woman is engaged in embroidery work, otherwise 0.	Negative/positive
WARD	1 if woman works as a ward assistant, otherwise 0.	Negative/positive
COM	1 if woman works as a computer operator, otherwise 0.	Negative/positive

Source: Authors' calculations.

5. Results and Discussion

This section presents our empirical analysis.

5.1. Descriptive Analysis

The mean and standard deviation of all the variables are reported in Table 2. The average age of the respondents is 31.13 years with a standard deviation of about 8.51. On average, 0.206, 0.476, 0.226, and 0.063 working women are in the age groups AGEI (15–24), AGEII (25–34), AGEIII (35–44), and AGEIV (45–55), respectively. Only 0.026 working women are in the oldest age group AGEV (55–64). The average level of education is 13.2 years of schooling with a variation of 299 percent. On average, 0.25, 0.19, 0.22, 0.26, and 0.07 women have matriculated and earned an intermediate (FA), graduate (BA), Master's (MA), and post-Master's degree, respectively. On average, 0.53, 0.46, and 0.58 women are married, live in a joint family, and live in an urban area, respectively.

Table 2: Descriptive statistics for selected variables

Variable	Mean	SD	Skewness	Kurtosis
AGE	31.1333	8.51139	0.953	0.915
AGEI	0.2067	0.40559	1.456	0.121
AGEII	0.4767	0.50029	0.094	-2.005
AGEIII	0.2267	0.41937	1.312	-0.280
AGEIV	0.0633	0.24397	3.604	11.061
AGEV	0.0267	0.16138	5.906	33.096
EDU	13.2033	2.99196	-0.325	-0.581
MAT	0.2533	0.43565	1.140	-0.705
FA	0.1900	0.39296	1.588	0.526
BA	0.2233	0.41718	1.335	-0.219
MST	0.2633	0.44118	1.080	-0.839
HE	0.0700	0.25557	3.388	9.539
EDM	4.9833	5.20192	0.462	-1.205
EDF	8.9533	5.61810	-0.431	-1.054
EDH	6.7700	6.86787	0.193	-1.695
FSP	0.4600	0.49923	0.161	-1.987
MAS	0.5333	0.49972	-0.134	-1.995
LCN	0.5800	0.49438	-0.326	-1.907
DSN	35.3033	29.30119	0.717	-0.760
NCH	1.2233	1.60271	1.074	0.099
NDP	1.8567	1.60563	0.348	-0.959
HEM	0.4667	0.49972	0.134	-1.995
HIN	14,810.0000	20,920.63119	1.602	2.390
OEM	0.5600	0.49722	-0.243	-1.954
FIN	42,731.1667	25,082.01871	1.535	4.765
FEX	38,044.0000	19,808.24962	1.223	3.049
ONH	0.1100	0.31341	2.505	4.306
ONL	0.4200	0.49438	0.326	-1.907
LSK	0.2500	0.43374	1.161	-0.658

Source: Authors' field survey calculations.

5.2. Econometric Analysis

Table 3 shows that there is not much difference in the qualitative nature of results across the three probability models of LFP. The most important factors affecting women's decision to participate in the labor force are age, the level of education, marital status, family structure, location, distance from the district headquarters, the spouse's income, family expenditures, and ownership of assets.

The intercept term indicates the average effect of all other omitted variables on the dependent variable. The value of R^2 in the LPM and of McFadden's R^2 in the probit and logit regressions should not be taken as reflecting poorly on the quality of our results. A low R^2 is typical of cross-sectional studies, especially when the number of observations is in the hundreds. Inevitably, numerous unknown factors influence the dependent variable no matter how carefully one has selected the potential explanatory variables.

In model 1 (Table 3), the value of R^2 and McFadden's R^2 is 0.40 and 0.37, which shows that the explanatory variables explain 40 and 37 percent of the variation in FLFP, respectively. Women in the age group AGEI (15–24) are less likely to participate in the labor force compared to those in AGEII (25–34). This is explained by social constraints and the lack of experience, skills, and training as well as by the fact that many younger women may still be completing their education or maybe busy caring for young children.

