ARTICLES

BOOK REVIEWS

C O N T E N T S

An Investigation of Firm Heterogeneity in the Constraints to Development and Growth in Pakistan

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This study considers the importance of firm characteristics in explaining the degree of business constraints facing Pakistani firms in the Investment Climate Survey. We quantify how firms with differing characteristics experience particular problems. After controlling for other factors, the largest differences in responses to business constraints occur among firms that vary by manufacturing industry, and among firms operating under different ownership structures or selling in different markets. In some cases, firm size and firm location also play an important role. The age of the firm generally does not lead to significant differences. These results account for the heterogeneity of firms better than others, and may be important for policy-makers to develop more specific approaches to fostering the investment climate.

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1. INTRODUCTION

What is the key to a country's economic development? This question has produced great controversy and a wide variety of answers. In recent years, the answers have increasingly emphasised the microeconomic institutions of a country: is there a strong legal system to promote property rights, is corruption under control, can financial institutions play their role as intermediaries between savers and investors, and so forth? In this new analytical framework, macroeconomic stability is not sufficient for development. It is along these lines that the most multilateral development institutions now place an increasing focus on improving the business or investment climate. A country cannot be expected to grow and flourish if potential entrepreneurs see no incentive to taking risks and expanding their businesses. Risk taking must provide the potential for rewards, but rewards can be almost nonexistent without the appropriate microeconomic institutions.

In order to analyse the investment climate, the World Bank commissioned surveys for 53 countries. In the case of Pakistan, an Investment Climate Assessment (ICA) survey was administered in 2002 in conjunction with the Small and Medium Enterprise Development Authority (SMEDA), Pakistan. This survey of 956 firms is the most extensive for Pakistan and will be the subject of our analysis. It is not the only survey of Pakistani businesses though, as more limited surveys were used to understand business constraints in World Bank (2001a), SMEDA (2002), and Bari, *et al.* (2002), among others.

Of course, the businesses of Pakistan are not homogenous units. They vary along a number of important dimensions, including their size, location, exporter status, type of production, age, and type of ownership. However, while previous studies have made attempts to understand business constraints in Pakistan, they have not included a systematic effort to understand the heterogeneity of Pakistani firms relating to these various constraints. Many discussions of policy reform tend to imply a one-policy-fits-all approach. Some of these studies make initial attempts along these lines by tabulating their results based on firm size or geographical region. But this is not sufficient to understand the differences in constraints and we are often left to wonder what characteristic of the firm (its size or its location) is driving the difference in firm responses.

Our goal in this paper is to provide a more systematic analysis of how the characteristics of a firm affect its responses to questions about various business constraints, in order to contribute to the discussion of reform efficacy in Pakistan. We accomplish this by using an ordered probit analysis. The reported degree of constraint facing a business is the dependent variable to be explained by a number of underlying firm characteristics, including firm size, province, exporter status, type of firm production, firm age, and the type of firm ownership. This regression analysis makes it possible to know whether firm size, for example, leads to significantly different responses about firm constraints after controlling for the other firm characteristics. By knowing this, we can gain more insight when interpreting the cross-tabulations of business constraints by different firm characteristics. This will allow for a more detailed analysis of Pakistan's business or investment climate, and perhaps even uncover further areas for reforms in the Pakistan economy.

As shared above, for the purpose of this paper, the Investment Climate Survey 2002 dataset has been analysed and our analysis proceeds as follows.[1] In Section 2, we provide background about previous studies of the Pakistan business climate, as well as motivate how the trend toward microeconomic institutional focus developed. Section 3 follows with a description of the Pakistan ICA and summary statistics for the sample firms. Section 4 explains the methodology of the ordered probit model approach. Section 5 provides the results, and Section 6 follows with conclusions and policy recommendations. Briefly, our findings suggest that a firm's characteristics plays an important role in determining its responses to different business constraints in Pakistan.

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[1]In 2006, the World Bank and SMEDA began work on the Investment Climate Assessment II for Pakistan. This survey was expected to be released in 2008, but it has not yet been cleared for use by private researchers. Subsequent research will consider this survey as well. It will be interesting to study the ICA II, because questions about business constraints are asked several times to check for consistency in the answers, and firms are also asked to rank the biggest three constraints and the three most needed reforms.

Firms that differ by export status, by the type of sub-manufacturing industry, and by firm ownership status, provide significantly different responses about the degree of business constraints. Exporters enjoy better conditions, as do firms in the sports goods, leather goods, and electronics industries. Meanwhile, private limited companies face additional burdens than other types of firm ownership structures. In some cases, firm size and firm location also play an important role. Medium size firms generally face more difficult conditions, as do firms in Sindh or Punjab. Finally, firm age does not generally play much role in determining firm responses.

2. BACKGROUND

During the 1980s and 1990s, the World Bank (WB) and the International Monetary Fund (IMF) designed the Structural Adjustment Programme (SAP) to assist economic development by providing credit for debt-ridden countries. Under World Bank and IMF conditionality, the SAP dominated economic policy planning in many developing countries. A typical SAP facility required the recipient country to restructure its economy in order to reduce deficits and yield financial resources required to pay debts. The prescribed macroeconomic framework included "structural" reforms to deregulate the economy, liberalise trade and investment, and privatise state enterprises. These were coupled with short-term stabilisation measures, including cutbacks in government expenditures, increased interest rates, and currency devaluation. The widespread failure of SAP in most of the low and middle income countries to yield sustainable moderate growth, as discussed in World Bank (2001b), prompted a paradigm shift even within the World Bank toward a broader economic development approach. Policy-makers realised that alongside deregulation, trade liberalisation, and fiscal discipline, microeconomic incentives are equally important to firm development and to stimulate private sector growth.

As such, the World Bank has increasingly focused on microeconomic incentives in recent years. James Wolfensohn, then president of the World Bank, developed the New Development Framework in 1999. His approach de-emphasised macroeconomic issues and moved the focus to fighting corruption, to creating an effective justice system, and to promoting a supervised financial system. There is only so much that macroeconomic stability can provide if a country's institutions are not designed to effectively facilitate investment and growth.

The World Bank's *World Development Report 2005* describes the World Bank's efforts to understand the investment climate in low and middle income countries. The report analyses survey data from 26,000 firms in 53 developing countries, in order to examine the relationship between the investment climate and growth. These surveys are conducted with local partners in each country, in order to include local input for policy reforms. The purpose of these investment climate surveys is to identify areas for policy reform that can reduce the burden on business and encourage them to invest and expand, with the idea that such growth will lessen poverty for everyone. The World Bank seeks to define how certain economic policy measures have the ability to unleash the growth potential of a country or otherwise restrain it from growing.

The World Bank, in collaboration with the Small and Medium Enterprise Development Authority (SMEDA) of Pakistan, produced an investment climate

assessment for Pakistan in 2003. The World Bank (2003) concluded that Pakistan needs to focus on microeconomic reforms to reduce business costs by providing better services in the areas of "power, telecom, tax administration, access to finance, and law and order" (p. iv). The World Bank's assessment focused on comparing various summary statistics from the survey to the situation in other comparable countries, mainly China, Bangladesh, and India. More detailed work was recently published as Dollar, Hallward-Driemeier, and Mengistae (2005). Table 1 compares the percentage of firms ranking a constraint as major or severe for these four countries. Generally, Bangladesh faces a more severe situation than Pakistan, but Pakistan's firms have more complaints than those in China or India. While such analysis is important, as a comparison to international benchmarks is needed to be able to quantify the severity of problems in Pakistan, there are still plenty of insights beyond the scope of the World Bank's assessment remaining to be learned from the survey results.

Table 1

Investment Climate Indicators in Four Countries
(Percentage of Firms Ranking Constraint as Major or Very Severe)

Constraint	Pakistan	Bangladesh	China	India
Tax Administration	47.0%	50.7%	26.7%	26.4%
Tax Rates	46.8%	35.8%	36.8%	27.9%
Financing	40.8%	45.7%	22.3%	19.2%
Economic Policy Uncertainty	40.4%	45.4%	32.9%	20.9%
Corruption	40.3%	57.9%	27.3%	37.4%
Electricity	39.3%	73.2%	29.7%	28.9%
Crime, Theft and Disorder	21.4%	39.4%	20.0%	15.6%
Labour Regulations	15.8%	10.8%	20.7%	16.7%
Skills and Educ. of Avail. Workers	13.0%	19.8%	30.7%	12.5%

Source: For Pakistan, own calculations from Pakistan ICA. For others, World Bank (2004b).

While the World Bank's assessment is able to use the most comprehensive survey available for Pakistani businesses, there have also been other analyses of the business situation. Of these, Bari, *et al.* (2002) is the most thorough, though they rely on a more limited survey of 54 firms to base their conclusions. These authors develop the notion of a "binding constraint" as a way to target the problems most affecting firm growth and investment, noting the need to focus on microeconomic as well as macroeconomic problems. They also do their best to obtain a good representation of firm sizes in several manufacturing and retail sectors. The binding constraints they observe include issues related to financing, infrastructure, government regulation, human resources, market regulations, and macroeconomic uncertainty.

In a separate study, World Bank (2001a) uses a larger survey of 500 firms to identify the severity of constraints based on firm perceptions. Their two-tiered approach first identifies the top ten problems experienced by firms in their efforts to grow, and then further investigates seven of these constraints. The analysis is limited to the presentation of summary statistics based on enterprise perception. Nevertheless, the unique feature was the larger representation of smaller size firms in the survey from the all major economic sectors, including industry, trade, and services.

Finally, a key early paper that helped begin the debate on SME policy in Pakistan is SMEDA (2002). They survey 333 firms in order to develop a set of policies for micro, small and medium enterprises. They give special attention to the necessary legislation and administrative steps for compliance. The distinctive contribution of this study is to identify important issues related to labour welfare and taxation laws. The study further helps to clarify the complications faced by smaller firms in their attempts to comply with these laws. The study maintains an overall focus on three broad issues, which included labour laws, business credit or enterprise financing, and taxation.

3. DATA DESCRIPTION

We will provide a more detailed analysis of business constraints in Pakistan, using the Investment Climate Survey of Pakistan 2002. The data consists of 956 firms interviewed in Pakistan by the Small and Medium Enterprise Development Authority of the Government of Pakistan in collaboration with the World Bank between May and November 2002. The firms were sampled randomly from a sample frame drawn from the directories of registered businesses published by each of the four provincial government labour departments. The published directories were updated in 2000 and disaggregated in terms of employment and industrial sub-sectors. This allows the survey sample to be fairly representative of industrial activity in Pakistan's twelve largest cities for seven manufacturing industries chosen in terms of their contribution to GDP. The ICA is the largest dataset available, and care was taken to make it representative of Pakistan's business enterprise population as described in Pakistan's Economic Census of 2001. Because of its size and scope, the dataset is rich enough to allow an extensive look at the heterogeneity of firms, and how this heterogeneity contributes to firm responses about business constraints.

Table 2 provides summary statistics for the firm characteristics in the survey sample. Firm size includes four categories based on the number of workers employed at the firm.[2] Micro firms employ 1 to 9 workers, while small firms employ 10 to 49 workers, medium firms employ 50 to 99 workers, and large firms have 100 or more workers. Micro firms account for 13.2 percent of the sample. Meanwhile, small firms represent 58.6 percent of the total, medium firms another 14.7 percent, and large firms account for 13.5 percent. With regard to Pakistan's four provinces, Punjab accounts for 60.7 percent of the firms in the survey, while 25 percent are in Sindh, 7.9 percent in NWFP, and 6.4 percent in Balochistan.[3] Meanwhile, 18.7 percent of the firms in the survey export at least some of their product.

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[2]These firm size definitions are based on the continuing discussions for the proposed SME Policy of Pakistan. For details, please see *SME Issues Paper* and SME policy task force reports as available on the website www.smepolicy.net.pk

[3]The results of the Economic Census of 2005 also suggest similar geographic patterns of industrial establishments, though we find that Sindh and Balochistan are overrepresented. Punjab is home to six of the most industrialised cities and 68.4 percent of Pakistan's 583,000 industrial establishments. Sindh, the home of Pakistan's largest industrial city Karachi, includes 13.9 percent of industrial establishments, while there are 16 percent in NWFP, and 1.4 percent in Balochistan.

Table 2

Description of Survey Data

	Number of Firms	Percent of Firms
Firm Size		
Micro	126	13.2%
Small	560	58.6%
Medium	141	14.7%
Large	129	13.5%
Province		
Sindh	239	25.0%
NWFP	76	7.9%
Punjab	580	60.7%
Balochistan	61	6.4%
Exporter Status		
No Exports	777	81.3%
Exports	179	18.7%
Type of Production		
Textiles	342	35.8%
Garments	136	14.2%
Leather and Leather Products	40	4.2%
Food Processing	151	15.8%
Electronics and Electrical Equipment	101	10.6%
Chemicals	138	14.4%
Sports Goods	46	4.8%
Other	2	0.2%
Firm Age		
0-5 Years	96	10.0%
6–10 Years	285	29.8%
11–15 Years	228	23.8%
16 + Years	347	36.3%
Firm Ownership		
Publicly Listed Company	32	3.3%
Private Held, Limited Company	486	50.8%
Partnership	167	17.5%
Sole Proprietorship	255	26.7%
Other	16	1.7%

Source: Own calculations from Pakistan Investment Climate Assessment.

Furthermore, the firms surveyed are involved in a variety of manufacturing industries. These industries include textiles (35.8 percent), food processing (15.8 percent), chemicals (14.4 percent), garments (14.2 percent), electronics and electrical equipment (10.6 percent), sporting goods (4.8 percent), leather and leather products (4.2 percent), and two other firms that were not classified. With regard to firm age, 10 percent of firms are between 0 and 5 years old, while 29.8 percent of firms are 6 to 10 years old, 23.8 percent of firms are 11 to 15 years old, and 36.3 percent of firms are at

least 16 years old. Finally, the formal ownership structure of the firm is also important. In this regard, the more formal firms, publicly listed or privately held limited companies, together make up 54.1 percent of the surveyed firms. Sole proprietorships and partnerships provide 44.2 percent of the sample, and other categories represent another 1.7 percent.

4. METHODOLOGY

Our goal is to understand the constraints facing Pakistani business. The business constraints in Pakistan will be considered along several different lines. Important among these are the size of the firm, the location of the firm, whether the firm is an exporter, the type of goods produced by the firm, the age of the firm, and the type of firm ownership. We attempt to understand these constraints through a system of self-reporting in the Investment Climate Assessment (ICA) of Pakistan. The ICA asked firms to rank seventeen different business obstacles on a scale with five categories ranging from "No Obstacle" to "Very Severe Obstacle." Table 3 shows how the 956 firms responded to each constraint. The list of constraints is provided in descending order for the sum of the "major obstacle" and "very severe obstacle" categories. We consider the results of the survey questions asking how severely constraining are various possible impediments to Pakistani business. This discussion will allow for a characterisation of the problems most affecting business in Pakistan.

Table 3

Firm Responses to Business Obstacles

Constraints	None	Minor	Moderate	Major	Very Severe
Tax Administration	24.40%	11.20%	17.40%	17.30%	29.70%
Tax Rates	25.40%	9.40%	18.40%	15.30%	31.50%
Financing Costs (Int. Rates)	26.30%	13.10%	17.40%	13.60%	29.60%
Economic Policy Uncertainty	29.50%	11.20%	18.90%	14.20%	26.20%
Corruption	28.60%	12.00%	19.10%	15.10%	25.20%
Electricity	21.30%	20.10%	19.30%	16.60%	22.70%
Access to Financing (Collateral)	29.60%	12.50%	19.60%	15.90%	22.40%
Macro-economic Instability	30.40%	13.60%	21.60%	14.60%	19.90%
Customs and Trade Regul.	43.80%	14.10%	17.70%	12.70%	11.70%
Anti-competitive Practices	37.20%	19.60%	21.80%	8.70%	12.80%
Crime, Theft and Disorder	44.80%	17.40%	16.40%	10.20%	11.20%
Access to Land	46.40%	16.80%	15.70%	10.10%	11.10%
Labour Regulations	43.80%	17.40%	23.00%	10.20%	5.70%
Business Permits	52.60%	17.30%	15.40%	8.00%	6.70%
Skills and Educ. of Avail. Workers	48.30%	19.90%	18.90%	7.60%	5.30%
Transportation	46.40%	23.60%	19.90%	6.50%	3.70%
Telecommunications	53.90%	25.60%	12.90%	4.20%	3.50%

Source: Own calculations from Pakistan Investment Climate Assessment.
Note: Constraints in the shaded part of the Table are "binding," as defined in Section 4.

We employ the concept of "binding constraint" to identify those constraints which produce the largest complaints from firms. Following the approach of Bari, *et al.* (2002), we use two criteria for determining a binding constraint: the median firm response must identify the constraint as at least a "moderate obstacle," and at least 30 percent of firms must identify the constraint as a "major obstacle" or a "very severe obstacle". Both criteria identify the first eight constraints listed in Table 3 as binding, from "Tax Administration" to "Macroeconomic Instability". At the cut-off point there is a large drop, as while 34.4 percent of firms identify macroeconomic instability as a severe or major constraint, only 24.3 percent of firms provide the same answer for customs and trade regulations. Binding constraints are of more interest, because these constraints suggest the areas where reform could produce the most benefit. It may be less effective to devote policy resources to areas where firms do not complain as loudly. We see that tax issues, financing issues, policy uncertainty, corruption, electricity, and macroeconomic instability produce the largest concerns for firms. Customs and trade regulations, anti-competitive practices, crime, land, labour and business regulations, the skills of the labour force, transportation, and telecommunications are not constraining firms to as large of degree. In comparison, SMEDA (2006) identifies the business environment, access to finance, human resource development, and support for technology as four of the most important areas for SME policy.

To understand the nature of the binding constraints, as well as the other constraints, we wish to determine what characteristics of a firm lead it to respond in a particular way. For example, it will be enlightening to know if small firms complain much more strongly than large firms about the access to financing. The overwhelming benefit of our approach is that we can control for other firm characteristics to make these conclusions. We will know that it is because firms are small that they answer in some particular way, and not because, for example, small firms tend to manufacture particular goods or be located in particular regions, and it is these other factors that are driving the firm's response. Such knowledge can guide policy-makers to design more appropriate policies responding to the specific needs of Pakistani firms.

An ordered probit model provides a natural approach for determining the significance of particular firm characteristics in answering about the degree of a constraint. Our dependent variable, the measure of constraint severity, includes five ordered categories. Ordinary least squares is not appropriate because there is no reason to believe that the differences between categories will be equal. We cannot observe the true severity of a constraint, which we call variable y^*. Each of the ranking categories refers to a range of actual severity. As the constraint grows for a firm, the constraint will reach a threshold and move to the next higher category. An ordered probit model provides a way to model this phenomenon. We seek to estimate:

$$y^* = \alpha + \beta X + \varepsilon, \text{ and we observe } y, \text{ where } y = \begin{cases} 0, \text{ if } y^* \leq \delta_1 \\ 1, \text{ if } \delta_1 \leq y^* \leq \delta_2 \\ 2, \text{ if } \delta_2 \leq y^* \leq \delta_3 \\ 3, \text{ if } \delta_3 \leq y^* \leq \delta_4 \\ 4, \text{ if } \delta_4 \leq y^* \end{cases}$$

$$\dots \quad (1)$$

In the above expression, *y** is the unobserved true underlying severity of the constraint, *X* is a matrix of explanatory variables, *y* is the observed constraint ranking, and the δs are the unknown threshold values that cause firms to decide their answer for *y*. We consider these constraints as a linear function of firm characteristics *X*, which include size, location, export status, type of production, firm age, type of firm ownership. The ordered probit approach uses maximum likelihood to determine the role of the explanatory variables. The value of using this approach is that it allows us to examine whether a particular firm characteristic results in different answers about the severity of a constraint, after controlling for the effects of other explanatory variables.

5. ANALYSIS OF THE CONSTRAINTS ON BUSINESS

The framework used in this paper explains the business constraints for firms in Pakistan along six specific firm characteristics, in order to provide the basis for a deeper policy discussion. We identify those characteristics of firms that produce statistically significant differences in their answers about the severity of business constraints. The main emphasis will be on binding constraints, though the discussion also includes limited analysis of other constraints. Table 4 provides the results of the ordered probit regressions. Tables 5 through 10 follow by showing the percentage of firms identifying a constraint as "Major" or "Very Severe," disaggregated by a particular firm characteristic. These tables incorporate information from the ordered probit regression to identify which constraints produce statistically significant differences in the responses of firms disaggregated by the particular category. These tables also identify the binding constraints as they apply to each of the firm characteristics.

5.1. Firm Size

The relationship between firm size and business constraints has been studied in the literature. Bari, *et al.* (2002) indicates that SMEs have generally faced greater challenges than their larger counterparts in Pakistan's recent history, on account of the heavily regulated industrialisation policy. Large firms held advantages because they were in better positions to obtain limited government licenses and investment incentives. Large firms also had greater access to finance, because credit and interest rate controls left banks with little reason to loan to the riskier small firms. Fixed costs in dealing with government regulators and administrators also worked to put a greater burden on smaller firms.

After controlling for other firm characteristics, we find evidence that firm size matters at the 5 percent level of significance for the degree of constraint facing firms with regard to the binding constraints of tax issues, electricity, and access to financing (see Table 5).

For nonbinding constraints, firm size matters for crime issues, access to land, labour regulations, and telecommunications. Interestingly, some issues do not produce answers that differ in a statistically significant way by firm size, including financing costs, economic policy uncertainty, corruption, macroeconomic stability, customs and trade regulations, anticompetitive practices, business licensing and operating permits,

Table 4

Ordered—Probit of Constraints on Firm Characteristics

	Binding Constraints								Non-binding Constraints								
	Tax Administration	Tax Rates	Cost of Financing	Economic Policy Uncertainty	Corruption	Electricity	Access to Financing (e.g. Collateral)	Macro-economic Instability	Customs and Trade Regulations	Anti-competitive Practices	Crime, Theft and Disorder	Access to Land	Labour Regulation	Business Licensing and Operating Permits	Skills and Education of Available Workers	Transportation	Telecommuni-cations
Firm Size (Omitted Condition is "Large Firm")																	
Overall p-value	**0.0262***	**0.0000****	**0.7003**	**0.0596**	**0.5249**	**0.0159***	**0.0265***	**0.2651**	**0.0641**	**0.1105**	**0.0013****	**0.0076****	**0.0044****	**0.4576**	**0.4582**	**0.5511**	**0.0281***
Micro Firm	–0.3593*	–0.6885**	–0.0073	–0.1671	–0.1801	–0.2606	0.1001	–0.1641	–0.5220**	–0.0099	–0.4576**	0.4649**	–0.5386**	0.0406	–0.1813	–0.0662	–0.4794**
Small Firm	–0.0505	–0.2306	0.1007	–0.2241	–0.0724	–0.0963	0.3091*	–0.1336	–0.3207**	–0.1132	–0.4399**	0.4326**	–0.2289	0.1661	–0.0821	0.0009	–0.2889*
Medium Firm	0.0779	0.1293	0.0699	–0.3693**	0.0324	0.1854	0.2472	–0.2722*	–0.0934	–0.2969*	–0.5084**	0.3659*	–0.0411	0.0826	0.0497	–0.1498	–0.1464
Province (Omitted Condtion is "Sindh")																	
Overall p-value	**0.2201**	**0.0614**	**0.0488***	**0.3255**	**0.5349**	**0.0009****	**0.0000****	**0.7189**	**0.0046****	**0.2524**	**0.0051****	**0.0000****	**0.0606**	**0.0044****	**0.0031****	**0.0847**	**0.4223**
NWFP	0.0487	–0.0337	–0.4426**	0.2507	–0.0295	0.1262	–0.7807**	–0.0359	0.1821	0.2933	–0.2071	–1.1439**	–0.3575*	–0.5160**	–0.5957**	–0.1399	–0.0882
Punjab	0.0225	–0.0557	–0.0772	0.0386	0.0145	–0.1789	–0.0516	–0.0846	–0.2300*	0.0398	–0.1398	–0.6174**	–0.0069	–0.1662	–0.0291	–0.1249	–0.1184
Balochistan	–0.2898	–0.4333**	–0.0365	0.1974	–0.2112	–0.5373**	–0.2206	–0.1544	–0.3041	–0.0287	0.3583*	–0.3523*	–0.2565	0.108	0.13	0.2355	–0.2591
Exporter Status (Omitted Condition is "Non-exporter")																	
Overall p-value	**0.0006****	**0.0040****	**0.0000****	**0.8351**	**0.0070****	**0.5582**	**0.0019****	**0.2594**	**0.5369**	**0.0148***	**0.2475**	**0.5844**	**0.0045****	**0.0310***	**0.7697**	**0.0662**	**0.2324**
Exporter	–0.3774**	–0.3153**	–0.4774**	–0.0224	–0.2945**	–0.0611	–0.3331**	–0.1205	–0.0688	–0.2694**	–0.1299	0.06	–0.3178**	–0.2491*	0.0316	–0.2050	–0.1349
Type of Production (Omitted Condition is "Textiles")																	
Overall p-value	**0.0000****	**0.0000****	**0.0000****	**0.0000****	**0.0000****	**0.0051****	**0.0000****	**0.0000****	**0.0000****	**0.0000****	**0.0000****	**0.6997**	**0.0000****	**0.0009****	**0.0361***	**0.0125***	**0.0018****
Garments	–0.1331	–0.1706	–0.0739	0.0382	–0.1629	–0.1132	–0.1243	–0.01	0.0468	0.0763	0.0153	–0.0566	–0.0847	–0.1695	0.0043	0.0196	–0.2289
Leather	–1.4174**	–1.2257**	–0.8074**	–0.9682**	–0.8473**	–0.3121	–0.4312*	–0.554**	–0.7407**	–0.5382**	–0.6656**	–0.0068	–0.6226**	–0.5173**	0.1709	–0.2764	–0.6800**
Food Proc.	0.2715*	0.1678	0.0597	0.037	0.2051	0.173	0.1119	–0.0571	0.0521	0.2609*	0.0785	–0.0058	0.0786	–0.1825	–0.3657**	–0.1675	0.0613
Electronics	–0.2885*	–0.6186**	–0.2631*	–0.3459**	–0.174	–0.0337	–0.1637	–0.2516	–0.1942	0.0955	0.0897	0.1353	–0.3690**	–0.1598	0.0497	0.0402	0.074
Chemicals	–0.0743	–0.0585	–0.0352	–0.051	0.0175	–0.064	–0.0073	–0.0217	0.1197	0.1684	0.0409	0.0666	0.1763	0.0056	0.0483	–0.1549	0.0413
Sports Goods	–2.0439**	–1.4757**	–1.4185**	–1.3818**	–1.7798**	–0.6394**	–1.1207**	–1.108**	–1.0756**	–1.8205**	–2.1028**	–0.2388	–1.4861**	–1.1451**	–0.1175	–0.7372**	–0.6702**
Firm Age (Omitted Condition is "0–5 Yr.")																	
Overall p-value	**0.0041****	**0.4788**	**0.4549**	**0.2875**	**0.7489**	**0.0588**	**0.4084**	**0.0030****	**0.1080**	**0.1390**	**0.2605**	**0.0751**	**0.0636**	**0.2922**	**0.0821**	**0.821**	**0.3997**
6–10 Yr.	0.3014*	0.072	0.1276	0.2281	0.1174	0.1018	–0.0057	0.4813**	0.1571	0.144	0.219	–0.2240	0.0517	0.2393	0.0092	–0.1018	0.1919
11–15 Yr.	0.4611**	0.1849	0.2158	0.1375	0.1059	0.0189	0.148	0.3036*	0.3302*	0.2778*	0.0548	0.0205	0.2695	0.2414	0.1	–0.132	0.1445
Over 15 Yr.	0.4372**	0.1489	0.1678	0.2209	0.142	0.2444	0.0961	0.3908**	0.2053	0.2600	0.1008	–0.0411	0.0453	0.1495	–0.1449	–0.1014	0.2322
Firm Ownership (Omitted Condition is "Sole Proprietorship")																	
Overall p-value	**0.0012****	**0.0238***	**0.0000****	**0.0266***	**0.0007****	**0.7831**	**0.0000****	**0.0063****	**0.0003****	**0.0001****	**0.0107***	**0.0357***	**0.0056****	**0.0241***	**0.0419***	**0.0642**	**0.1099**
Publicly Listed Co.	–0.017	–0.2847	0.3654*	–0.179	–0.0394	–0.1085	0.139	0.1768	0.1918	0.0574	–0.0071	0.177	0.302	0.5261*	0.4970**	0.5923**	0.3392
Private limited Co.	0.2956**	0.2125*	0.4876**	0.1221	0.1912*	0.0452	0.4302**	0.2292*	0.3579**	0.3391**	0.2018*	0.2521*	0.3472**	0.3102**	0.2655**	0.2479*	0.0914
Partnership	–0.0556	0.0261	0.2521*	–0.118	–0.2479*	0.0635	0.1727	–0.0694	–0.0316	–0.1128	–0.1589	0.0062	0.2180	0.155	0.2579*	0.1486	0.2769*
Other	–0.1323	–0.4054	–0.3793	0.6446	0.0254	–0.188	–0.1401	0.5688**	0.1121	0.4750	0.1043	0.2772	0.0951	0.4002	0.3401	0.468	0.2885
Observations	953	954	953	954	953	954	953	953	948	954	953	953	954	952	953	953	952

Note: * Significant at 5 percent; ** Significant at 1 percent.

Table 5

Percentage of Firms Identifying Constraint as
"Major" or "Very Severe" by Firm Size

	Micro	Small	Medium	Large
Tax Administration	34.9%	**47.7%**	**53.2%**	**49.6%**
Tax Rates	29.4%	**45.9%**	**59.6%**	**54.3%**
Financing Costs (Int. Rates)	**33.3%**	**45.5%**	**41.8%**	**44.2%**
Economic Policy Uncertainty	**41.3%**	**39.2%**	**38.3%**	**46.5%**
Corruption	33.3%	**39.4%**	**45.4%**	**45.0%**
Electricity	33.3%	**38.9%**	**48.2%**	**38.0%**
Access to Financing (Collateral)	33.3%	**40.7%**	**39.0%**	31.8%
Macro-economic Instability	27.8%	**33.3%**	**34.0%**	**45.7%**
Customs and Trade Regulations	13.5%	22.4%	**30.5%**	**36.4%**
Anti-competitive Practices	26.2%	21.5%	12.1%	26.4%
Crime, Theft and Disorder	17.5%	19.7%	19.9%	**33.3%**
Access to Land	16.7%	22.0%	23.4%	18.6%
Labour Regulations	7.9%	14.3%	22.7%	22.5%
Business Permits	11.1%	15.4%	16.3%	13.2%
Skills and Educ. of Avail. Workers	9.5%	12.2%	20.6%	11.6%
Transportation	10.3%	10.6%	7.1%	10.9%
Telecommunications	6.3%	6.8%	6.4%	14.0%

Note: Own calculations from Pakistan ICA. The constraint name is in boldface if the ordered probit analysis identifies statistically significant differences at the 5 percent level in the answers of firms varying by the firm characteristic. The percentage is in boldface if the constraint is binding for the sub-category, where binding constraints are identified as those with a median response indicating the constraint is at least "Moderate", *and* at least 30 percent of firms identify the constraint as "Major" or "Very Severe".

skills and education of the labour force, and transportation. But regarding tax issues and electricity, medium firms express the strongest complaints, followed by large firms, small firms, and micro firms, once we control for other factors. In fact, micro firms generally have fewer complaints, as their only binding constraints are financing costs and economic policy uncertainty. Meanwhile, for access to finance, small firms complain most, followed by medium, micro, and large firms.

First consider the issues of tax administration and tax rates. Micro firms complain about these issues much less than their larger counterparts. In fact, tax issues are not a binding constraint for micro firms. Regarding tax administration, the responses of small and medium firms are not statistically distinguishable from the responses of large firms. With regard to tax rates, we find evidence that micro and small firms do complain to a lesser degree in a statistically significant way, than do medium or large firms. We can observe some justification for this through further exploration of the data along three parameters: the amount of entrepreneurial time spent in dealing with tax regulators, average fines paid during a year, and average bribes paid to the regulators. We find evidence in the ICA that larger firms must devote significantly more resources in absolute terms for dealing with taxation issues, while small firms are most burdened as a percentage of sales. Micro firms can more easily escape the targets of the government tax authorities.

Access to financing is an important issue, as it is seventh in the list of binding constraints, and here it is the case that large firms complain least and small firms complain most. Access to financing is only a binding constraint for small and medium firms. In a topic deserving much greater attention, we indeed find evidence that firm size has a direct bearing on a firm's ability to get financing from formal channels; larger firms enjoy easier and greater access to formal financing than their smaller counterparts in the ICA. It is puzzling why micro firms do not voice loud complaints despite having the least access to formal financing though. For example, more than half of large firms had at least one loan from a bank at the time of the survey, while this is true for only 2.3 percent of micro firms. There are several possible explanations. Micro firms believe that they will not be entertained by the financial institutions, and hence they are discouraged to apply in the first place and then effectively find other sources of financing. Also, micro firms assign low probability to their survival in a highly uncertain economic policy environment and avoid taking any additional liabilities in the absence of effective bankruptcy procedures.

There are four other constraints with statistically significant differing answers regarding firm size that are not binding in nature. These are related to crime, access to land, labour regulations, and telecommunications. The most likely targets of theft and crimes are the large enterprises. Limited financial resources have translated into the larger complaints by the micro, small and medium enterprises about the access to land. Unlike the usual perception that labour regulations are a real source of trouble for the smaller firms, see SMEDA (2002) and SMEDA (2004), our analysis suggests otherwise, as the bigger a firm is, the more it tends to complain about labour regulations.

Revisiting the discussion above, our analysis suggests that conditions for the SME manufacturing sector in Pakistan can improve if reform efforts focus on: (a) improving both tax rates and tax administration to respond better to SMEs' unique conditions, b) ensuring the supply of electricity from the national grid, and c) deepening the formal financing to reach out to smaller firms. To make the business environment even more conducive for micro and small manufacturers, giving access to land should be considered. However, any intervention in other areas is likely benefit larger enterprises more than the SMEs.

5.2. Firm Location

Table 6 provides evidence that, after controlling for other firm characteristics, the province in which a firm is located affects its business constraints. Firms in Sindh and NWFP tend to voice louder complaints than those in Punjab and Balochistan. The subset of binding constraints in which firm location plays an important role in producing different responses, with at least 5 percent significance, include the cost of financing, electricity, and access to financing. With regard to the costs of financing and access to financing, the complaints are loudest in Sindh, though the responses in Punjab, Balochistan, and Sindh do not differ significantly from one another. However, financing issues are an area in which complaints from NWFP are significantly lower, once we control for other firm characteristics. As for electricity, the degree of complaints is significantly less in Balochistan than the other regions. NWFP experiences the biggest problems with electricity, followed by Sindh and Punjab. We find justification for this in

Table 6

Percentage of Firms Identifying Constraint as
"Major" or "Very Severe" by Region

	Sindh	NWFP	Punjab	Balochistan
Tax Administration	**54.4%**	**56.6%**	**43.6%**	**39.3%**
Tax Rates	**54.8%**	**59.2%**	**42.7%**	**39.3%**
Financing Costs (Int. Rates)	**50.6%**	**40.8%**	**40.3%**	**44.3%**
Economic Policy Uncertainty	**39.7%**	**56.6%**	**38.4%**	**41.0%**
Corruption	**41.4%**	**47.4%**	**39.4%**	**34.4%**
Electricity	**43.5%**	**52.6%**	**38.8%**	13.1%
Access to Financing (Collateral)	**46.4%**	23.7%	**36.9%**	**37.7%**
Macro-economic Instability	**39.3%**	**40.8%**	**31.5%**	**34.4%**
Customs and Trade Regulations	28.5%	**39.5%**	20.9%	21.3%
Anti-competitive Practices	13.4%	**39.5%**	23.0%	14.8%
Crime, Theft and Disorder	23.8%	15.8%	18.7%	**42.6%**
Access to Land	38.1%	3.9%	16.3%	21.3%
Labour Regulations	16.7%	10.5%	16.6%	11.5%
Business Permits	19.7%	5.3%	13.0%	23.0%
Skills and Educ. of Avail. Workers	12.1%	9.2%	12.6%	24.6%
Transportation	10.0%	11.8%	9.0%	18.0%
Telecommunications	7.5%	6.6%	7.6%	9.8%

Note: The Note in Table 5 explains how to interpret this table.

the survey, as the median percentage of merchandise value lost due to electricity problems follows the same ordering. In NWFP, the median firm estimates that it loses 5 percent of its merchandise on account of electricity problems. Because different regions have different experiences with electricity, there are grounds for a deeper analysis of the arrangement of electricity production and supply in the four regions.

The regional location of firms also produces statistical significance for some non-binding constraints as well. For instance, customs and trade regulations are less of a problem in Balochistan and Punjab than in NWFP and Sindh. Meanwhile, access to land is a bigger problem in Sindh than in other regions. This constraint points to possible opportunities for substantially improving the investment climate by establishing new industrial zones in Sindh. Complaints about access to land are particularly low in NWFP once we control for other factors. As for the issues of crime, business permits, and worker skills, Balochistan experiences the biggest problems, followed by Sindh, Punjab, and NWFP.