The coefficients of AGEIII (35–44 years) and AGEIV (45–54 years) are positive and significant because women may have school- or college-going children, giving them more time to work outside the home. In the LPM, FLFP increases by 27.2 percent and 30.5 percent with each additional woman in the age groups AGEIII and AGEIV, respectively. The probability of FLFP increases by 1.03 and 1.32 units in the probit model and by 1.80 and 2.34 units in the logit model for the age groups AGEIII and AGEIV, respectively. The coefficient of AGEV (55–64 years) is negative and insignificant because older women are likely to be in poorer health and thus less productive. Our results concerning the age of the female labor force are similar to the findings of Naqvi and Shahnaz (2002) and Hafeez and Ahmad (2002).

Women's level of education is a key determinant of their decision to enter the labor market. Our results show that the relationship between FLFP and different levels of education is positive and significant: the higher the level of education, the higher is the likelihood of FLFP. The LPM indicates that women with a Master's degree or beyond are 48.8 and 70.2 percentage points more likely to participate in the labor force compared to those with a matriculation certificate. The probability of FLFP increases by 1.71 and 2.62 units in the probit model and by 2.94 and 4.70 units in the logit model with respect to women with a Master's degree or more. Clearly, higher levels of education enhance women's job opportunities outside the home and their capacity to generate an income. These results reflect Becker's (1965) theory of household production and time allocation. Higher levels of education increase the opportunity cost of producing nonmarket output as well as the probability of participating in income-generating activities outside the home. Ahmad and Hafeez (2007) and Kozel and Alderman (1990) present similar findings.

In examining the impact of the level of education among women's close relatives (mother, father, and spouse), we find that the coefficient of the mother's education is insignificant in all three models. This implies that their mothers' level of education does not affect women's decision to participate in the labor force. The coefficients of the father's level of education and the husband's level of education are, however, significant at 1 percent. Each additional year of education in the father's case decreases the probability of FLFP by 0.07 in the probit model and by 0.13 in the logit model. This is presumably because household income rises in tandem with the father's level of education with a corresponding decrease in the participation rate of educated women. In rural households in particular, fathers may be more reluctant to allow their daughters to work. Women's participation in the labor force increases with their spouses' level of education, possibly because of fewer social constraints and women's desire to provide their children with a better life. Our results with respect to the spouse's level of education are similar to those of Faridi, Malik, and Basit (2009).

Marital status is another key variable influencing women's decision to participate in the labor market. We find there is a positive and significant relationship between married women and FLFP. Faridi, Sharif et al. (2009) and Ejaz (2007) present similar findings.

Family structure is an important determinant of FLFP. Although the LPM does not yield a significant regression coefficient, both the probit and logit models indicate that the coefficient is significant. Family structure has a positive and significant effect on FLFP. The probability of FLFP increases by 0.41 (probit model) and 0.66 (logit model) with each additional woman in a joint family. This may be because it becomes possible to share the burden of domestic responsibilities or for one woman to substitute for another in this context. Faridi, Sharif et al. (2009) and Naqvi and Shahnaz (2002) corroborate this finding.

The effect of location and distance from the district headquarters on FLFP is negative and significant at the 5 percent level. Rural women are more likely to participate in the labor market than urban women because rural incomes are generally lower than urban incomes. Khan and Khan (2009) present a similar finding. Additionally, the LPM shows that a one-kilometer increase in the distance from the district headquarters decreases the probability of FLFP by 0.3 percentage points because of the associated increase in transport costs. Faridi, Sharif et al. (2009) corroborate this result.

The number of dependents has a positive but insignificant effect on FLFP: women living in households with a large number of dependents are likely to face greater economic pressure, compelling them to enter the labor market. Ahmad and Hafeez (2007) support this finding. The coefficient of the employment status of the husband and other working members of the household is insignificant. An increase in the husband's income will likely reduce the need for his wife to participate in the labor force. The presence of other working members of the household has a similar effect. Ahmad and Hafeez (2007) present similar results.

The coefficient of family expenditure is positive and insignificant in the LPM but significant in the probit and logit models. An increase in family expenditures will increase the likelihood of FLFP, given the need for women to participate in the labor force for cash remuneration. Ownership of assets (house, land, and livestock) has a negative and significant relationship with FLFP. The coefficients of ONH and ONL are significant at the 1 percent level in all three models, while the coefficient of LSK is insignificant. Ownership of assets increases household wealth and financial stability, making it less likely for women to seek employment. Ahmad and Hafeez (2007) and Faridi, Sharif et al. (2009) put forward similar findings.