5.3. Access to Export Markets

Exporting firms overwhelmingly have fewer complaints than firms serving only the domestic market, as shown in Table 7. At the 5 percent level of significance, our analysis regarding market access has confirmed significantly lower complaints for exporters with five of the eight binding constraints. For the other constraints, exporters complain less, but not significantly less. In general, exporters complain less with regard

Table 7

*Percentage of Firms Identifying Constraint as "Major"
or "Very Severe", by Market Access*

	Non-exporters	Exporters
Tax Administration	**51.2%**	29.2%
Tax Rates	**50.6%**	30.3%
Financing Costs (Int. Rates)	**47.2%**	25.8%
Economic Policy Uncertainty	**43.2%**	28.1%
Corruption	**43.3%**	27.0%
Electricity	**41.4%**	**30.9%**
Access to Financing (Collateral)	**42.1%**	21.3%
Macro-economic Instability	**37.0%**	23.0%
Customs and Trade Regulations	25.5%	19.1%
Anti-competitive Practices	23.1%	14.0%
Crime, Theft and Disorder	22.7%	15.2%
Access to Land	22.0%	16.9%
Labour Regulations	17.0%	10.7%
Business Permits	16.1%	8.4%
Skills and Educ. of Avail. Workers	13.5%	10.7%
Transportation	11.0%	6.2%

Note: The Note in Table 5 explains how to interpret this table.

to tax issues, financing issues, and experiences with corruption. In fact, the only constraint identified as binding by exporting firms in the survey is electricity. As for non-binding constraints, exporters complain significantly less about anti-competitive practices, labour regulations, and business permits.

For practical reasons, exporting firms can complain less because they enjoy special incentive packages in areas such as taxation, financing, and other regulations.[4] Briefly, exporting firms are not required to pay sales tax (VAT), and income tax is governed by a presumptive tax regime, which allows exporters to settle their income tax liability by paying tax at a rate ranging between 0.75 percent and 1.25 percent of sales. This arrangement takes away both of the top ranking constraints for exporters, and it allows them to internalise the costs of taxation as a fixed operating cost.

The arrangement for financing is also unique for exporters. The central bank of Pakistan allows exporters to have access to an export refinancing fund, available through all commercial banking channels without a requirement of furnishing any physical collateral. Additionally, the export refinancing rates are pegged to the average six-month Treasury bill rates plus a certain percentage for covering operational costs. This arrangement has allowed exporters to enjoy increased access to financing at the lowest possible market interest rates. There are some limitations, however, because commercial banks can occasionally demand additional collateral for riskier clients. Corruption and uncertainty about regulations and policy is also reduced because of lessened contact between exporters and regulators. In general, our analysis confirms the effectiveness of said incentives resulting in relatively better scores from exporters against those constraints.

[4]For details on incentives, please visit <www.tdap.gov.pk>.

5.4. Manufacturing Sub-sector

Does the type of product a firm produces matter for its well-being in the Pakistani business environment? Are some industries able to offer better investment opportunities than others? The answer to these questions is yes, as shown in Table 8. After controlling for other factors, the sub-manufacturing industry of the firm is an important determinant of its constraints. In fact, overall responses are different at the sub-manufacturing level for all of the constraints except for access to land. Among textiles, garments, leather goods, food processing, electronics, chemicals, and sports goods, business conditions in Pakistan tend to most favour the sports goods industry, followed by leather manufacturers and electronics manufacturers. To be precise, the sports goods and leather goods industries do not experience any binding constraints. Meanwhile, the food processing industry complains most loudly, though the responses from textiles, garments, and chemicals are also relatively close.

Given these results, the industrial sectors can be classified in two groups based on their relative perceptions about the business environment. The first group comprises sports goods, leather goods, and electronics. While sports goods and leather goods are well ahead, the case of electronics is more split, since they are better off than the textiles, garments, chemicals and food processing industries, but only for the first four binding constraints, from tax administration to economic policy uncertainty. For the rest of the binding constraints, from corruption to macroeconomic instability, their experience is no different.

The second group includes textiles, garments, chemicals, and food processing. It is interesting that textile and garment manufacturers voice loud complaints. SMEDA (2005) and the World Bank (2004a) predict declining returns for the textile and garment industries in Pakistan, with regard to the abolition of textile quotas and increased competition from other regional players, such as India, Bangladesh, and China. Food processing firms voice the loudest complaints, though tax administration is the only area which has any statistical significance for this sector, besides anticompetitive practices in the list of nonbinding constraints. On the other hand, in terms of the availability of skilled labour, food processing is the only industry which enjoys better conditions.

The survey results identify issues which have direct bearing on the industrial policy of Pakistan. The results imply potential opportunities for improving investment conditions substantially for the textiles, garments, chemicals and food processing industries by placing them at the core of possible future industrial policy. Given the fresh investment by the textile and the garment sectors to the tune of USD 4 billion, it is all the more important to understand reasons for the differences at the sub-manufacturing level for evolving a more conducive business environment.

5.5. Firm Age

It is interesting that firm age is not an important factor for determining how firms view potential business constraints, once we control for other factors (see Table 9). The only two constraints with differential responses are tax administration and macroeconomic instability. With regard to tax administration, the largest constraints are felt by firms between 11 and 15 years old, while the young firms are least affected again. As for macroeconomic stability, the youngest firms are least affected; macroeconomic stability is not a binding constraint for firms between 0 and 5 years old. The biggest complaints come from firms between 6 and 10 years old.

Table 8

Percentage of Firms Identifying Constraint as "Major" or "Very Severe", by Industry

	Textiles	Garments	Leather	Food Processing	Electronics	Chemicals	Sports Goods
Tax Administration	**51.2%**	**49.3%**	7.5%	**62.9%**	**38.6%**	**50.0%**	2.2%
Tax Rates	**53.5%**	**50.7%**	7.5%	**62.3%**	25.7%	**51.4%**	2.2%
Financing Costs (Int. Rates)	**47.7%**	**41.9%**	10.0%	**54.3%**	37.6%	**48.6%**	2.2%
Economic Policy Uncertainty	**43.9%**	**41.9%**	15.0%	**51.7%**	32.7%	**42.8%**	4.3%
Corruption	**43.3%**	**35.3%**	10.0%	**52.3%**	39.6%	**46.4%**	2.2%
Electricity	**42.4%**	**33.8%**	17.5%	**53.6%**	37.6%	**37.7%**	15.2%
Access to Financing (Collateral)	**42.7%**	**33.8%**	17.5%	**47.0%**	36.6%	**40.6%**	4.3%
Macro-economic Instability	**38.9%**	**38.2%**	10.0%	**39.7%**	26.7%	**37.7%**	0.0%
Customs and Trade Regulations	22.8%	30.9%	7.5%	30.5%	19.8%	**30.4%**	2.2%
Anti-competitive Practices	16.4%	18.4%	12.5%	**31.1%**	30.7%	28.3%	2.2%
Crime, Theft and Disorder	20.5%	18.4%	7.5%	25.2%	24.8%	30.4%	0.0%
Access to Land	26.3%	20.6%	0.0%	21.9%	19.8%	18.1%	10.9%
Labour Regulations	14.9%	16.2%	5.0%	21.2%	8.9%	25.4%	0.0%
Business Permits	17.0%	14.0%	7.5%	15.9%	11.9%	16.7%	2.2%
Skills and Education of Avail. Workers	15.2%	14.0%	12.5%	7.3%	12.9%	15.9%	4.3%
Transportation	10.8%	10.3%	5.0%	11.9%	8.9%	11.6%	0.0%
Telecommunications	7.3%	5.1%	2.5%	8.6%	11.9%	10.9%	0.0%

Note: The Note in Table 5 explains how to interpret this table.

Table 9

Percentage of Firms Identifying Constraint as "Major"
or "Very Severe", by Firm Age

	0-5 Years	6-10 Years	11-15 Years	Over 15 Years
Tax Administration	**42.7%**	**48.4%**	**50.9%**	**44.7%**
Tax Rates	**43.8%**	**49.1%**	**46.0%**	**46.4%**
Financing Costs (Int. Rates)	**37.5%**	**46.3%**	**45.1%**	**40.9%**
Economic Policy Uncertainty	**39.6%**	**42.5%**	**39.4%**	**39.5%**
Corruption	**36.5%**	**40.0%**	**41.2%**	**40.9%**
Electricity	**38.5%**	**36.5%**	**36.3%**	**44.1%**
Access to Financing (Collateral)	**33.3%**	**38.6%**	**40.7%**	**37.8%**
Macro-economic Instability	26.0%	**38.9%**	34.1%	33.1%
Customs and Trade Regulations	18.8%	22.8%	27.4%	25.1%
Anti-competitive Practices	17.7%	18.2%	25.7%	22.2%
Crime, Theft and Disorder	15.6%	23.9%	22.6%	19.9%
Access to Land	19.8%	15.8%	23.5%	24.2%
Labour Regulations	12.5%	14.0%	18.6%	16.4%
Business permits	10.4%	15.8%	15.0%	14.7%
Skills and Educ. of Avail. Workers	13.5%	14.0%	17.3%	9.2%
Transportation	14.6%	8.8%	9.3%	10.4%
Telecommunications	8.3%	8.1%	7.1%	7.5%

Note: The Note in Table 5 explains how to interpret this table.

As for why young firms complain the least, the answer may be related to survey bias in the ICA sample. As an illustration of this bias, a sample of 279 manufacturing firms from Directories of Labour Year Book 2000, Karachi—Government of Sindh, were contacted one year after publication, and it was discovered that some 85 businesses were either closed or not traceable. This suggests a degree of severity in business conditions for new entrants that cannot be picked up entirely in the sample due to the lag between obtaining sources for choosing the sample and actually interviewing the selected firms.

5.6. Ownership Structure

Previous analysis, such as SMEDA (2002), indicates that ownership structure does matter for the development and the growth of a firm. Ideally, more formalised structures should lead to better business services delivery from the business support institutions and should result in better business conditions for firms. This is not the only possibility, however, as Osama (2004) suggests that corporatisation provides no additional advantages for taxes, access to business support services, or financing. Instead, a limited liability structure is more expensive on account of tax rates and fixed operational costs associated with additional paper work.

The survey shows that firm ownership structure is very important in determining the degree of constraint reported by businesses. Table 10 shows that ownership is statistically significant for all binding constraints except for electricity. Private limited companies report the largest complaints for all of the statistically significant binding constraints. Private limited companies and sole proprietors are only comparable for economic policy uncertainty and electricity. On the other hand, publicly listed companies have lesser complaints than the sole proprietary concerns for most of the binding constraints. In cases where publicly listed companies claim a higher degree of binding

Table 10

Percentage of Firms Identifying Constraint as "Major"
or "Very Severe", by Firm Ownership

	Publicly held Limited Liability	Privately held Limited Liability	Partnership	Sole Proprietorship
Tax Administration	**40.6%**	**57.6%**	29.9%	**39.1%**
Tax Rates	**40.6%**	**57.4%**	**33.5%**	**36.4%**
Financing Costs (Int. Rates)	**34.4%**	**52.9%**	**34.1%**	33.2%
Economic Policy Uncertainty	**34.4%**	**44.2%**	26.9%	**41.1%**
Corruption	34.4%	**48.4%**	24.0%	**36.8%**
Electricity	**40.6%**	**42.4%**	**38.9%**	**34.0%**
Access to Financing (Collateral)	21.9%	**45.9%**	**31.7%**	30.8%
Macro-economic Instability	**40.6%**	**40.1%**	25.1%	27.7%
Customs and Trade Regulations	28.1%	**31.9%**	15.0%	15.0%
Anti-competitive Practices	21.9%	25.3%	10.2%	20.6%
Crime, Theft and Disorder	21.9%	27.2%	14.4%	14.6%
Access to Land	18.8%	25.7%	13.8%	17.0%
Labour Regulations	21.9%	18.3%	15.0%	11.1%
Business Permits	12.5%	16.3%	12.0%	13.4%
Skills and Educ. of Avail. Workers	12.5%	15.0%	11.4%	9.9%
Transportation	15.6%	12.3%	5.4%	7.5%
Telecommunications	15.6%	8.8%	6.0%	5.5%

Note: The Note in Table 5 explains how to interpret this table.

constraint, which include cost of financing, access to finance, and macroeconomic instability, the results are not statistically significant. Firm ownership continues to play a statistically significant role in explaining the responses to seven of the nine nonbinding constraints. Again, in these cases, the complaints of private limited companies are the largest by a statistically significant degree. The complaints of sole proprietorships, publicly listed companies, and partnerships follow, but are generally not distinguishable from one another, except for the case of workforce skills, where sole proprietorships complain significantly less.

The survey data confirms the fact that privately held companies spend more days dealing with regulators and pay more to government regulators in terms of fines and bribes. Being a corporate entity in Pakistan does not offer any incentives in terms of dealing with tax authorities, qualifying for better tax rates, negotiating lower interest rates or better access to finance, dealing with corruption, or fighting macroeconomic instability. Sole proprietary concerns can more easily escape from regulatory oversight without losing any advantages in terms of access to business services or resources. This has important implications for developing the formal economy of Pakistan, and not letting firms slip into the informal economy. The State Bank of Pakistan (2001) estimates that the informal economy was close to 32 percent of the total between 1996 and 2000. The magnitude of the informal economy makes it difficult for the government to adequately plan and provide effective business services. As we understand, it has its roots in ownership structure of the firms and any effort to improve conditions for privately held firms will help to improve the investment climate.

6. CONCLUSIONS AND POLICY RECOMMENDATIONS

This study confirms that a one-size-fits-all policy is not appropriate for improving the conditions of Pakistan's manufacturing firms. A number of different firm characteristics are found to play important roles in determining business constraints. First, while existing research, such as SMEDA (2002) and SMEDA (2004), discusses firm growth vis-à-vis firm size, it does not recognise a need for different mechanical processes based on firm size. The analysis of responses in this research sketches a different picture. While confirming heterogeneity with regard to the aforementioned constraints, the results suggest that smaller firms are better off in quantitative terms. The efforts of the smaller firms and micro firms in particular are devoted in escaping regulatory burden, using bribes and gifts to regulators as a tool. Large firms tend to use similar tools for reducing their official tax liabilities and remain within the regulatory environment. This difference in approach to dealing with regulatory burden requires a different policy treatment for ironing out the variations of firm size in the regulatory environment. This would also require the development of different mechanical processes based on firm size. Access to finance comes out as the top-ranking constraint for the small firms, where the difference is both wide and significant. Using Non-bank Financial Institutions (NBFI) as a channel for small firms would greatly improve their condition (please see Table 11 for a summary of policy recommendations).

Additionally, certain regional locations in Pakistan are posing an extra burden on firms due to the lack of necessary infrastructure such as electricity and industrial land, which becomes binding constraints to their growth. Most of the significantly differing responses, though, come from the list of non-binding constraints. An appropriate response to remove these barriers would include that the government yield modest resources in terms of setting up new industrial parks with adequate infrastructural support.

Meanwhile, exporting firms face only a few binding constraints. The difference in the condition of non-exporters and exporters are stark and significant, and incentives for exporters with respect to most of the regulations are creating another divide among industrial enterprises. While the incentive regime for exporters is effective and results in fewer complaints, it needs to be counterbalanced with a business support mechanism for non-exporters to smooth differences.

Furthermore, there are definitely some industries which enjoy relatively better regulatory environments than others. Sports and leather goods industries complain least. The specific conditions surrounding these industries could give clues for making life better for others. The results in this respect also pose doubts about the effectiveness of industrial policies for creating better conditions. It appears that they are distorting the business environment whereby some industries like food processing are becoming worse off without bettering conditions for others. Current industrial policy should be pragmatically reviewed.

Among the surviving enterprises, older firms do not enjoy any extra advantage, despite prevailing popular beliefs. On the contrary, older firms are penalised in terms of tax administration. This suggests that tax regulators go after obvious targets regardless of their compliance record. This underlying psychology of the regulator explains firms' general preference for tax evasion.

Table 11

Policy Analysis of Firm Conditions vis-à-vis Constraints

Policy Area	Analysis/ Challenges/ Policy Focal Points
Firm Size	Reducing interface between tax regulators and firms will reduce compliance costs for all but micro sized firms
	Only a responsive tax regime for smaller size firms (micro and small) can improve business conditions—analysis confirmed that smaller firms end up paying more (as a percentage of sales) to avoid interface with tax authorities
	Access to finance is a binding constraint for small size firms—survey results show that Non-bank Financial Institutions are more effective than the commercial banks
	Increasing access to land can significantly improve the business climate for SMEs
	Labour regulations are not a constraint for SMEs, reducing interface of labour regulators is desired more by large firms
Regional Location	Firms in Sindh and NWFP tend to voice the loudest complaints
	Cost of financing, electricity, and access to financing and industrial land are the key areas for improvement in Sindh
	In NWFP major complaints are about economic policy uncertainty, electricity supply and taxation
	The major concern in Balochistan is the prevailing law and order situation
Market Access (Local and Foreign)	Non-exporters generally feel deprived
	The incentive regime for exporters is effective resulting in fewer complaints
	The difference in the conditions of non-exporting and exporting firms are stark
	In order to avoid another divide in the economy, the incentive structure must be counterbalanced through other business support mechanisms for non-exporting firms
Sub-manufacturing Sector	The business or investment conditions across industries are significantly different
	Sports goods, leather goods and electronics industries enjoy relatively better investment conditions. Indeed, the first two do not experience binding constraints
	Returns are declining in textiles, garments and chemical industries—due to fierce foreign competition
	The food processing industry produces the most complaints, particularly about tax administration and anti-competitive practices
	Industrial and investment policies must carefully look into the incentives for different industries
Firm Age	Analysis does not confirm any particular advantage related to the age of the firm, except that old firms are more exposed to taxation-related problems
	It is reasonable to conclude that the existing business climate does not encourage new start-ups.
Ownership Structure	Privately held limited liability companies face large compliance costs
	There is no added advantage to be a corporate entity in terms of taxation, finance, or in accessing business services or resources
	Sole proprietary firms do not show any disadvantage or advantage over publicly held companies or partnerships but are definitely better off than privately held limited liability companies
Cross Cutting Themes	There are constraints that are significant for many types of firms, such as electricity supply from public grid, macroeconomic stability, and law and order
	A more reliable power supply from public grid has the largest potential to improve growth conditions across the board
	Stabilising the shifting policy regime would further strengthen the confidence of investors
	An improved law and order situation would greatly enhance firms' ability to grow and plan for long-term investments

Finally, we establish that more formal structures of organising businesses, such as privately held limited liability companies, can also be punishing to firms. The current regulatory environment in Pakistan is killing the incentives for formal business structure and becoming a liability for business.

Conclusively, evidence is found that economic policy reforms in Pakistan cannot treat firms as homogeneous units. A great amount of heterogeneity exists, and this heterogeneity can drive many different responses to questions about the severity of business constraints. For instance, fashioning an effective business climate for micro firms will entail different policies than for small, medium, or large firms. Additionally, we find that access to foreign markets, type of production, and type of firm ownership play substantial roles in determining business responses to constraints. The age of the firm is less important, as is the province in which the firm is located. Some issues are cross-cutting across firms, such as a desire for a more reliable electricity supply, but generally the results suggest that policy-makers must develop proposals that account for the heterogeneity of firms, and that a one-size-fits-all approach will not be effective and could even have unintended consequences.

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The Ultimatum Game and Gender Effect: Experimental Evidence from Pakistan

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Laboratory experimentation was once considered impossible or irrelevant in economics. Recently, however, economic science has gone through a real 'laboratory revolution', and experimental economics is now a most lively subfield of the discipline. This study attempts to examine answers to questions of the changing behaviour of opposite sexes under conditions of both anonymity and knowledge of gender by playing the ultimatum game in Pakistan. It is observed that the behaviour of males and females in Pakistani society is quite different from that found in earlier studies. Insights from the previous experiments have already shown that normative economic theory had failed in its predictions of human behaviour. Currently, the ultimatum game is widely discussed in behavioural economic literature, and this paper will adjust the traditional ultimatum game into a new form wherein it will be tested in the country (Pakistan) with multidimensional behaviour of subjects. With regard to gender effect specifically, all previous studies came up with somewhat mixed results, since results do not always point in the same direction and it is rather early to draw far-reaching conclusions regarding the behavioural differences of men and women. More facts are required in order to move towards the development of a systematic theory. This work is a small attempt to investigate the changing behaviour of opposite sexes under different controlled conditions.

INTRODUCTION

There is substantial diversity in the social and economic behaviour of men and women in most of the societies around the globe. In Pakistan, socio-economic groups behave differently in bargaining. These behavioural differences in both genders may affect wages and other economic outcomes. Here it has been tried to test the behaviour of Pakistani people using the Ultimatum Game. The *Ultimatum Game*[1] has been the basis for many experimental investigations and the outcomes of the ultimatum game are not

[1]In the ultimatum game (UG), two people, a first-mover (proposer) and a second-mover (responder), are allocated a sum of money, which they can share if they can come to an agreement. Responders decide whether to accept or reject offers from the proposers. Accepted offers are implemented but rejected offers result in both players receiving nothing. Because the proposer is allowed to make a take-it-or-leave-it offer and because the proposer knows any reasonable responder will accept even a little money rather than rejecting an offer, as the economic theory dictates the proposer should receive nearly all the money as something is better than nothing. But the game-theoretic prediction for this game is straightforward. If both players are rational in the sense that each is concerned only with maximising his own profit, proposer should propose to keep all but a penny for himself and give a penny to responder. Responder should accept this proposal since even a penny is better than nothing [Camerer and Thaler (1995) and Güth, *et al.* (1982)].

consistent with the results expected from standard economic theory for one-shot and repeated games [Thaler (1998) and Roth (1995)].

Social Norms defining "*Fairness*" influence outcomes of Ultimatum Game. These norms vary across culture. Accordingly, ultimatum game has been studied in many different cultures [Croson and Buchan (1999); Roth, *et al.* (1991)]. However, we add to this literature by studying, for the first time; ultimatum game in Pakistan also by applying new statistical techniques which have never been used in existing literature. The experiment made in this paper involves four rounds of ultimatum game. In each round the size of the monetary stake remained unchanged and the gender of the players has been recorded. In the first two rounds the players remained mutually anonymous. But in the next two rounds the gender of the player is common knowledge. It had been tried to examine how the behaviour is affected by the knowledge about gender of the players, why do people offer more in their social negotiations, how people learn from their past experience and the consistency of social behaviour with the conventional economic wisdom.

In the following sections a short overview of the related literature on ultimatum game, design of experiment along with the discussion over the experimental results from Pakistan. The final section was the conclusion and policy recommendation.

THEORETICAL FRAMEWORK

The role of gender in human decision-making has been extensively analysed in the literature. More specifically, gender differences have been investigated in the laboratory using several environments one of which is the Ultimatum Game (UG).[2] We now review the literature on effects of Gender on the Ultimatum Game, as a preliminary to our study of this issue in the context of Pakistan.

As far as the Ultimatum Game (UG) is concerned, Eckel and Grossman (2001) conducted the UG experiment specifically designed to test for gender effects in the bargaining process. In their design employs the "game method[3]", they implement an UG which is repeated along eight rounds. Proposers and respondents are matched using a face to face protocol. The sex of a subject's partner is made known by having a group of four proposers seated facing a group of four respondents. Subjects have no information on their partner's identity. They find that women proposals are, on average, more generous than men, regardless of the sex of the partner, and women respondents are more likely to accept an offer of a certain amount. Furthermore, a given offer is more likely to be accepted if it comes from a woman, a result which is interpreted as chivalry. Women paired with women almost never fail to reach an agreement. Our design of experiment is closer to Eckel and Grossman's design. As in our study the players were seated face to face so that the players may see each other and make their ultimatum decision. Contrary to the findings of Eckel and Grossman, we find that males made more generous offers in the case where the gender of the responder was unknown, and also in the case where the responder was know to be female. This difference is most likely due to cultural differences.

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[2]See Eckel and Grossman (2005) for an exhaustive revision of differences in economic decisions of men and women. They examined these differences in several experimental scenarios.

[3]In game method the proposer makes an offer which is presented to the responder, who then decides whether to accept or reject the given offer.

In another study, Solnick (2001) conducted a one-shot UG game using the strategy method.[4] This method generates additional data (the minimum willingness can be analysed directly) but is thought to lead to more analytical decision-making states than the game method used by Eckel and Grossman (2001). Gender is communicated by the first name of the counterpart (a practice which Holm (2000) suggests yields the same results as informing the participant "your counterpart is a (fe)male student"; see also Fertshman and Gneezy (2001). The analysis involved two treatments. In first treatment, players remained mutually anonymous while in second treatment the gender of the players was known to both parties (proposer and responders). She analysed the players behaviour using Wilcoxon test and found that both sexes make lower offer to women and that both sexes choose higher minimum acceptable offer (MAO) when he/she faces a woman. In general the highest rejection rate exists when a women player faces a women player. There are two fundamental differences in our study and Solnick's study which are (i) design of experiment, (ii) strategy to disclose player's identity. In Solnick study the strategy method was used whereas we have not used strategy method (methodology of our study will be discussed in coming chapters). Solnick study revealed that players only knew the gender but they cannot see the players themselves while in our study the players were seated face to face without allowing them to talk to each other. Our results are substantially different from those of Solnick, most likely due to cultural differences between Pakistan and USA.

Similarly, Saad and Gill (2001) conducted one shot UG in which subjects face randomly a subject of the same or contrary gender (i.e. man to woman, woman to man, man to man and woman to woman). Here each subject knew the sex of his/her partner. They found that males make more generous offers when pitted against female whereas, females made equal offers independently of the other's sex. Our results are similar to Saad and Gill (2001) but here again there is difference of experimental design. We have tested the player's behaviour under anonymity as well as full gender knowledge where as Saad and Gill tested the player's behaviour with full gender knowledge. Also, we have used non-parametric test and logistic regression analysis to analyse the distributional pattern of offers made and the responders' response to a given offer which was missing in the Saad and Gill's study. In our study the female players have shown learning behaviour when the gender was unknown but this aspect of learning was not discussed in the Saad and Gill's study. However, in the Saad and Gill study an interesting rather more important parameter of physical attractiveness of the subjects was discussed to explore the plausible reasons for the gender differences. They were also of the opinion that the physical attractiveness of the subject has a very important role in determining the behavioural response of the subjects in ultimatum game. Rating the physical attractiveness is not easy because this relates to the mental state of mind where the mood and attitude of the subject also play a pivotal role. Therefore, we have tried to exclude all those confounding parameter which may affect the behaviour of subjects other than gender to observe the natural response of the subjects when they were paired with a subject of opposite sex.

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[4]Under the strategy method, the proposer decides the offer and, at the same time, the responder records a minimum acceptable offer. If proposer's offer equals or exceeds responder's minimum acceptable offer, the offer is accepted and the pie divided according to proposer's proposal.

The factor of physical attractiveness influencing the gender decision on the ultimatum game was also discussed by Solnick and Schweitzer (1999). The study revealed that one's own attractiveness did not influence decision making but did influence the decision process of others. In particular, it was found that more was offered to attractive people and to men, even though attractive people and men did not demand more. In this study the expected earnings of attractive people were 8 to 12 percent greater than the expected earnings of un-attractive people, and the expected earnings of men were 13 to 17 percent greater than the expected earnings of women. Thus, the physical appearance significantly influenced the types of offers and demands negotiations. The implications of this study were consistent with Heilman's (1983) and Rynes and Gerhart (1990) findings.

Botelho, *et al.* (2000) postulated the hypothesis that behavioural differences in bargaining in UG stems from the differences in demographic characteristics of the subjects within each country. They used the data previously collected in the USA and Russia to test not only for the effects of nationality on behaviour but also for the effects of other demographic factors. They found that proposer behaviours were fairly similar across USA and Russia but there were substantial differences in behaviour across genders. The average offers made by female subjects in both USA and Russia about 45 percent of pie whereas, male offered 31.5 percent of the pie. The results of this study are also in contradiction to our study.

Sutter, *et al.* (2006) studied the influence of gender and gender pairing on economic decision making in an experimental two-person UG where the other party's gender was known to both subjects. The game was played with four treatments (FF, FM, MF, MM) using the censored Tobit regression analysis it was observed that gender pairing systematically affects the behaviour. Moreover, competition and retaliation was observed which lowered the efficiency when the bargaining partners were having the same gender and vice versa.

The composition of the gender related games also affects the decision of the subjects as examined by Dufwenberg and Muren (2005). They tried to explain how does gender composition influence team decisions. They use dictator game[5] (DG) to address this issue. The results do indicate that there were significant gender effects in group decisions i.e. female-majority groups give more to individual recipient and also choose the equalitarian division more after than male-majority groups do. It was also found that the presence of a man triggers an exaggerated generosity among the women in the group. The results of Dufwenberg and Muren's this study receives some support from the observations already raised by Stockard, *et al.* (1988). In another paper by Dufwenberg and Muren (2004) it was examined experimentally that how a person's generosity depends on the degree of anonymity between given and recipient, as well as on the sex of either party. Here again dictator game was used and it was concluded that women were mere generous than man.

However, to our knowledge there have been no prior studies involving ultimatum game to investigate gender effect in Pakistan.

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[5]In the dictator game, the first player, "the proposer", determines an allocation (split) of some endowment (such as a cash prize). The second player, the "responder", simply receives the remainder of the endowment not allocated by the proposer to himself. The responder's role is entirely passive that he has no strategic input into the outcome of the game [Camerer and Fehr (2003)].

DESIGN OF EXPERIMENT

The ultimatum game was tested in the Govt. Postgraduate College Nawabshah, Ghizer, Kharan, Rawlakot and Professional Academy of Common Knowledge, Lahore (PACK) separately at the stake size of Rs 100, consisting of four rounds. The stake size remained fixed through out the study.[6] The advertisement about the game was done through pasting the posters in the institutes. No show up fee was taken from the participants. A short seminar was conducted in order to explain the rules of the game to the students. Thirty pairs of postgraduate students consisting of thirty male and thirty females from each *Govt. College*, were chosen except ten pairs of postgraduate students consisting of ten male and ten female, were chosen from *PACK* for the experiments.

In the first round at *Govt. Colleges*, there were 15 male and 15 female proposers, with 15 male and 15 female responders but in *PACK* there were 5 male and 5 female proposers, with 5 male and 5 female responders. The identity and gender of the players was kept secret in the first two rounds. The experimenter was the only one who has complete knowledge of the player's gender (identity). There was no opportunity for the mutual coordination among the proposers as well as the responders through out the experiment. The proposers were placed in one room and the responders in another. Two persons were assisting the experimenter.[7] In the start of round every player was allotted an identity number. In each round the players (proposers) were given a slip to write their identity number and make their offer. They have only two minutes to make their offer and then the assistants collected the offer slips and took them to the responders to make their decision (either to accept or reject the offer). After making the decision, the slips were taken back and given to the experimenter and he then announced the resulting payoffs to the players. After the announcement the payment was made to the players according to their decided share. After that round the players have to answer a short questionnaire. The same methodology was adapted in the second round with a slight difference that male proposers were making their offers to the male responders and female proposers were making their offers to the female responders. However, the gender was still not the not known to both player's parties.

In the next two rounds (third and fourth) the players were seated face to face and the gender became a common knowledge. But still the players were not allowed to make mutual conversation. Here in the third round, all the male players were chosen to make offers to all the female responders. After that round both the parties have to answer the questionnaire regarding their decision and hand it over to the experimenter. In the fourth round, the role of proposer and responder was swapped within the mixed gender pairs selected in the third round. After all these experimental rounds, the players had passed through a short interview regarding their preferences and their attitude towards the opposite sex.

RESULTS AND DISCUSSION

(i) Round 1

In this round of play the both the player parties were ignorant of the gender of each other and there was no provision of making any bilateral or multilateral conversation

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[6]Including all the rounds 1, 2, 3, 4.
[7]One man in the proposer's room and the other in the responder's room from the respective institute.

among them. The hypothesis we were trying to test here is that either the distribution of male and female offer differ significantly from each other or otherwise. In this context two sample Kolmogorov-Simrnov Test (K-S Test),[8] for additional econometric analysis logistic regression model and mean comparison test have been used.

While analysing the offer pattern of male and female in round I, it was observed that offers were not the same, meaning that there were significant differences in the offer pattern of male and female players according to the results of K-S Test (Table 1). As the computed *p-value* was less than significance level ($\alpha = 0.05$), also the computed value of (*Absolute Difference of Cumulative Distribution Functions*) was *D = 0.246* which was higher than the critical value of *D = 0.175* at *n=65* rejecting the null hypothesis.

Table 1

Kolmogorov-Simrnov Test for Distributional Analysis

Variables	Two Sample Kolmogorov-Simrnov Test (Two Tailed Test)		
	Round 1	Round 2	Round 3 and 4
D	0.246	0.138	0.331
P-value	0.025	0.457	< 0.0001
Alpha (Level of Significance)	0.05	0.05	0.05

The gender effect was also analysed by using the test of mean comparison by taking in account the more offer given by either male or female. In Table 2 the results of mean comparison test for male and female offers have been shown for this purpose. It was observed that the male players on the average gave more offers than the female players as average male offers was 40.492 and average female offers was 37.538. These results were statistically significant to reject the null hypothesis of no difference in male and female offers. Graphically, it was represented in Figure 1, which clearly showed that there were substantial differences in the offer pattern of male and female offer curves (both offer curves for male and female players gradually took the same pattern of offer after the offer of Rs 40 and offers made less than Rs 40.

Table 2

Mean Comparison Analysis for Male and Female Offers in Round 1

Variable	Mean	N	SD	Assumptions	T-stat	P-value
F1	37.538	65	8.5697	Equal Variances	–2.39	0.0181
M1	40.492	65	5.0563	Unequal Variances	–2.39	0.0185

[8]This test is used to investigate the significance of difference between two population distributions, based on two sample distributions [Kinji (1999)]. The method used here is that we have segregated the male and female offers with sample size *n1* & *n2*, then we have calculated the cumulative distribution functions *Sn1(Xm)* & *Sn2(Xf)* for male and female sample respectively. Then we have calculated the absolute difference between cumulative distribution functions *Sn1(Xm)* & *Sn2(Xf)*. Hence, the maximum value of the difference between *Sn1(Xm)* & *Sn2(Xf)* is calculated denoted as maximum value of *D* and compared with the critical value of the null hypothesis *(Ho: Pm=Pf, H1: Pm≠Pf)*. As if the observed value exceeds the critical value the null hypothesis is rejected or otherwise. See Appendix 1 for explanation of Kolmogorov-Simrnov hypothesis.

Fig. 1. Cumulative Distribution Curves for Male and Female Offers in Round 1
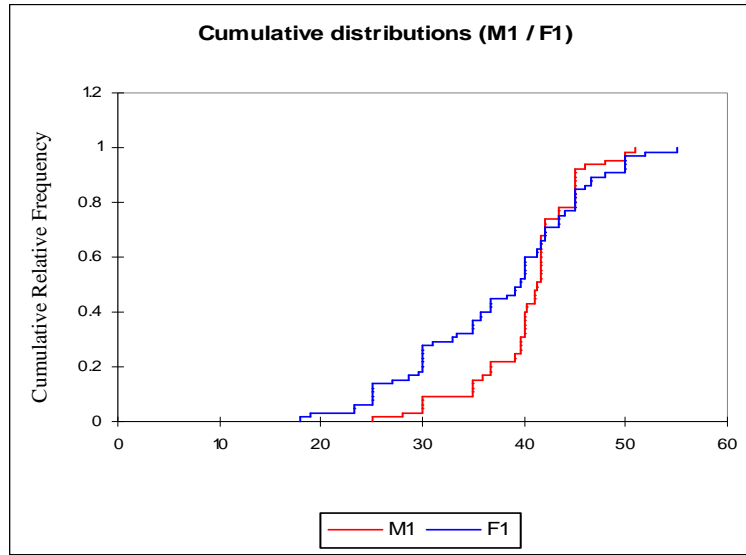
The logistic regression function was used to describe the probability of rejection for each given offer by including the gender variable first and then by dropping it. The logistic regression model given below:

$$p(X) = 1 - \frac{\exp(\alpha + \beta X)}{1 + (\alpha + \beta X)}$$

Where, p is the probability of rejection and X is the offer amount, as a proportion of the total stake. The rejection behaviour of each sample then is described by two parameters α and β.

$$R = \phi \ (\alpha + \beta O + \gamma G) \qquad \text{with gender variable} \qquad \ldots \qquad \ldots \qquad \ldots \qquad (1)$$

$$R = \phi \ (\alpha + \beta O) \qquad \text{without gender variable} \qquad \ldots \qquad \ldots \qquad \ldots \qquad (2)$$

Where: ϕ denotes the Cumulative Density Function for the Standard Normal Distribution.

Where: R = Response of Responders to the proposed offers by the Proposers.

O = Offers made by Proposers to the Responders.

G = Gender of Proposers.

In this specification gender and response of the players were the dummies that take value "1" for female proposers and "0" for male proposers. Similarly, value "1" is also for the offers being accepted by the responders and "0" for the rejected offers.