Table 3: Estimated probability model 1 for FLFP

Explanatory variable	LPM	Probit model	Logit model
Constant	0.546***	0.297	0.558
	(3.061)	(0.437)	(0.484)
Age group (AGEII [25–34 years] is reference category)			
AGEI	-0.058	-0.311	-0.528
	(-0.812)	(-1.196)	(-1.204)
AGEIII	0.272***	1.037***	1.807***
	(3.854)	(3.479)	(3.453)
AGEIV	0.309***	1.321**	2.346***
	(2.458)	(2.386)	(2.327)

Explanatory variable	**LPM**	**Probit model**	**Logit model**
AGEV	-0.168	-0.984	-1.583
	(-0.928)	(-1.313)	(-1.234)
Education level (matriculation is reference category)			
FA	0.233***	0.971***	1.630***
	(2.902)	(2.990)	(2.903)
BA	0.302***	1.163***	1.991***
	(3.495)	(3.331)	(3.301)
MST	0.484***	1.712***	2.942***
	(4.348)	(3.917)	(3.822)
HE	0.702***	2.625***	4.707***
	(4.371)	(3.988)	(3.962)
Close relatives' education			
EDM	0.004	0.020	0.038
	(0.657)	(0.744)	(0.822)
EDF	-0.019***	-0.074***	-0.133***
	(-3.062)	(-3.018)	(-3.060)
EDH	0.033***	0.137**	0.258***
	(3.043)	(3.229)	(3.341)
Other socioeconomic and demographic variables			
MAS	0.811***	2.935**	4.853**
	(2.973)	(2.576)	(2.352)
MRED	-0.063***	-0.220***	-0.383***
	(-3.415)	(-2.883)	(-2.788)
FSP	0.090	0.418*	0.668*
	(1.449)	(1.761)	(1.640)
LCN	-0.178	-0.862*	-1.486*
	(-1.499)	(-1.774)	(-1.764)
DSN	-0.003*	-0.016**	-0.028**
	(-1.849)	(-2.223)	(-2.173)
NDP	0.032	0.093	0.182
	(1.289)	(1.023)	(1.167)
HEM	-0.165	-0.785	-1.168
	(-1.302)	(-1.593)	(-1.134)
HIN	-9.47E-05***	-4.07E-05***	-7.74E-05***
	(-4.799)	(-4.705)	(-4.247)
OEM	-0.048	-0.143	-0.248
	(-0.597)	(-0.495)	(-0.478)
FEX	2.37E-05	1.23E-05**	1.98E-05*
	(1.399)	(1.984)	(1.765)

Explanatory variable	LPM	Probit model	Logit model
ONH	-0.277***	-1.231***	-2.112***
	(-3.093)	(-3.152)	(-3.048)
ONL	-0.249***	-0.899***	-1.548***
	(-4.681)	(-4.358)	(-4.322)
LSK	-0.101	-0.394	-0.664
	(-1.429)	(-1.407)	(-1.366)
Sample size	300	300	300
R^2	0.40	-	-
Adjusted R^2	0.35	-	-
McFadden's R^2	-	0.37	0.37

Note: z-statistics are given in parentheses; ***, **, and * denote statistical significance at 1, 5, and 10 percent, respectively.
Source: Authors' calculations.

Model 2 (Table 4) includes women's age in completed years instead of different age groups; all other explanatory variables are the same as in model 1. The coefficient of AGE is positive but insignificant. The effects of all the variables are the same as in model 1 with some exceptions: the coefficient of FEX (family expenditure) is positive but insignificant in the logit model, and the coefficient of LSK (ownership of livestock) is negative and significant at 5 percent in the probit and logit models but insignificant in the LPM.