The results of logistic regression Equation (1) given in Table 3 imply that the role of gender on responder's decision was insignificant. Also the test results do indicate that higher offer rate increases the probability of acceptance for a given offer (i.e., the

Table 3

Logistic Regression Model including Gender Variable

Variables	Round 1				Round 2				Round 3 & 4			
	Coefficient	S.E	Z -Stat	P-Value	Coefficient	S.E	Z-Stat	P-Value	Coefficient	S.E	Z-Stat	P-Value
Intercept (C)	−24.7334	6.3252	−3.9102	0.0001	−38.3047	11.3363	−3.3789	0.0007	−23.6378	4.3067	−5.4887	0.0000
Gender (G)	−1.8431	1.2025	−1.5328	0.1253	−2.3009	1.6320	−1.4099	0.1586	−1.0974	0.7365	−1.4899	0.1363
Offer (O)	0.7669	0.1897	4.0419	0.0001	1.1517	0.3422	3.3651	0.0008	0.6369	0.1101	5.7842	0.0000

coefficient of offers i.e. O = 0.7669). Therefore, the response of responder was not influenced by the gender of the players. In-fact there is no difference in rejections by gender—as both the sexes have the same behaviour regarding rejecting the unfair offers. Table 4, clearly showed that there is 100 percent rejection for all the offers below Rs 30 and all the offers above Rs 40 were accepted by both male and females.

Keeping the same phenomenon the logistic regression was also tested by dropping the gender variable from the model. Here, again the test results for Equation (2) given in Table 5 ascertain the results/estimates of the logistic Equation 3 with gender that higher the offer rate the higher will be the acceptance rate. Table 5 and Figure 2, where it was explained that the offer over Rs 40 were {having higher probability} always accepted and the offers below Rs 40 were always rejected.

Fig. 2. Logistic Regression Curve for Round 1
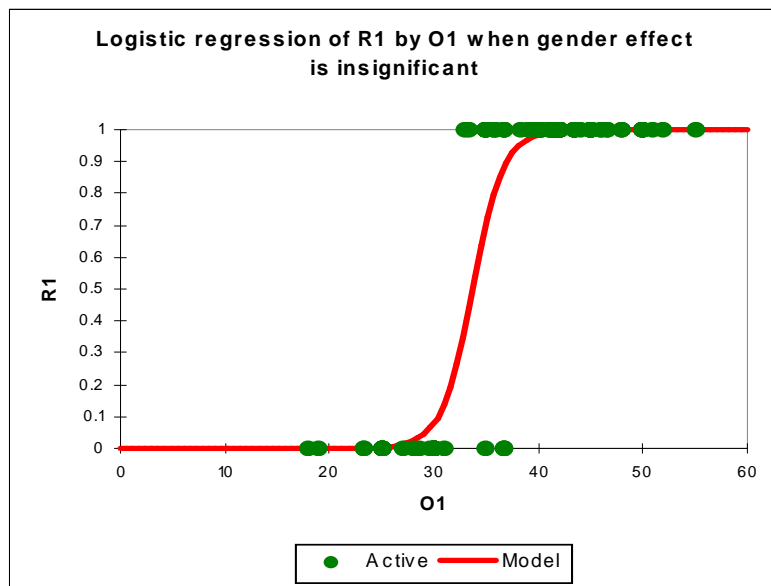
In short, the results of Round 1 do indicate that the pattern of offer for both male and female proposer was different from each other. Male proposers on average offered more than the female proposers; which was consistent with the results observed by Saad and Gill (2001). As Saad and Gill conducted a one shot UG and found that male offered more when paired with female players whereas, the female made equal offers independent of sex of the partner.

(ii) Round 2

The second round of experimentation was also carried out without the knowledge of gender to both the parties. But there was slight change of design that the male players were making offers to male players and female to female.[9] The game was played with complete anonymity on the part of both parties of players.

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[9]Experimenter was the only one who was well aware of the change in the design of experiment.

Table 4

Percentage Analysis for Acceptance and Rejection of Offers for Round 1

Offer Range		0 to 10	11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100	Sum
Overall Offers	Male	0.00	0.00	0.09	0.34	0.55	0.02	0.00	0.00	0.00	0.00	1.00
		(0/65)	(0/65)	(6/65)	(22/65)	(36/65)	(1/65)	(0/65)	(0/65)	(0/65)	(0/65)	
	Female	0.00	0.03	0.25	0.32	0.37	0.03	0.00	0.00	0.00	0.00	1.00
		(0/65)	(2/65)	(16/65)	(21/65)	(24/65)	(2/65)	(0/65)	(0/65)	(0/65)	(0/65)	
Accepted Offers	Male	0.00	0.00	0.00	0.34	0.55	0.02	0.00	0.00	0.00	0.00	0.91
		(0/65)	(0/65)	(0/65)	(22/65)	(36/65)	(1/65)	(0/65)	(0/65)	(0/65)	(0/65)	
	Female	0.00	0.00	0.00	0.26	0.37	0.03	0.00	0.00	0.00	0.00	0.66
		(0/65)	(0/65)	(0/65)	(17/65)	(24/65)	(2/65)	(0/65)	(0/65)	(0/65)	(0/65)	
Rejected Offers	Male	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
		(0/65)	(0/65)	(6/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	
	Female	0.00	0.02	0.25	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.34
		(0/65)	(2/65)	(16/65)	(5/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	

Table 5

Logistic Regression Model without Gender Variable

Variables	Round 1				Round 2				Round 3 and 4			
	Coefficient	S.E	Z-stat	P-value	Coefficient	S.E	Z-stat	P-value	Coefficient	S.E	Z-stat	P-value
Intercept (C)	–25.2654	6.1479	–4.1095	0.0000	–32.6848	8.9174	–3.6653	0.0002	–24.2138	4.2095	–5.7521	0.0000
O (Offer)	0.7481	0.1768	4.2327	0.0000	0.9523	0.2549	3.7360	0.0002	0.6309	0.1055	5.9782	0.0000

The overall average offer of male players was Rs 41.308 and by female players Rs 38.662 (Table 6). It was observed that out of 65 MM and 65 FF offer, 78 percent of the male and 69 percent of female offers were accepted. However, the average rejection in MM and FF offers were Rs 30.02 and Rs 27.70. This pattern of offers by proposers and responders in comparison to round 1 showed that the both the parties have realised that if they want to earn or want to gain any monetary benefit then they have to make some what fair offer i.e., close to Rs 40 and above as the offers below Rs 40 were mostly rejected by both the parties in round 1. The overall rejection rate in FF and MM offers were 31 percent and 22 percent respectively. A surprising aspect in round 2 was that the female players have shown a little tendency of making some what higher offers because the average offer rate has increased which resultantly decreased the rejection rate of the female offers as compared to round 1[10] but this increase in offer rate is statistically insignificant (Table 8). Conversely, the rejection rates for male offers have increased as compared to round 1.[11] While analysing the said behaviour it was revealed that in Round 1 there were 34 percent and 44 percent of the offers made by female and male players within the range of Rs 31–50 respectively. On the other hand, in Round 2 the offers made by female players for the range of Rs 31–50 increases to 37 percent whereas, the male offers decreases to 41 percent. Therefore, it is safe to say that females have learnt from their past experience and made higher offers and males reduced their offers in wrong anticipation of opponent's behaviour. Thus there was a convergence in behaviour— females increased their offers and males decreased their offers so that, in the second round, their was no significant difference in the male and female offers (unlike the first round).

Table 6

Descriptive Statistics for Round 2

Round 2 (Unknown Gender) Comparison of Offers (n=65)	Percentage		Mean	
	Accept	Reject	Accept	Reject
Female Offers to Female (FF)	69%	31%	Rs 43.49	Rs 27.70
Male Offers to Male (MM)	78%	22%	Rs 44.40	Rs 30.02

Table 7 shows the majority of the male and female offers were in the offer range (41 to 50), i.e. 49 percent (32/65) and 45 percent (29/65) of the pie for male and female proposers respectively with 0 percent rejection rate. The overall offers which have been accepted and rejected falls with in the range of 69 percent (45/65) (female accepted offers) and 78 percent (51/65) (male accepted offers), whereas, the rejection rate for male offers was 22 percent (14/65) and for female offers 31 percent (20/65).

During the interview session, it was concluded that the players have had a tendency to learn and coverage their offers to the average offers i.e. Rs 40 and above. This was also discovered that the players either male or female do not like to have an

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[10]In Round 1 female rejection rate was 34 percent and in Round 2 female rejection rate was 31 percent (Tables 4 and 6).

[11]In Round 1 male rejection rate was 9 percent and in Round 2 male rejection rate was 22 percent (Tables 4 and 6).

Table 7

Percentage Analysis for Acceptance and Rejection of Offers for Round 2

Offer Range		0 to 10	11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100	Sum
Overall Offers	Male	0.00	0.00	0.18	0.29	0.49	0.03	0.00	0.00	0.00	0.00	1.00
		(0/65)	(0/65)	(12/65)	(19/65)	(32/65)	(2/65)	(0/65)	(0/65)	(0/65)	(0/65)	
	Female	0.02	0.03	0.22	0.29	0.45	0.00	0.00	0.00	0.00	0.00	1.00
		(1/65)	(2/65)	(14/65)	(19/65)	(29/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	
Accepted Offers	Male	0.00	0.00	0.00	0.26	0.49	0.03	0.00	0.00	0.00	0.00	0.78
		(0/65)	(0/65)	(0/65)	(17/65)	(32/65)	(2/65)	(0/65)	(0/65)	(0/65)	(0/65)	
	Female	0.00	0.00	0.00	0.25	0.45	0.00	0.00	0.00	0.00	0.00	0.69
		(0/65)	(0/65)	(0/65)	(16/65)	(29/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	
Rejected Offers	Male	0.00	0.00	0.18	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.22
		(0/65)	(0/65)	(12/65)	(2/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	
	Female	0.02	0.03	0.22	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.31
		(1/65)	(2/65)	(14/65)	(3/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	(0/65)	

offer which is slightly unfair i.e. less than Rs 30. As majority of the offers below Rs 40 were rejected because the players feel it unfair.[12]

For detailed statistical analysis to examine the behavioural responses of the players, in this round of play pooled offer data was used. The results of K-S Test in Table 1 indicated that there were no differences in the distributional pattern of the offers among male and female players as the computed *p-value (p = 0.457)* was greater than the level of significance $\alpha = 0.05$. Also the computed value of *D = 0.138* was less than the critical value of *D = 0.175* at *n = 65*. Table 8 showed the results for the test of mean comparison also imply that the offer pattern of male and female did not differ systematically from each other. This behavioural pattern has been presented graphically in Figure 3 showing no variation in the offer pattern of male and females across this round. It was also explained that the average male and female offers in Round 2 were (41.308 and 38.662 respectively) insignificant to show any change in overall average offer pattern of male and female.
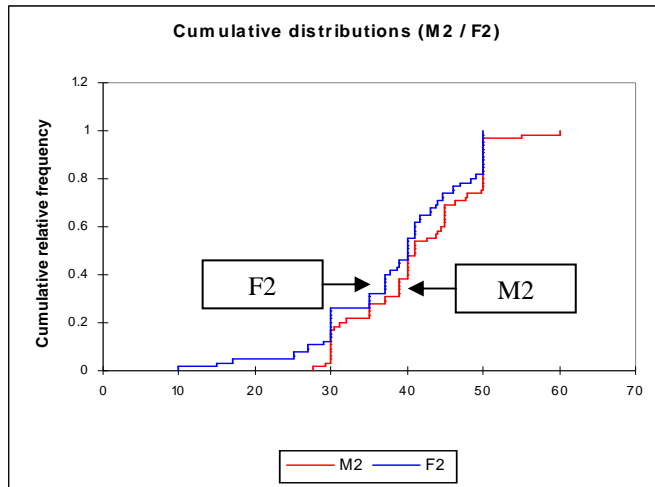
Table 8

Mean Comparison Analysis for Male and Female Offers in Round 2

Variable	Mean	N	SD	Assumptions	T-stat	P-value
F2	38.662	65	9.2505	Equal Variances	1.78	0.0775
M2	41.308	65	7.8281	Unequal Variances	1.78	0.0776

[12]See offer ranges in Tables 4 and 7 and Offer pattern in Figures 1 and 3. Also During the experimental analysis of gender effect it was interestingly observed that as in rounds 1 and 2 the knowledge of gender was not known to both the parties and when they were asked about their behaviour/prediction that what type of offers they were trying to offer to responders and from responders that what type of offers they were expecting and were ready to accept. Both the parties answered (almost 92 percent of the players) that they were trying and expecting such an offer which can made both of them better off so in this pursuit they preferred for fair play.

Fig. 3. Cumulative Distribution Curves for Male and Female Offers in Round 2

If we look at Tables 3 and 5 for the logistic regression results for the regression with and without gender variable to analyse the behaviour of the responders it was observed that still the role of gender was insignificant in affecting the responder's behaviour. The results of logistic regression were same as in Round 1 showing that as the offer rates were increasing acceptance rate for the given offers were also increasing. In contrast with Eckel and Grossman (2001), we find that there is no difference in rejection behaviour of males and females conditional on the offer received. However, since females received higher offers, they rejected less often in our experiment.

This behaviour of the players was presented graphically in Figure 4. Where it was obvious that as the offer rate was getting closer to Rs 40. The acceptance rate was gradually rising and after Rs 40 showing almost 100 percent acceptance rate. At Rs 30 and below, the rejection rate was 100 percent.

Fig. 4. Logistic Regression Curve for Round 2
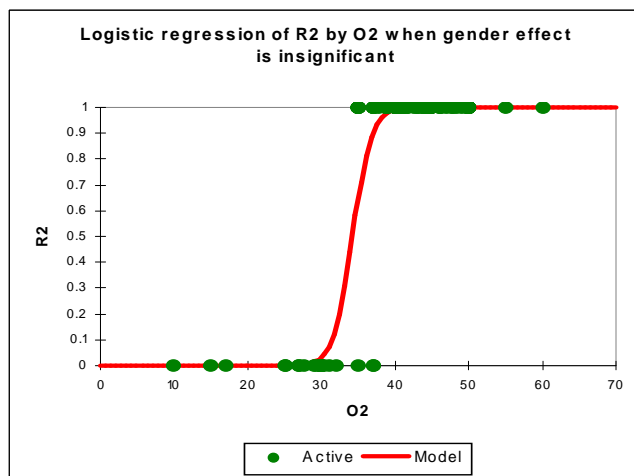
The results observed in Round 2 were consistent with the findings of Sutter, *et al.* (2006), Dufwenberg and Gneezy (2004) and Bolton and Katok (1995) in which they employed to play a two player dictator game[13] and found no differences in male and female offers. Similarly, we also found no differences in the offer pattern of male and female in Round 2 and conclude that in this Round of play male and female offers were same. As the structure of our study was based on the repeated games and the players were employed for the four sessions of real money play.
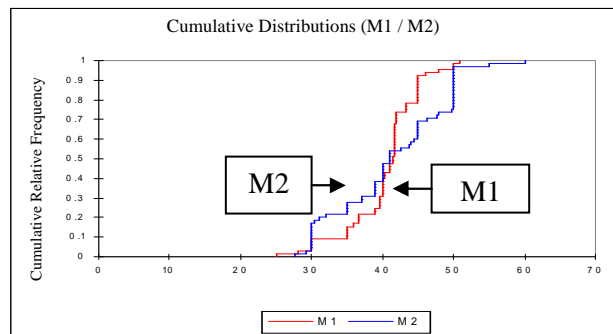
Comparison of Rounds 1 and 2

While comparing the male offers in Round 1 with male offers on Round 2 it was observed that the offer pattern of male players was not the same across the rounds as the K-S Test results for analysis male offers in Rounds 1 and 2 rejected the null hypothesis showing significant differences in the offer pattern of male players, because computed *p-value* was lower than $\alpha = 0.05$, also the computed value of *D (0.246)* was higher than the critical value of *D = 0.175* at *n = 65* (Table 9). This has been presented graphically in Figure 5. On the other hand, the comparative analysis of female offer pattern across both rounds (Round 1 and 2) we found no significant change in the offer pattern of females as the K-S Test results showed in Table 10 accepted the null hypothesis showing no differences in the offer pattern of female players in both these rounds (the computed *p-value = 0.614* is higher than the $\alpha = 0.05$ and also the computed D-value of *D = 0.123* is lower than the critical value of *D = 0.175* at *n = 65*). Graphically this behaviour is represented in Figure 6.
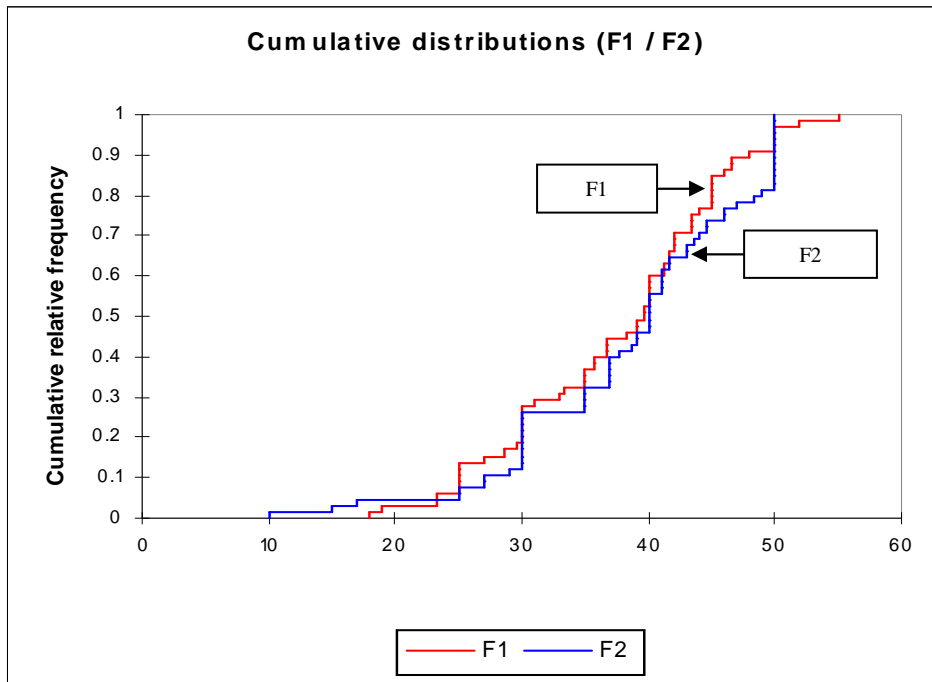
Table 9

Kolmogorov-Simrnov Test for Inter Round Gender Analysis

Variables	Two Sample Kolmogorov-Simrnov Test (Two Tailed Test)	
	M1 & M2	F1 & F2
D	0.246	0.123
P-value	0.023	0.614
Alpha (Level of Significance)	0.05	0.05

Fig. 5. Cumulative Distribution Curves for Male Offers in Rounds 1 and 2

[13]The structure of game for Bolton and Katok (1995) and Eckel and Grossman (2001) were same.

Fig. 6. Cumulative Distribution Curves for Female Offers in Rounds 1 and 2

The mean comparison for male offers in Round 1 and male offers in Round 2 also gave a clear indication that on average there were no significant differences among the male and female offers across rounds (Tables 10 and 11).

Table 10

Mean Comparison Analysis for Male Offers in Rounds 1 and 2

Variable	Mean	N	SD	Assumptions	T-stat	P-value
M1	40.492	65	5.0563	Equal Variances	–0.71	0.4818
M2	41.308	65	7.8281	Unequal Variances	–0.71	0.4820

Table 11

Mean Comparison Analysis for female Offers in Rounds 1 and 2

Variable	Mean	N	SD	Assumptions	T-stat	P-value
F1	37.538	65	8.5697	Equal Variances	–0.72	0.4740
F2	38.662	65	9.2505	Unequal Variances	–0.72	0.4740

Rounds 3 and 4

The most distinctive point in both these rounds was that the players were having the complete knowledge of gender as both parties (proposers and responders were seated in-front of each other). Therefore, we have tried to make analysis of the results when the males were proposers and females were responders with results when the females were

proposers and males were responders. We combined all the offer data of all the experimental locations and tried to figure out how behavioural patterns of players changes or affected by the knowledge of gender.

In round 3, when males were making offers to female players the acceptance rate was 93 percent and the average of accepted offers was Rs 50.80. Here, the male proposers have shown a strong tendency of offering more than even split of the money because 30 percent of the offers made were above Rs 50. This clearly showed that the behaviour of male players has changed considerably in comparison to rounds 1 and 2. As there was 68 percent of the male offers made with in the range of Rs 40 to 50. However, in round 4 female players were the proposers and the male players were responders and the behaviour of female players was quite different from previous two rounds. The tendency of offering more than Rs 50 was as low as 3 percent of the offers to male players. However, there is high proportion of female offers in the range of Rs 40 to 50 (even split of money) i.e. 90 percent. The overall average of accepted female offers was Rs 45.37 which was less than the male offers in round 3. Similarly, 74 percent of the female offers in round 4 were accepted by male players and 26 percent were rejected. It was observed that all the offer below Rs 45 were rejected by male players as the average of accepted offers was Rs 45.37 (Tables 12 and 13). During investigation it was found that males were expecting the same altruistic behaviour from females in round 4 but the females were more sensitive to fair play therefore males retaliated and rejected all the offers which were slightly unfair offers i.e., Rs 40 and below. From our interviews, it is clear that this is due to local cultural norms, which differ from those, prevalent in the Western cultures studied.

Table 12

Descriptive Statistics for Rounds 3 and 4

Rounds 3 and 4 (Known Gender) Comparison of Offers (n=130)	Percentage		Mean	
	Accept	Reject	Accept	Reject
Male Offers to Female in R 3 (MF)	93%	7%	Rs 50.58	Rs 31.33
Female Offers to Male in R 4 (FM)	74%	26%	Rs 45.37	Rs 35.25

Table 13

Percentage Analysis for Acceptance and Rejection of Offers for Rounds 3 and 4

Offer Range		0 to 10	11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100	Sum
Overall Offers	M	0.01	0.00	0.02	0.10	0.58	0.22	0.05	0.02	0.01	0.01	1.00
		(1/130)	(0/130)	(2/130)	(13/130)	(76/130)	(28/130)	(6/130)	(2/130)	(1/130)	(1/130)	
	F	0.00	0.00	0.07	0.32	0.58	0.03	0.00	0.00	0.00	0.00	1.00
		(0/130)	(0/130)	(9/130)	(41/130)	(76/130	(4/130)	(0/130)	(0/130)	(0/130)	(0/130)	
Accepted Offers	M	0.00	0.00	0.00	0.05	0.58	0.22	0.05	0.02	0.01	0.01	0.93
		(0/130)	(0/130)	(0/130)	(7/130)	(76/130)	(28/130)	(6/130)	(2/130)	(1/130)	(1/130)	
	F	0.00	0.00	0.01	0.15	0.55	0.03	0.00	0.00	0.00	0.00	0.74
		(0/130)	(0/130)	(1/130)	(19/130)	(72/130)	(4/130)	(0/130)	(0/130)	(0/130)	(0/130)	
Rejected Offers	M	0.01	0.00	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.07
		(1/130)	(0/130)	(2/130)	(6/130)	(0/130)	(0/130)	(0/130)	(0/130)	(0/130)	(0/130)	
	F	0.00	0.00	0.06	0.17	0.03	0.00	0.00	0.00	0.00	0.00	0.26
		(0/130)	(0/130)	(8/130)	(22/130)	(4/130)	(0/130)	(0/130)	(0/130)	(0/130)	(0/130)	

Here, it can be seen that male have made much higher offers to female players. Therefore, it was obvious that acceptance rate was also high and rejection rate was low. But in response to high offers the female players have not made high offers which the male players were expecting. The female players have not deviated from their over all offer pattern and made the offers in the corridors of even split of money. In response, male players rejected all the offers which were below Rs 45. Comparing the results of both 3rd and 4th round it can be concluded that there has been strong reciprocal effect from the male side by not accepting any offer below Rs 45.

The results of K-S test (Table 1) showed that the null hypothesis of no-difference in male and female offers was rejected, as the computed P-value was lower than the level of significance also the computed value of *D=0.331* was higher than the critical value of *D=0.1193* at *n=130*. Therefore, we can conclude that distribution of male and female offers were statistically different from each other. This has also been explained graphically (Figure 7). In Figure 7, it was quite clear that the offer curves for both male and female proposers have no resemblance and they were showing different pattern of offers. As far as the females are concerned, offers starting from the range of Rs 20 to 30 and it ended up to Rs 50 where as the male offer curve started from the Rs 0 to 20 and ended at Rs 100. The spread of male offers was wider than the female offers as majority of the female offers were clustering within the range of Rs 30 to 50, where as, the majority of the male offers were clustering within the range of Rs 40 to 60 but still there were few outliers (extreme offers very rarely observed) like the offer of Rs 10 and Rs 100.

Results of the test for mean comparison showed that on average male players were offering move as compared to female players i.e. *average male offer = 49.462 and average female offer = 42.746*. These results were also statistically significant to reject the hypothesis of no difference in male and female offers on average and it can clearly be interpreted that distributional gap in the offer behaviour of proposer exist in both rounds 3 and 4 (Table 14). These results are in contradiction with the findings of Solnick (2001), Eckel and Grossman (2001), Dufwenberg and Muren (2005) and Botelho, *et al.* (2000) in which it was found that females on the average gave more to males.

Fig. 7. Cumulative Distribution Curves for Male and Female Offers in Rounds 3 and 4
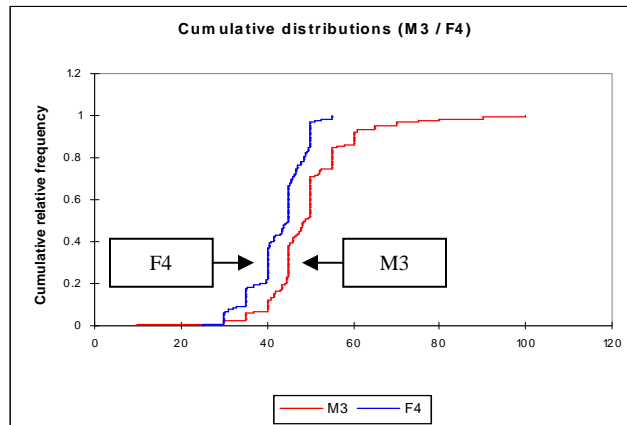
Table 14

Mean Comparison Analysis for Female Offers in Rounds 3 and 4

Variable	Mean	N	SD	Assumptions	T-stat	P-value
M3	49.462	130	10.477	Equal Variances	6.29	0.0000
F4	42.746	130	6.1887	Unequal Variances	6.29	0.0000

It was observed that the results of logistic regression model (with and without gender variable) showed insignificant gender influence. Also the propensity of accepting higher offers was still their, means as the offer rate was increasing the probability of accepting the offer was also increasing (Tables 3 and 5). This same behaviour was also represented graphically in Figure 8 given below.

Fig. 8. Logistic Regression Curve for Rounds 3 and 4
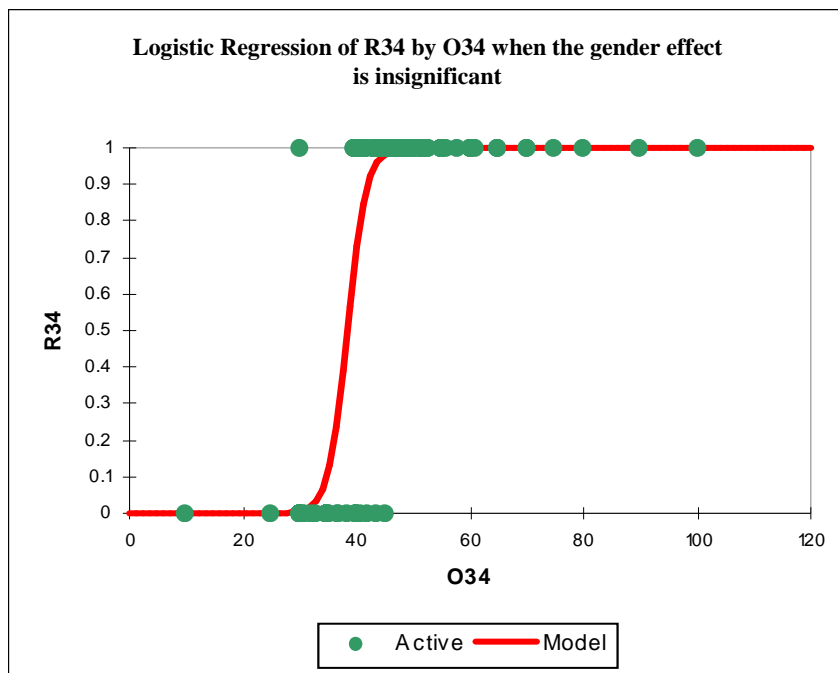
Hence, it was concluded that distribution gap in the responder's behaviour for a given offer were present. Moreover, the behavioural pattern of offering high was triggered by the knowledge of gender as both male and female proposers started offering more as compared to their average offers in Rounds 1 and 2. The effect of gender knowledge was more dominant on the male offers and almost more than 50 percent of the pie was offered. Whereas, the female offers were increased but not more than 50 percent of the pie. Such type of behaviour has not been observed in the literature. The modal (most common and ideal) offer according to ultimatum game theory was 50-50 percent of the pie [Camerer (2003)] and the results of this study support this argument.

Comparison of Pooled Offers of Rounds 1 and 2 with the Offers of Rounds 3 and 4

In order to have a detailed comparison of offer pattern for all the rounds of play with and without the knowledge of gender, the offer data for rounds 1 and 2 was pooled and was then compared with the offer data of rounds 3 and 4.

Table 15

Kolmogorov-Simrnov Test for Distributional Analysis for
Pooled Data of Rounds 1 and 2 with Rounds 3 and 4

Variables	Two Sample Kolmogorov-Simrnov Test (Two Tailed Test)
D	0.3654
P-value	7.6071 E-16
Alpha (Level of Significance)	0.05

Here, the K-S test results given in Table 15 clearly reject the hypothesis that both the distribution with gender and without gender knowledge was significantly different. As the computed *p-value* was lower than the significance level and along with that the computed value of *D=0.3654* was higher than the critical value of *D=0.1193*. Hence, it can easily be derived that there were significant differences in the pattern of offers across rounds.

The results also explained the fact that the range where there was high probability of acceptance was (40–60) percent of the pie. The logistic curves presented in Figures 2, 4 and 8 showed that majority of the offers were clustering within the said range of offers. Although, there were few offers which were over 60 percent of the pie with almost 100 percent acceptance rate (as per the ultimatum theory)[14] and there was high rejection rate for the offers below 40 percent of the pie.

CONCLUSION

This study reports the results of a series of experiments designed and conducted to determine the behavioural pattern of people in Pakistan. Unlike many previous studies, we found male offers to be more generous then female offers. Also, knowledge of gender increases the average offer in both MF (Male to Female) and FM (Female to Male) pairs. In particular, males offered more than 50 percent to females in about 30 percent of the cases, whereas this never occurred in female offers to males. Pakistani cultural norms of chivalry and courtesy towards females lead males to make hyperfair offers, and also to expect reciprocity. However, females are trained not to respond to overtures by males, and do not change behaviour. Males expect to be rewarded for high offers, and do not receive this reward and hence reject much more often than they do in earlier rounds[15]. The results of this paper are in contradiction with the evidence that females are more generous than the males [Andreoni and Vesterlund (2001); Eckel and Grossman (2001)]. It was also observed that in this particular study that the males displayed a rather severe reaction for unfair offers.

[14]For detail survey analyses see Camerer (2003) and Roth (1995).
[15]See Tables 13 and 14 offer and rejection pattern of male and female players in Rounds 3 and 4.

Cultural norms differ in Pakistan and Western societies. In West, women can make generous offers to males without being seen as forward or flirtatious. In Pakistan a girl offering more than 50 percent to a boy would be mis-understood as being forward. The third and fourth rounds showed the strong impact of reciprocity. Hyperfair offers by males were not reciprocated by females, and men retaliated by higher rejections. One important finding of this study was that the players did not show any fear of rejection while making their offers, as the male and female players during interviews explained that if they were having any concern for the fear of rejection of their offers they would defiantly offer much more in the other rounds of play. Therefore, we can conclude that the behaviour of the people of Pakistan is in contradiction with the conventional economic thinking [Eckel and Grossman (1996)].

APPENDIX-I

The Kolmogorov-Smirnov test compares two distributions. This test is used for distribution fitting tests for comparing an empirical distribution determined from a sample with a known distribution. It can also be used for comparing two empirical distributions [Massey (1951)].

Note: This test enables the similarity of the distributions to be tested at the same time as their shape and position.

Take sample *S1* comprising *n1* observations, with *F1* the corresponding empirical distribution function. Take second sample *S2* comprising *n2* observations, with *F2* the corresponding empirical distribution function.
The null hypothesis of the Kolmogorov-Smirnov test is defined by:

H0 : F1(x) = F2(x)

The Kolmogorov statistic is given by:
D1 is the maximum absolute difference between the two empirical distributions. Its value therefore lies between 0 (distributions perfectly identical) and 1 (separations perfectly separated). The alternative hypothesis associated with this statistic is:

Ha: F 1(x)? F 2(x)

The Smirnov statistics are defined by:
The alternative hypothesis associated with *D2* is:

Ha : F1(x) < F 2(x)

The alternative hypothesis associated with *D3* is:

Ha : F1(x) > F 2(x)

APPENDIX-II

QUESTIONNAIRE

(ROUND #_____   ID # _____)

1. NAME   _____

2. EDUCATIONAL QUALIFICATION _____

3. MARTIAL STATUS (MALE/FEMALE)_____

4. AGE   _____

5. SALARY/POCKET MONEY (MONTHLY) Rs _____

6. NATIVE CITY / VILLAGE _____

7. **For Proposer**

    Have you made your offer/decision on the basis of: (Tick as appropriate)

    - You Like Fairness
    - You are afraid of Rejection
    - You are kind enough to others (Altruistic)
    - Any other reason explain briefly.

8. **For Responder**

    Have you made your decision [**] on the basis of: (Tick as appropriate)
    - You Like Fairness
    - You are kind enough to others (Altruistic)
    - As a Reaction (Reciprocation)
    - Any other reason explain briefly

**= your decision (Accept/Reject) Offer.

APPENDIX-III

<table>
<tr><td align="center"><u>**DECISION SLIP**</u></td></tr>
<tr><td align="center">**Round # _____   For Rupees _____**</td></tr>
<tr><td align="center">**P1 ID #_____   P1 Offer _____**</td></tr>
<tr><td align="center">**P2 ID # _____   P2 Decision (A/R)**</td></tr>
<tr><td align="center">**   A= Accept   R= Reject**</td></tr>
</table>

APPENDIX-IV

Abbreviations

M1	–	Offers by male proposers in Round-1
M2	–	Offers by male proposers in Round-2
M3	–	Offers by male proposers in Round-3
F1	–	Offers by female proposers in Round-1
F2	–	Offers by female proposers in Round-2
F4	–	Offers by female proposers in Round-4
R1	–	Offers rejected in Round-1
R2	–	Offers rejected in Round-2
R3	–	Offers rejected in Round-3
R4	–	Offers rejected in Round-4
R34	–	Offers rejected in Rounds-3 and 4
O1	–	Offers made in Round-1
O2	–	Offers made in Round-2
O3	–	Offers made in Round-3
O4	–	Offers made in Round-4
O34	–	Offers made in Rounds-3 and 4
M	–	Male Offers
F	–	Female Offers

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Wastewater Use in Cauliflower Production and Farmer's Health: An Economic Analysis

SHAHZAD KOUSER, ABEDULLAH, and ABDUS SAMIE

The present study aims to estimate the economic values of negative externalities of wastewater use in cauliflower production. Cost-benefit analysis is employed to estimate the farmer's health externalities in the production sector. The data are collected from 200 farmers (100 from each group, wastewater and freshwater) in the year 2006 from two peri-urban villages of Faisalabad city. Ignoring the value of negative externalities, wastewater use is profitable in vegetable production but when the economic value of negative externalities are factored in the analysis, the results strongly discourage its use. The cost of health externalities due to wastewater use in cauliflower production (only for a three-month crop) is Rs 3.2 million from the 741 acres planted. In Faisalabad, 5,283 acres of vegetables are cultivated using wastewater, and the value of total negative health externalities amounts to Rs 90.7 million in a year. A huge economic loss due to wastewater use may attract the attention of policy agents to intervene. Among different available options, installation of a water treatment plant appears to be most viable to minimise the external effect of wastewater use in peri-urban agriculture.

JEL classification: Q25, O13

Keywords: Cauliflower, Wastewater, Freshwater, Externalities, Health Damages, Cost-benefit Analysis

1. INTRODUCTION

The demand of water for household, commercial, industrial, and agricultural purposes has increased remarkably all over the world. The population of Pakistan was 136 million in 1998 [Population Census Organisation (2001)] and is expected to double by 2025. Population and income growth will further boost the demand of water in multifarious sectors and it will lead to severe water stress in the near future [Seckler, *et al.* (1998)]. Growing water scarcity is threatening economic development, sustainable human livelihoods and environmental quality [Scott, Faruqui, and Sally (2004)]. At the same time, due to increased industrialisation, the generation of wastewater will also increase leading to more opportunities for expanding vegetable production on wastewater in peri-urban belts.