Table 4: Estimated probability model 2 for FLFP

Explanatory variable	LPM	Probit model	Logit model
Constant	0.538**	0.231	0.429
	(2.316)	(0.285)	(0.306)
Age in completed years			
AGE	0.006	0.023	0.038
	(1.281)	(1.419)	(1.376)
Education level (matriculation is reference category)			
FA	0.237***	0.901***	1.485***
	(2.887)	(2.928)	(2.828)
BA	0.302***	1.113***	1.839***
	(3.458)	(3.382)	(3.315)
MST	0.493***	1.725***	2.915***
	(4.594)	(4.237)	(4.120)

Explanatory variable	LPM	Probit model	Logit model
HE	0.709***	2.557***	4.378***
	(4.455)	(4.111)	(4.045)
Close relatives' education			
EDM	0.005	0.022	0.038
	(0.649)	(0.893)	(0.850)
EDF	-0.019***	-0.069***	-0.122***
	(-3.016)	(-2.978)	(-2.971)
EDH	0.031***	0.102***	0.188***
	(2.798)	(2.661)	(2.757)
Other socioeconomic and demographic variables			
MAS	0.971***	3.216***	5.228***
	(3.237)	(3.035)	(2.855)
MRED	-0.069***	-0.236***	-0.402***
	(-3.639)	(-3.289)	(-3.232)
FSP	0.085	0.366*	0.601
	(1.324)	(1.606)	(1.553)
LCN	-0.238**	-1.057*	-1.720**
	(-1.958)	(-2.324)	(-2.211)
DSN	-0.004**	-0.020***	-0.032***
	(-2.365)	(-2.798)	(-2.663)
NDP	0.030	0.085	0.163
	(1.153)	(0.957)	(1.084)
HEM	-0.154	-0.499	-0.670
	(-1.186)	(-1.140)	(-0.771)
HIN	-8.98E-05***	-3.41E-05***	-6.28E-05***
	(-4.432)	(-4.268)	(-3.938)
OEM	-0.116	-0.382	-0.691
	(-1.428)	(-1.403)	(-1.419)
FEX	2.44E-05	9.29E-05*	1.45E-05
	(1.423)	(1.621)	(1.435)
ONH	-0.290***	-1.152***	-1.886***
	(-3.174)	(-3.174)	(-2.962)
ONL	-0.256***	-0.867***	-1.454***
	(-4.647)	(-4.457)	(-4.391)
LSK	-0.112	-0.444*	-0.753*
	(-1.530)	(-1.663)	(-1.650)

Explanatory variable	LPM	Probit model	Logit model
Sample size	300	300	300
R^2	0.35	-	-
Adjusted R^2	0.30	-	-
McFadden's R^2	-	0.31	0.31

Note: z-statistics are given in parentheses; ***, **, and * denote statistical significance at 1, 5, and 10 percent, respectively.
Source: Authors' calculations.

Model 3 (Table 5) includes women's education in completed years instead of different levels of education. The coefficient of education is positive and significant at 1 percent and all the variables have the same impact on FLFP as in model 1. However, the coefficient of HEM (husband's employment status) is significant in the probit model, while the coefficient of FEX (family expenditure) is significant in the LPM.

Table 5: Estimated probability model 3 for FLFP

Explanatory variable	LPM	Probit model	Logit model
Constant	-0.050	-2.029**	-3.407
	(-0.203)	(-2.089)	(-2.080)
Age group (AGEII [25–34 years] is reference category)			
AGEI	-0.083	-0.366	-0.639
	(-1.229)	(-1.472)	(-1.513)
AGEIII	0.278***	1.063***	1.828***
	(3.937)	(3.560)	(3.525)
AGEIV	0.284**	1.259**	2.241**
	(2.290)	(2.294)	(2.274)
AGEV	-0.215	-1.083	-1.744
	(-1.205)	(-1.459)	(-1.382)
Education in completed years			
EDU	0.067***	2.262***	0.449***
	(4.650)	(4.262)	(4.183)
Close relatives' education			
EDM	0.005	0.023	0.044
	(0.720)	(0.876)	(0.950)
EDF	-0.019*	-0.077***	-0.138***
	(-3.080)	(-3.126)	(-3.149)
EDH	0.034*	0.147***	0.268***
	(3.215)	(3.460)	(3.477)
Other socioeconomic and demographic variables			

Explanatory variable	LPM	Probit model	Logit model
MAS	0.788***	3.044***	4.911**
	(2.957)	(2.684)	(2.444)
MRED	-0.062***	-0.232***	-0.394***
	(-3.427)	(-3.055)	(-2.951)
FSP	0.095	0.428*	0.708*
	(1.541)	(1.830)	(1.752)
LCN	-0.184	-0.881*	-1.515*
	(-1.566)	(-1.837)	(-1.830)
DSN	-0.004***	-0.017**	-0.030**
	(-1.972)	(-2.348)	(-2.287)
NDP	0.029	0.089	0.167
	(1.163)	(0.999)	(1.067)
HEM	-0.176	-0.883*	-1.130
	(-1.394)	(-1.786)	(-1.292)
HIN	-9.76E-05***	-4.07E-05***	-7.60E-05***
	(-5.026)	(-4.748)	(-4.258)
OEM	-0.039	-0.136	-0.250
	(-0.489)	(-0.478)	(-0.483)
FEX	2.69E-05*	1.18E-05*	1.92E-05*
	(1.631)	(1.944)	(1.728)
ONH	-0.271***	-1.178***	-1.957***
	(-3.051)	(-3.142)	(-3.017)
ONL	-0.252***	-0.893***	-1.539***
	(-4.774)	(-4.356)	(-4.323)
LSK	-0.083	-0.349	-0.593
	(-1.178)	(-1.240)	(-1.214)
Sample size	300	300	300
R^2	0.40	-	-
Adjusted R^2	0.35	-	-
McFadden's R^2	-	0.37	0.37

Note: z-statistics are given in parentheses; ***, **, and * denote statistical significance at 1, 5, and 10 percent, respectively.
Source: Authors' calculations.

Finally, model 4 (Table 6) includes both age and education in completed years. The coefficient of AGE is positive and insignificant while the coefficient of EDU is positive and significant. The effects of all the variables are the same as in model 1, but the coefficient of location is significant in the LPM.

Table 6: Estimated probability model 4 for FLFP

Explanatory variable	LPM	Probit model	Logit model
Constant	-0.056	-1.950	-3.299
	(-0.196)	(-1.893)	(-1.867)
Age in completed years			
AGE	0.006	0.022	0.039
	(1.342)	(1.387)	(1.395)
Education in completed years			
EDU	0.066***	0.246***	0.411***
	(4.589)	(4.242)	(4.144)
Close relatives' education			
EDM	0.005	0.026	0.044
	(0.774)	(1.067)	(1.014)
EDF	-0.019***	-0.071***	-0.123***
	(-3.026)	(-3.041)	(-3.016)
EDH	0.032***	0.108***	0.192***
	(2.916)	(2.822)	(2.831)
Other socioeconomic and demographic variables			
MAS	0.852***	3.146***	5.024***
	(3.066)	(2.964)	(2.767)
MRED	-0.065***	-0.232***	-0.389***
	(-3.468)	(-3.232)	(-3.177)
FSP	0.090	0.381*	0.642*
	(1.412)	(1.691)	(1.680)
LCN	-0.254**	-1.091**	-1.767**
	(-2.107)	(-2.436)	(-2.310)
DSN	-0.005*	-0.020***	-0.033***
	(-2.530)	(-2.952)	(-2.807)
NDP	0.026	0.074	0.145
	(0.988)	(0.854)	(0.974)
HEM	-0.153	-0.512	-0.655
	(-1.181)	(-1.183)	(-0.772)
HIN	-9.21E-05***	-3.42E-05***	-6.20E-05***
	(-4.591)	(-4.345)	(-3.973)
OEM	-0.103	-0.343	-0.626
	(-1.283)	(-1.284)	(-1.293)
FEX	2.80E-05*	9.40E-05*	1.49E-05*
	(1.652)	(1.668)	(1.480)
ONH	-0.289***	-1.099***	-1.768***
	(-3.169)	(-3.163)	(-2.950)

Explanatory variable	LPM	Probit model	Logit model
ONL	-0.259***	-0.864***	-1.447***
	(-4.726)	(-4.481)	(-4.406)
LSK	-0.094	-0.398	-0.673
	(-1.289)	(-1.491)	(-1.478)
Sample size	300	300	300
R^2	0.34	-	-
Adjusted R^2	0.30	-	-
McFadden's R^2	-	0.31	0.31

Note: z-statistics are given in parentheses; ***, **, and * denote statistical significance at 1, 5, and 10 percent, respectively.
Source: Authors' calculations.