Due to increasing pressure on water demand, planners are continually searching for new sources of water that can be used economically and effectively to cope with development process. The use of urban wastewater in agriculture is a centuries-old practice that is receiving renewed attention with the increasing scarcity of freshwater resources in many arid and semiarid regions of the world [Ensink, *et al.* (2004)]. It supports livelihoods

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and generates considerable value in urban and peri-urban agriculture despite the human health, crop productivity and environmental risks associated with this practice [WHO (1989); Pescod (1992); USEPA (1992) and Van der Hoek, *et al.* (2002)]. It is estimated that one-tenth or more of the world's population consumes food produced on land irrigated with wastewater [Smit and Nasr (1992)]. As population continues to grow—the use of wastewater is certain to increase, both in terms of areas irrigated, and volumes applied.

Some form of treatment is needed to meet the water quality standards that are set by international organisations and national governments. A wide range of wastewater treatment methodologies currently exist that can remove all harmful pathogens and other pollutants to make it safe for agriculture and even for domestic use [Von Sperling and Fattal (2001)]. Rudimentary treatments can be adapted to crops that are not consumed by humans, while sophisticated type of treatment is required for unrestricted use [Haruvy (1997)]. However, wastewater treatment method recommended for hot climates is a system of wastewater stabilisation ponds [Mara (2000)]. Most of the developing countries are facing severe financial constraints and thus using wastewater without any kind of treatment for agriculture purpose.

Peri-urban vegetable production is a major user of untreated wastewater in agriculture sector of Pakistan. Nothing is wrong to use treated wastewater because it is profitable even after internalising the cost of externalities [Haruvy (1997)] but there are serious concerns in apply untreated wastewater in vegetable production. Untreated wastewater is not only affecting productivity of agricultural labourers by increasing the probability of getting sick but it also affects the soil productivity in the long run. Further it is affecting the quality of ground water by leaching nitrate and other pollutants from agricultural fields and is also multiplying the expenditures on medical treatment for the poorer of the poor. In order to shift this group above the poverty line Government not only have to take measures to increase their agricultural productivity but also have to provide conducive environment to reduce non-productive expenditures (medical) by improving physical infrastructure.

The story of negative externalities of wastewater is not ending here yet because it also affects the environment and the health of consumers using vegetables grown with untreated wastewater. However, present study did not deal with consumption and environmental related externalities under the assumption that almost all Pakistani eat food after cooking at a very high temperature and majority of the pathogens are either died or became ineffective by cooking at such a high temperature. Secondly, it is difficult for the consumers to differentiate vegetables grown with wastewater and freshwater. Hence, it is extremely hard to identify the consumers who are using vegetables daily grown with wastewater because source of supply of vegetables to the consumers is changing on everyday basis. The data on environmental pollution related variables is not available especially for our study area and therefore, cost of environmental damages of untreated wastewater use is also not included in the analysis.

The costs of health damages of untreated wastewater have not yet been estimated in Pakistan and present study is attempting to fill this information gap by estimating it in terms of loss in earnings, and medical treatment costs.

The rest of the paper is organised as follows. Section 2 delineates the empirical model and discusses the data collection procedure. Section 3, derive the results that are useful to understand the cost of externalities of wastewater use in cauliflower production and it also facilitates the reader's approach to understand the issue of negative externalities of wastewater use in vegetable production. Final section summarises the discussion and recommends policy suggestions based on empirical findings.

2. EMPIRICAL MODEL AND DATA COLLECTION PROCEDURE

2.1. Valuing Benefits and Losses of Wastewater Use in Cauliflower Production

Different types of production function are available to study input-output relationship but Cobb-Douglas (beside its restrictive properties) is more popular and commonly used to study such relationship in the agriculture sector. Hence, the Cobb-Douglas type of production function is employed here and it can be written as follow;

$$Y = AF^{\alpha_1} S^{\alpha_2} L^{\alpha_3} P^{\alpha_4} I^{\alpha_5} E^{\alpha_6} e^{\alpha_7 D_1 + \alpha_8 D_2 + \alpha_9 D_3} + \mu \qquad \ldots \qquad \ldots \qquad \ldots \quad (1)$$

Where

Y = Yield of cauliflower in Kg.
A = Intercept of the model.
F = Fertiliser nutrients in kg per acre (total of N, P and K).
S = Total quantity of seed in kg.
L = Total quantity of labour in hours.
P = Pesticide cost in Rupees per acre.
I = Hours of Irrigation (proxy for the amount of water).
E = Level of education of household head (Proxy for management).
D_1 = Dummy for variety ('1' for early and local variety in wastewater and freshwater areas, respectively and '0' otherwise).
D_2 = Dummy for soil type ('1' for high productive soil and '0' otherwise).
D_3 = Dummy for seed source ('1' for home made seed and '0' otherwise).
μ = Stands for random shocks.

In the above equation α_1, α_2, α_3, α_4, α_5, α_6 are the partial production elasticities and α_7, α_8, α_9 are the coefficients of dummy variables. It is worth noting that in both groups (wastewater and freshwater areas) farmers are growing two varieties of cauliflower but difference in sowing method (transplanting and dibbling) is only observed in freshwater area. Difference in sowing method in freshwater area is mainly depending on variety (local or imported). If farmers are growing local variety then they use transplanting technique, otherwise they employed dibbling method. Therefore, difference in sowing method in freshwater area can be captured by using the dummy for variety. Two varieties (late and early) in wastewater area differs in terms of sowing time but not in terms of sowing methods and therefore, dummy for variety in wastewater area stands for difference in sowing time. To capture the variation in soil types dummy for soil is introduced for both wastewater and freshwater areas. High productive soil includes sandy loam soil and less productive restrains loamy and sandy soil.

A three stage estimation technique suggested by Just and Pope (1978) was employed to obtain unbiased parameters of production function in both wastewater and freshwater areas. The results of third stage in estimation technique are used to estimate the predicted yield of two groups (wastewater and freshwater areas) by using Equation 1. The variation in yield due to difference in input use and management factors has been captured through production function and the remaining variation is purely due to difference in quality of water (wastewater or freshwater) and random shocks. Under the assumption that random shocks are similar in both wastewater and freshwater areas (because respondents who have been selected from both wastewater and freshwater areas are close to each other) therefore, it is reasonable to assume that difference of variation in yield of two groups is mainly due to difference in quality of water. The difference in revenue (predicted yield × price) could be referred to the contribution or loss of wastewater use in vegetable production but there is a difference in costs of production in two groups. Hence, the difference of net profits of two groups should be referred to the contribution or loss of wastewater use in cauliflower production and per acre average net benefit of wastewater use is estimated as given below.

$$NB_w = NVO_w - NVO_f = \frac{\sum_{i=1}^{N} \left(P_{wi} \dot{Y}_{wi} - C_{wi} \right)}{N} - \frac{\sum_{j=1}^{M} \left(P_{fj} \dot{Y}_{fj} - C_{fj} \right)}{M} \qquad \ldots \qquad \ldots \qquad (2)$$

Where

NVO_W = Average per acre net profit of cauliflower with wastewater use.

NVO_f = Average per acre net profit of cauliflower with freshwater use.

$\dot{Y}_{fi}$ = Predicted yield per acre of *i*-th farmer with wastewater use.

$\dot{Y}_{fj}$ = Predicted yield per acre of *j*-th farmer with freshwater use.

P_{wi} = Price of cauliflower of *i*-th farmer in wastewater area.

P_{fj} = Price of cauliflower of *j*-th farmer in freshwater area.

C_{wi} = Per acre cost of cauliflower production (cost of inputs and wastewater) of *i*-th farmer in wastewater area.

C_{fj} = Per acre cost of cauliflower production (cost of inputs and freshwater) of *j*-th farmer in freshwater area.

The subscripts "*i*" and "*j*" stand for the *i*-th and *j*-th farmer in wastewater and freshwater areas, respectively while "*N*" and "*M*" represents the total number of observations in each group, respectively. The difference of net economic benefit of two groups (NB_w) is called the per acre average net benefits of wastewater use without incorporating the cost of externalities. The emphasis of this study is to incorporate the cost of health externalities in cost-benefit analysis and therefore, first of all it is required to explain how the external cost of health is estimated.

2.2. Economic Value of Labour Productivity Loss

There could be potential risk of disease(s) with wastewater irrigation. Illnesses caused by wastewater pathogens may result in:

- loss of potential earnings; and
- medical costs.

Loss of potential earnings or labour productivity is evaluated by using opportunity cost principle. These losses are quantified in economic terms by using the information on prevalence of disease (number of sick days, full-time or part-time work due to sickness or off-work, generally called restricted activity days in literature) and daily wage rate. Wastewater irrigation creates different kinds of diseases and the value of labour productivity losses (VLPL) due to theses diseases (in both wastewater and freshwater area) is estimated. Annual productivity loss of unemployed and underemployed sick individuals is estimated by employing the equation discussed below;

$$VLPL = (SD*WR*Prob*TP)_P + ... + (SD*WR*Prob*TP)_Q \quad ... \qquad ... \quad (3)$$

Where

SD = Average number of sick days.
WR = Average wage rate in the study area.
$Prob$ = Probability of getting P-th disease.
TP = Total population in a given community or study area.
Q = Total number of diseases attributed to wastewater use i.e. from $P=1$ to Q.

Medical or healthcare costs and inconvenience costs of wastewater use in cauliflower production should be added to obtain total costs of health related illnesses. The medical costs include, the cost of medical consultation(s), cost of medication, transport cost, cost of defensive expenditure (continued use of medicine, protective measures etc., to avert the disease risk in future) and any other out of pocket illness related expenses. The private treatment cost can be used as proxy (opportunity cost) for medical costs because public healthcare is highly subsidised in Pakistan.

Annual loss of money value due to medical expenditures (*VMEL*) for both wastewater (*VMEL_w*) and freshwater growers (*VMEL_fr*) is calculated as follows:

$$VMEL = (CC+MC+TC+PC+OC)_R (Prob*TP)_R + ... +$$
$$(CC+MC+TC+PC+OC)_S (Prob*TP)_S \quad ... \qquad ... \qquad ... \quad (4)$$

Where

CC = Average cost of medical consultation in the sample.
MC = Average cost of medicine in the sample.
TC = Average transport cost in the sample.
PC = Average preventive cost in the sample.
OC = Average other costs in the sample.
$Prob$ = Probability of being affected from a certain diseases.
TP = Total population in a given community or study area.
S = Total number of diseases attributed to wastewater use, i.e., from R=1 to S.

2.3. Cost-benefit Analysis after Internalising the Cost of Externalities

Per acre per crop Average Cost of Health Damage (*CHD*) due to wastewater use in cauliflower production is estimated as follows,

$$CHD_w = \frac{\left(NLPL_w + NMEL_w\right)}{Total\ wastewate\ area\ in\ the\ sample} \qquad \dots \qquad \dots \qquad \dots \qquad (5)$$

Where, $NLPL_w$, $NMEL_w$ are Net Labour Productivity Loss and Net Medical Expenditure Loss, respectively due to wastewater use in vegetable production and on per crop basis it is estimated as defined below:

$$NLPL_w = \left(\frac{VLPL_w}{4} - \frac{VLPL_f}{3}\right) \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (6)$$

Where, $VLPL_w$ and $VLPL_f$ are values of labour productivity loss of wastewater and freshwater vegetable growers, respectively and are estimated by implying Equation 3 for both wastewater and freshwater growers separately. On an average farmers are growing four vegetable crops in wastewater and three crops in freshwater area in a year and therefore, we have divided $VLPL_w$ and $VLPL_f$ by four and three, respectively because these costs are estimated on per annum basis but our crop productivity analysis is only for one crop (cauliflower) season. That is why it important to maintain the same period of analysis in production and externalities. Net Medical Expenditure Loss due to wastewater use ($NMEL_w$) in cauliflower production is estimated by employing equation as given below.

$$NMEL_w = \left(\frac{VMEL_w}{4} - \frac{VMEL_f}{3}\right) \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (7)$$

Where, $VMEL_w$ and $VMEL_f$ are values of medical expenditure loss for wastewater and freshwater growers, respectively and are estimated by implying Equation 4 for both wastewater and freshwater growers, separately. Here, we have again divided $VMEL_w$ and $VMEL_f$ by 4 and 3, respectively due to the reasons discussed above in labour productivity loss.

Finally, per acre per crop Net Benefit (Loss) of wastewater use (NB_{WE}) after internalising the Cost of Health Externalities (CHD_w) in cauliflower production is estimated with the help of Equation 8 given below.

$$NB_{WE} = NB_w - CHD_w \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (8)$$

Where, NB_w and CHD_w are respectively, average net benefit of wastewater use without internalising the health externalities and average cost of health damages (or health externalities) with wastewater use in vegetable production. They are estimated by employing Equations 2 and 6, respectively.

2.4. Sample Data

Stratified random sampling approach is adopted to collect input-output data from two strata (wastewater and freshwater). The input-output data from 100 cauliflower

growers in each stratum (wastewater and freshwater) is randomly collected in 2006 from two villages Chakera and Chak No. 4, respectively of Faisalabad city in summer season. These two villages are representative of cauliflower production in wastewater and freshwater areas, respectively. The data on different kinds of sickness and number of days of sickness is also collected from each stratum which is used to estimate the probability of sickness from a particular disease in each stratum (wastewater and freshwater). The detail of medical expenditure on different kinds of sickness is also collected from two groups which allowed us to estimate the total expenditure to get medical treatment for each kind of sickness. The reliability of treatment costs is cross checked by asking expenditure details of different sicknesses from medical doctors. In majority of the cases we observed that information given by farmers are reliable and matches with doctor's perception and where it was not there we took the cost of treatment given by the doctor. This information is used to estimate the cost of health damages for both groups which made it possible to estimate the external cost of wastewater use.

However, it should be noted that the impact of wastewater use on consumer's health has not been considered in the present study because it required laboratory test and more detailed information from consumers which is little expansive to collect and arrange. Due to resource constraints it is decided to exclude it from the analysis. Secondly, we are eating vegetables after cooking at a very high temperature and most of the pathogenic organisms which are dangerous for health die at such a high temperature. Therefore, it is hard to capture the cost of externalities of wastewater use on consumer's health.

3. RESULTS AND DISCUSSIONS

Mean values of different inputs and outputs on per acre basis for two groups (wastewater and freshwater users) are estimated and results are reported in Table 1. A small number of farmers (10–15 percent) used farmyard manure in freshwater area but in wastewater area no farmer observed doing this practice, indicating that wastewater is a substitute for farmyard manure. Farmyard manure is converted into nutrient nitrogen or N[1]. It is evaluated based on the average market price of N assuming that if farmers would have to supply that amount of N from Urea, then they have to pay the market price for it. Average dose of fertiliser nutrients (nitrogen and phosphorous) used by farmers in cauliflower production in freshwater area is 134.5 kg per acre which is significantly higher compared to the amount of nutrients (39.3 kg per acre) in wastewater area because huge amount of nutrients includes in wastewater [wastewater contains 39 percent more nitrogen than the recommended level set by WHO, Ensink, *et al*. (2002)]. It clearly indicates that wastewater works as a substitute of fertiliser and helps to save Rs 3170 per acre for wastewater growers due to less use of chemical fertiliser. Average level of seed in freshwater area is 0.7 kg per acre while in wastewater area it is 0.9 kg per acre which is significantly higher compared to freshwater area. In freshwater area majority of the farmers are purchasing seed from the market while in the wastewater area almost all farmers use home produced seed. The higher amount of seed in wastewater area might be due to lower rate of seed germination in wastewater compared to freshwater area or home produced seed has lower probability of

[1]One ton of farmyard manure generates 10 kg of active nutrient of Nitrogen [Ali (1996)].

germination compared to the market purchased seed. Average labour use in freshwater area is 120 hrs per acre while in wastewater area it is 135 hrs per acre. The labour used in wastewater is slightly higher because wastewater farmers have to plant nursery for cauliflower and also do hoeing practices. Further, farmers in wastewater area face more severe problems of weed due to untreated irrigation water which require more labours to manage the fields. Average irrigation hours in fresh and wastewater areas are 29 and 11 hours per acre, respectively, implying that intensity of wastewater flow is very high compared to freshwater. That is why wastewater farmers require less time to irrigate their fields compared to freshwater users. This implies that wastewater users reduce their costs in two ways, (i) they pay less price for each hour of irrigation compared to freshwater users, (ii) due to high intensity of wastewater flow compared to freshwater, wastewater users required fewer hours to irrigate their fields which lead to reduction in their costs of irrigation and labour. Moreover, timely and surplus availability of wastewater allows farmers to grow more number of crops compared to freshwater growers and they are also enjoying high prices because they are selling a larger part of their crop early in the season. Average pesticide costs in both fresh and wastewater areas are Rs 525 and Rs 1227, respectively, implying that amount of pesticide used in wastewater area is significantly higher compared to freshwater area.   The high pesticide costs of wastewater users are due to high cropping intensity and favourable environment for pests to grow. After having information about early harvest and significantly higher amount of pesticide use in wastewater area, consumers need to avoid consuming early cauliflower because toxic chemicals in pesticide could be extremely hazardous for health. Average land rent in fresh and wastewater areas are Rs 10520 and Rs 15610, respectively. Per acre rent of land for wastewater area is significantly higher compared to freshwater area because of high cropping intensity (due to reliable supply of wastewater), cheaper and more nutritious supply of water in the area. Mean predicted yield (i.e., after capturing the impact of different level of input use and management factors) of cauliflower in fresh and wastewater areas is 8975 and 8659 kg per acre, respectively, indicating that yield is higher in freshwater area compared to wastewater area. The wastewater is being used in the study area since last thirty years and low average yield in wastewater area is probably due to deterioration of soil productivity or use of home made seed. Accumulation of poisonous chemicals on upper layer of soil resulted to lower the soil productivity.

Table 1

Average Values of Input-output Quantities on Per Acre Basis for Two Groups
(Freshwater, Wastewater) of Water Uses

Variables	Freshwater	Wastewater
Yield (Kg/Ac)	8975	8659
Fertiliser (NPK in Kg)	134.5	39.3[*]
Seed (Kg)	0.7	0.9
Labour (Hours)	120	135[*]
Irrigation (Hours)	29	11[*]
Pesticide Cost (Rupees)	525	1227[*]
Annual Rent (Rupees)	10520	15610[*]
Education (Years of Schooling)	6	4

[*] It represents that values are significantly different from each other for two groups.