5.3. Estimates of Earnings Equation for Working Women

Table 7 gives the results for the earnings function of FLFP. Most of the regression coefficients are highly significant at 1 percent. Model 5(a), which incorporates the completed years of education, shows that the explanatory variables account for 61 percent of the variation in women's earnings as shown by R^2. The literature has already established that women's education is a key determinant of their earnings and plays a vital role in human capital formation. The coefficient of EDU is positive and significant at 1 percent. Each additional year of schooling increases women's earnings by 9.4 percent because it improves their skills and their scope for obtaining a better-paid job. Our results are similar to those of Mincer and Polachek (1974), Nasir (2002), Ahmad and Hafeez (2007), Chaudhry et al. (2010), and Faridi, Malik, and Ahmed (2010).

The coefficient of experience is positive and significant: each additional year of experience (and thus of productivity) increases women's earnings by 16 percent. The coefficient of experience-squared is significant and negative, which suggests that experience has a decreasing impact over time. This may be because women's earnings initially rise and then fall with age as described in the lifecycle theory. Our results are similar to those of Ahmad and Hafeez (2007).

The number of children has a negative impact on married women's earnings: as their childcare responsibilities increase, they are likely to have less time to work outside the home. Our results are similar to Chaudhry et al. (2010). Finally, women's earnings also depend on their profession. The LPM shows that teachers and computer operators earn more than doctors, while health workers, ward assistants (lower medical staff), and women engaged in embroidery work earn less than doctors. In the logit model, only teachers earn more than doctors.

Table 7: Log linear estimates of earnings function (model 5)

Variable	5a Completed years of education	5b Various education levels	5c Instrumental variable
C	7.331*** (17.373)	9.293*** (41.682)	8.714*** (28.338)
EDU	0.094*** (3.917)	-	-
FA	-	-0.416* (-1.797)	-
BA	-	-0.692*** (-3.129)	-
MST	-	-0.086 (-0.340)	-
HE	-	0.385 (1.292)	-
FAEXP	-	0.056*** (3.189)	-
BAEXP	-	0.066*** (4.201)	-
MSTEXP	-	0.075*** (3.672)	-
HEEXP	-	0.036 (1.357)	-
EXP	0.160*** (5.406)	-	0.112*** (3.327)
EXP2	-0.004**** (-3.174)	-	-0.003** (-2.017)
EDH	-	-	0.024** (2.417)
LCN	-	-	0.119 (0.546)
DSN	-	-	0.003 (0.836)
NCH	-0.057 (-1.511)	-0.028 (-0.749)	-0.084* (-1.846)
TCHR	0.224* (1.649)	0.223 (1.528)	0.237* (1.627)

Variable	5a Completed years of education	5b Various education levels	5c Instrumental variable
LHW	-0.136	0.025	-0.374*
	(-0.743)	(0.128)	(-1.824)
EMB	-0.651***	-0.824***	-1.037***
	(-3.402)	(-4.134)	(-5.868)
WRD	-0.101	-0.014	-0.331
	(-0.472)	(-0.062)	(-1.540)
COM	0.001	0.153	-0.081
	(0.003)	(0.767)	(-0.430)
Sample size	156	156	156
R^2	0.61	0.61	0.59
Adjusted R^2	0.59	0.57	0.56
F-statistic	25.70	15.80	18.90

Note: ***, **, and * denote statistical significance at 1, 5, and 10 percent, respectively.
Source: Authors' calculations.

Model 5(b) takes into account various levels of education and shows that the explanatory variables account for 61 percent of the variation in wage earnings as shown by R^2. Women with an FA, BA, or MA earn less than those with a higher qualification. Using the interaction term (education with experience), the results show that the level of education with experience increases earnings.

Model 5(c) uses an instrumental variable. The results show that the explanatory variables account for 59 percent of the variation in wage earnings as shown by R^2. The coefficient of experience is positive while that of experience-squared is negative and insignificant. The coefficient of EDH (husband's education) is positive and significant, which implies that better-educated men are likely to encourage their wives to work, thereby increasing the latter's earnings.

Location and distance have a positive and insignificant impact, respectively, on women's wage earnings. Urban women tend to earn more than rural women because the former are likely to have better-paid occupations. Every one-kilometer increase in the distance from the district headquarters causes hourly wage earnings to rise by 0.3 percent, but the coefficient is statistically insignificant; distance, therefore, has more or less no effect on women's earnings. Ahmad and Hafeez (2007) find a negative relationship between distance and women's earnings.

5.4. Estimates of Hours-of-Work Equation for Working Women

The overall explanatory power of the R^2 term is reasonably high: it explains 68 percent of the variation in the hours-of-work equation. Table 8 (model 6) shows that some of the regression coefficients are statistically significant. The coefficient of age is positive and significant, implying that, as women grow older, they work longer hours in order to earn more. Most women in our sample (about 91 percent) are younger than 45, explaining why the hours of work increase with age in our analysis. The coefficient of AGE2 is negative and significant, suggesting that older women, who are likely to be in poorer health, work shorter hours. These findings are similar to those of Ahmad and Hafeez (2007).

The level of education has little effect on women's working hours; the coefficient is positive but insignificant. Occupation, however, is an important variable in this case: a one-unit increase in the number of women who are doctors—as opposed to teachers—will increase the monthly hours of work by 52. A one-unit increase in the number of women who are health workers, ward assistants, or computer operators or who engage in embroidery work will decrease the monthly hours of work by 19, 41, 6, and 3, respectively. Ward assistants work longer hours but earn less because their jobs are low-paid.

Finally, our results show that the number of dependents and hours spent on household activities are negatively and significantly related to women's working hours. Similar to Ahmad and Hafeez (2007), we find that, as the number of dependents increases, women are likely to spend longer engaged in household activities and less time on market activities, with a corresponding fall in the hours of work.

Table 8: Estimates for hours-of-work equation for working women (model 6)

Variable	Coefficient	SE	t-statistic
C	78.355***	39.070	2.006
AGE	5.439***	1.926	2.824
AGE2	-0.061***	0.027	-2.255
EDU	1.399	1.156	1.210
DOC	52.038***	8.611	6.043
LHW	-19.300***	7.447	-2.592
EMB	-41.995***	7.926	-5.299
WRD	-6.448	9.390	-0.687
COM	-3.810	7.704	-0.495
NDP	-5.644***	1.714	-3.292
HRH	-0.128***	0.055	-2.354
R^2	0.68	F-statistic = 30.84	
Adjusted R^2	0.66	Prob. (F-statistic) = 0.000	
Total observations	156		

Note: ***, **, and * denote statistical significance at 1, 5, and 10 percent, respectively.
Source: Authors' calculations.

6. Conclusion and Suggestions

The present study has analyzed the correlates of educated women's LFP and the impact of various social and economic factors on their decision to participate in the labor market. The analysis was conducted as a case study of women in Multan who had completed at least eight years of schooling. The empirical results suggest that numerous factors explain FLFP in the district.

We find that the coefficients of all levels of education are significant and have a positive impact on FLFP. The coefficients of AGEIII, AGEIV, the husband's level of education and income, marital status, family structure, and family expenditures have a positive and significant impact on FLFP, while the coefficients of the father's education, location, distance, husband's employment status and income, family expenditures, and ownership of assets significantly reduce FLFP. The effect of AGEI, AGEV, the mother's education, the number of dependents, the husband's employment status, and the presence of other working members of the household is insignificant. Women's earnings increase if they live in an urban area and are highly educated and experienced. The number of working hours also rises with age and education.

Based on these conclusions, we suggest the following policy measures:

- Entry into the labor market requires more than basic schooling. Therefore, efforts should be to make higher education more easily available to women throughout Pakistan, especially in rural areas.
- Policies to organize the informal sector and establish more agriculture-based industries would benefit women with less than a year of schooling, giving them the opportunity to work in such industries for cash remuneration.
- The government should initiate rural development programs that focus on creating more employment opportunities for educated women living in rural areas.
- The government should also ensure the provision of childcare resources such as childcare centers and primary schools to support and encourage educated mothers to participate in economic activities.
- Given that the rate of FLFP appears to initially increase with age and then decrease, older educated women could be encouraged to participate by providing benefits such as social security, annual increments, and pensions.

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