3.1. Results of the Production Function Analysis

In the literature various techniques are available to estimate the non-linear model described in Equation 1, and different studies have employed different techniques to obtain consistent and asymptotically efficient estimates [Just and Pope (1979); Antle (1983) and Antle and Goodger (1984)]. There is slightly difference of deriving weights in Just and Pope and Antle's approach but the basic idea is similar in both the techniques. Hence, three stage estimation technique suggested by Just and Pope (1979) is employed to estimate the input and output relationship in cauliflower production and the detail of estimation procedure is given in Appendix-I. In cross section data like the ones employed in this study, problem of heteroscedasticity may generate asymptotically inefficient results [Just and Pope (1979)]. A variety of tests are available to test the existence of heteroscedasticity. In this study, the Breusch-Pagan test, preferable to other tests due to reasons cited in Kmenta (1986), is applied to diagnose the problem of heteroscedasticity.[2] The null hypothesis of homoscedasticity is rejected at the 5 percent and even at 1 percent level, suggesting the presence of heteroscedasticity in each group of data set. To attain asymptotically efficient β's, three stage estimation technique developed by Just and Pope (1979) is employed to establish the input-output relationship as defined in Equation 1 for cauliflower and results are reported in Table 2. In three stage estimation technique the value of multiple determination (R^2) improved from 65 and 72 in the first stage to 85 and 83 in the third stage for wastewater and freshwater areas, respectively. The significance levels of almost all coefficients are also improved in the third stage. The results are of individual groups (wastewater and freshwater) are comparable with the results of pool data i.e., when both groups are pooled and dummy for one group is used. The results of production function for pool data is reported in Appendix-II. The discussion about the production function coefficients of inputs in the following pages is about the individual groups for which the results are reported in Table 2.

The coefficient of fertiliser nutrients (NP) is positive and highly significant in wastewater area but in contrast to our expectations the coefficient of fertiliser is negative and significant for freshwater area as reported in Table 2. The negative sign of fertiliser in freshwater area is due to over utilisation of fertiliser which is clear from the mean value of fertiliser use revealed in Table 1. In wastewater area farmers are using 1 to 2 bags of urea per acre while in freshwater area farmers are using 4 to 6 bags of urea and 1 to 2 bags of DAP. Hence the total amount of nutrients increased significantly than the fertiliser standards set by the Ministry of Food, Agriculture and Livestock, [Federal Water Management Cell (1997)]. It is posing a negative impact on output and thus reflecting in terms of negative coefficients of fertiliser in production function for freshwater area. It represents the third zone of production function which clearly shows negative marginal contribution of fertiliser in production process.

In freshwater area, the negative and significant coefficient of seed implies that might be seed is over utilised or seed is not suitable according to local soil condition and environment. A separate study need to be conducted to provide such evidence. However, coefficient of seed is positive and significant in wastewater area which is according to our priori expectations.

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[2]It is based on the sample data that if the hypothesis of homoscedasticity is true, the ordinary least squares estimates of the regression coefficients should not differ significantly from the maximum likelihood estimates that allow the possible heteroscedasticity [Breusch and Pagan (1979)].

Table 2

Results of Production Function for Two Types of Water Groups
(Freshwater and Wastewater)

Variables	Wastewater			Freshwater		
	Ist Stage	2nd Stage	3rd Stage	Ist Stage	2nd Stage	3rd Stage
Intercept	6550.44***	1.50^{ns}	2554.53^{ns}	9708.78**	11.65*	3214.33^{ns}
	(2.78)	(0.18)	(0.90)	(1.81)	(1.58)	(0.18)
Fertiliser	0.009^{ns}	–0.004^{ns}	0.03***	–0.04^{ns}	1.16^{ns}	–0.04**
	(0.52)	(–0.01)	(2.16)	(–0.72)	(1.44)	(–1.59)
Seed	0.007^{ns}	–0.59^{ns}	0.20**	–0.20***	2.65***	–0.28**
	(0.32)	(–1.13)	(1.82)	(–2.97)	(2.65)	(–1.67)
Labour Hours	–0.03^{ns}	0.90^{ns}	0.20**	–0.07^{ns}	–1.40^{ns}	0.23*
	(–0.50)	(0.63)	(1.99)	(–0.92)	(–1.32)	(1.51)
Irrigation Hours	0.15**	–0.59^{ns}	0.17***	0.06^{ns}	–0.91*	0.26***
	(2.00)	(–0.36)	(4.83)	(1.34)	(–1.57)	(3.57)
Pesticide Cost	0.00^{ns}	0.02^{ns}	–0.002*	0.00**	–0.01^{ns}	0.003***
	(0.02)	(1.14)	(–1.52)	(1.71)	(–0.41)	(2.19)
Education	0.00^{ns}	0.03^{ns}	0.02**	0.00**	0.06**	0.02***
	(0.13)	(0.79)	(1.62)	(1.62)	(1.98)	(2.01)
Dummy for Variety	–0.02^{ns}	–0.12^{ns}	–0.04**	–	–	–
	(–1.36)	(–0.36)	(–1.97)			
Dummy for Soil	0.10***	0.04^{ns}	0.05***	0.16***	–0.15^{ns}	0.12**
	(6.76)	(0.10)	(2.44)	(8.83)	(–0.62)	(1.75)
Dummy for Seed Source	0.01^{ns}	0.77*	–0.78**	–	–	–
(Home=1, Otherwise=0)	(0.49)	(1.56)	(–1.66)			
Dummy for Sowing Method	–	–	–	0.18***	–1.94***	0.21^{ns}
				(3.20)	(–2.35)	(3.46)
R^2	0.65	0.14	0.85	0.72	0.27	0.83
Adj.–R^2	0.57	0.05	0.80	0.66	0.13	0.79

*** = Significant at 1 percent, ** = significant at 5 percent, * = significant at 10 percent, ns = not significant.
Figures in parentheses are t-statistics.

The signs for the coefficients of labour hours in both freshwater and wastewater areas are positive and highly significant. Cauliflower like other vegetables is a labour intensive crop indicating that improvement in labour supply could further enhance the productivity of cauliflower. Similarly the signs for the coefficients of irrigation hours in both freshwater and wastewater areas are positive and highly significant, indicating that water is scarce resource in both areas and additional supply of water could improve the productivity of cauliflower. The contribution of freshwater in the improvement of yield is higher than wastewater. It is because wastewater is contaminated with poisonous chemicals coming from different industries, institutions and households and moreover, it is completely untreated.

The coefficient of pesticide cost is highly significant in both groups and its sign is also consistent with priori expectations. However, coefficient of pesticide cost is larger in freshwater area compared to wastewater area, implying that marginal contribution of pesticide use is comparatively higher in freshwater area than wastewater area. It is due to the reason that wastewater farmers have high probability of being affected their crop from insects because wastewater fields have more conducive environment for insects to survive and breed. This argument can be supported by pesticide cost incurred in both sample groups and it is observed that pesticide cost is more than double in wastewater

area compared to freshwater area. The coefficient of education is positive and significant in both groups according to priori expectations, implying that investment on education could help to enhance the productivity of cauliflower.

The dummy for variety (stands for local variety which is also called early sowing variety) in wastewater is highly significant with negative sign implying that farmers who are planting their crop early are getting lower yield. It is surprising then why farmers are planting their crop early? When weekly price distribution in near by market is observed then we get the answer. The price of cauliflower in early weeks of harvest is found to be enormously higher compared to the price in later weeks, implying that farmers in wastewater area are rational and substituting low yield with high price. This clearly indicates that high prices in early weeks of harvest are contributing more than the loss in yield incurred due early plantation. The variety dummy in freshwater area stands for local variety. The positive and significant results clearly depicts that local variety in freshwater area performs better than imported variety.

The dummy for soil (i.e., sandy loam soil) is positive and significant in both groups but contribution is higher in wastewater area. The dummy for seed source is negative and significant, implying that home made seed performs better than other sources. It might be due to the reason that imported seed or certified seed is not being used properly according to the supplier's instructions.

3.2. Cost-benefit Analysis without Externalities

Net benefits of wastewater use in cauliflower production are estimated by employing Equations 2 and results are reported in Table 3. Cost-benefit analysis highlights the differences in net return for two groups (freshwater and wastewater users) in cauliflower production. The gross revenue, which only depends on production and output price, is low in wastewater area compared to freshwater area. Mainly it is due to low predicted yield (yield after capturing the effect of difference in input use, soil characteristic, and management factors etc.). The low average predicted yield on wastewater fields clearly depicts that untreated wastewater has negative impact on cauliflower production in the long run. The impact of differences in input level and management has been captured through production function in both groups and the remaining variation in predicted yield is referred to the difference in quality of water which is affecting the soil fertility. Hence, the difference in average yield of two groups is due to soil fertility loss which is taking place due to wastewater use. The cost of pesticides is more than double in wastewater irrigated site as compared to freshwater irrigated fields. This might be due to high cropping intensity and favourable environment for pests to grow in wastewater fields.

Fertiliser is one of the major contributor in cash cost in freshwater area and it is significantly higher compared to wastewater fields. Freshwater farmers spent four times more on fertilisers compared to wastewater farmers. The low cost of fertiliser in wastewater area is due to the fact that wastewater contains high amount of nutrients (Nitrogen and Phosphorus) and it encourages farmers to use low doses of fertiliser.

The cost of seed is also high on freshwater fields compared to wastewater area because farmers in freshwater area purchased their seeds from market at higher prices while it costs less to wastewater users because they use home produced seed.

Table 3

Comparison of Costs and Benefits (Rs/Ac) of Cauliflower Production in
Two Sources of Irrigation in the Study Area

Classification	Freshwater	Wastewater
Gross Returns	42516	37243
Cash Costs		
Pesticide	525	1227
Fertiliser	4094	924
Seed	3692	–
Labour[*]	2820	2922
Land Preparation	3414	3678
Irrigation	2082	686
Total	16627	9437
	(88)	(74)
Non-cash Costs		
Seed	–	1054
Labour	2197	2266
Total	2197	3320
	(12)	(26)
Total Labour Cost	5017	5188
	(27)	(41)
Total Cost	18824	12757
Net Benefit	23692	24486
Net Benefit Per Unit of Cash Input	1.4	2.6

Figures in parentheses represent the percentage of total cost incurred in cauliflower production.
Note: Labour cost also includes weeding cost (manual).

The total cost of labour (hired+family) in wastewater area is slightly higher than freshwater area due to intensive use of labour for weeding because in wastewater area the probability of germinating weeds is higher than freshwater area. Moreover, labour required to spray pesticide is higher in wastewater area than freshwater area. The contribution of labour cost in total cost of production is 27 and 41 percent in freshwater and wastewater areas, respectively, indicating that vegetable production is a labour intensive enterprise. Even wastewater vegetable production is more labour intensive than freshwater. This suggests that expansion of wastewater vegetable production could expand the absorption of labour in agriculture sector.

In wastewater area land has become more compact and hard due to wastewater use for a long time (since last 30 years) and it requires relatively more cultivation and planking cost. The farmers give more cultivations and plankings to make the land soft and to eradicate weeds. Therefore, land preparation cost for cauliflower is higher on wastewater irrigated farms compared to freshwater irrigated areas.

The cost of irrigation is another major cost. Freshwater farmers have much higher irrigation costs compared to wastewater farmers. The reason of this big difference is less availability of canal water in the freshwater area and it forces the farmers to supplement irrigation with tubewell water which is very costly due to high diesel costs, whereas the farmers who used wastewater had a clear advantage in terms of low priced wastewater.

Cash cost in freshwater area is Rs 16627, contributing 88 percent of total cost but in wastewater area, the total cash cost is smaller than freshwater area and it is Rs 9437, contributing 74 percent to the total cost. However, non-cash cost is higher in wastewater area (Rs 3320) than freshwater site (Rs 2197). The cost of family labour is the major component of non-cash cost. The amount of cash cost is higher than non-cash cost in both areas, implying that farmers depend more on market-base resources for cauliflower production than resources available at home.

The net benefit is estimated after deducting total cost from gross return; it is almost four percent higher in wastewater area compared to freshwater area. The rate of return per rupee of cash cost is estimated after dividing net benefits by total cash costs to observe the rate of return on cash investment in cauliflower production. The rate of return from cash investment is higher in wastewater area than freshwater site (Table 3) because of lower cash cost incurred in wastewater area. Net benefit or value of wastewater use is estimated by employing Equation 4 which is Rs 794 per acre and Rs 588354 (Rs 794 × 741 acres) for the whole study area before internalising the cost of externalities of wastewater use in cauliflower production.

3.3. Economic Value of Externalities

As mentioned earlier, the present study considers the health externalities of wastewater use, i.e., labour productivity loss and medical expenditure incurred on different kinds of sickness and results are discussed as below.

3.3.1. *Estimating the Probability of Different Diseases*

Chakera is the main site, where untreated wastewater is being used for irrigation and contained a high concentration of *helminth* eggs and *faecal coliform* bacteria that exceeded far the WHO guidelines [Ensink, *et al.* (2002)]. This poses a high potential health risk to both farmers and crop consumers. Due to limited available resources we did not get the blood test of the farmers to see the real effect on health of different pathogens and moreover, it would have provided the information at one point in time but we are interesting to get the information of different kinds of sickness over the year. We collected data from 100 farmers and asked them, how many times they get sick and what kind of sickness doctor diagnoses for them. Further, for how many days they could not go to work due to a particular sickness mentioned above. The probability distribution for each kind of sickness in both groups is estimated by applying the sparse data rule [Anderson, *et al.* (1977)] on cross sectional data of 100 farmers and results are reported in Table 4.

The vegetable farmers operating in wastewater area are found to have significantly higher prevalence of hepatitis, vomiting, stomach, skin allergy, cholera, diarrhea, typhoid and dysentery than those who are growing vegetables with canal or tubewell water. This implies that probability of existence of pathogens and being affected from these pathogens is significantly higher among farmers and workers involved in different farming activities on wastewater fields compared to those who are engaged in farming with canal water or freshwater. This clearly indicates that wastewater farmers are at a high risk. Simply, because they have intensive contact with wastewater as they do most of the field works manually and barefooted. However, probability of fever and cold was almost the same in both areas because these sicknesses dose not appear due to wastewater use.

Table 4

Per Year Labour Productivity Loss in Wastewater and Freshwater Areas

Disease	Wastewater			Freshwater		
	Probability	Average Days of Sickness	Real Labour Productivity Loss	Probability	Average Days of Sickness	Real Labour Productivity Loss
Hepatitis	0.12	110	1536612 (25610)			
Vomiting	0.12	1.3	18626 (310)			
Stomach	0.12	108.3	1513330 (25222)			
Skin Allergy	0.14	9.1	127718 (2129)			
Cholera	0.06	5.7	79159 (1319)			
Diarrhea	0.04	2	27938 (466)			
Typhoid	0.06	76.7	1070972 (17850)			
Dysentery	0.04	12.5	174615 (2910)			
Fever	0.22	8.8	123183 (2053)	0.20	7.9	261329 (4355)
Cold	0.16	13.4	186838 (3114)	0.14	7	162974 (2716)
Total		347.8	4858991 (80983)		14.9	424303 (7072)

Note: Figures in parentheses are values of Labour Productivity Loss in Dollar terms.

3.3.2. *Labour Productivity Loss*

By employing the probability and opportunity cost principle (on going market wage rate) as discussed in Equation 3, the value of annual loss of potential earnings or labour productivity loss due to each kind of sickness is reported in Table 4 for both groups. In wastewater area labour productivity loss due to stomach ach and hepatitis is found to be the highest US$ 75667 and US$ 25610, respectively. Among different diseases reported in Table 4 typhoid fever is caused by bacterial pathogen (*Salmonella typhi*) which is present in wastewater and it caused a labour productivity loss of US$ 17850. The farmers during their farming activities remain in contact with contaminated soil which generates a high loss of potential earnings due to skin allergy. Cholera which is a severe form of diarrhea, also a source of labour productivity loss equal to US$ 1319. Total annual labour productivity loss due to different kinds of sickness is Rs 4858991 (US$ 80983) and Rs 424303 (US$ 7072) in wastewater and freshwater areas, respectively and the difference in labour productivity loss is Rs 4.4 million (US$ 73912) which can be referred to annual loss due to wastewater use.

3.3.3. *Loss of Money in Medical Expenditures*

On one side wastewater use causes different kinds of diseases which affects the labour productivity but on the other side the treatment of such diseases required heavy

expenditures on medicines. The affected members of the society spend an enormous amount of money to purchase medicines for treatment and it leads to welfare loss to the society. The data on medical expenditures is collected from the diseased farmers. Annual loss of money in terms of medical expenditures is estimated by using Equation 4 and results are reported in Table 5.

Table 5

Per Year Loss of Money to Medical Facilities in Wastewater and Freshwater Areas

Disease	Wastewater		Freshwater	
	Medical Expenditure* (Rs)	Medical Expenditure ($)	Medical Expenditure (Rs)	Medical Expenditure ($)
Hepatitis	2615200	43587	–	–
Vomiting	18900	315	–	–
Stomach	1918000	31967	–	–
Skin Allergy	261800	4363	–	–
Cholera	369600	6160	–	–
Diarrhea	30800	513	–	–
Typhoid	1494500	24908	–	–
Dysentery	955500	15925	–	–
Fever	757400	12623	478265	7971
Cold	598500	9975	249900	4165
Total	9020200	150337	728165	12136

* Medical Expenditure includes cost on medicine, consultation cost, prevention cost, and transport cost.

In wastewater area, medical expenditures for Hepatitis are the highest (US$ 43587) followed by expenditures on Stomach (US$ 31967). The costs of medical expenditure for other different sicknesses are reported in Table 5 for both groups. Total annual loss of money in terms of medical expenditures is Rs 9020200 (US$ 150337) in wastewater area compared to Rs 549665 (US$ 1916) in freshwater area. Annual additional expenditures on medicines due to wastewater use are Rs 8.5 million (US$ 141175). Not a single chance of death is found due to wastewater irrigation in the study area. Therefore, economic value of mortality (deaths) is not evaluated in terms of net labour productivity loss of an individual over the expected life span.

3.4. Cost-benefit Analysis after Internalising the Externalities

The results of cost-benefit analysis before and after internalising the cost of externalities are estimated and reported in Table 6. Cost of health damage (CHD_w), Net Labour Productivity Loss ($NLPL_w$), Net Medical Expenditure Loss ($NMEL_w$) and Net Benefit of wastewater after internalising the cost of externalities (NB_{WE}) in cauliflower production are estimated by implying Equations 5, 6, 7 and 8, respectively.

Table 6

Cost-benefit Analysis before and after Internalising Cost of
Externalities in Cauliflower Production

Categories	Cost and Benefit (Rs)	Cost and Benefit (Rs per Acre)
Net Labour Productivity Loss (NLPL$_w$)	1108672	1496
Net Medical Expenditure Loss (NMEL$_w$)	2973009	2798
Cost of Health Damage (CHD$_w$)	3181681	4294
Net Benefit of Wastewater without Externality	588354	794
Net Benefit of Wastewater after Internalising the Externality	–2593327	–3500

Before incorporating the values of these negative externalities, net benefit or value of wastewater use is Rs 794 per acre and Rs 588354 (Rs 794 × 741 acres) for cauliflower production in the study area under the assumption that cauliflower is grown on the entire wastewater site in Chakera. Although, some other vegetables are also grown in the study area but the cropped area under these vegetables is negligible in our sample.

Net labour productivity loss (forgone labour earnings) and net medical expenditures on treatment due to wastewater use are amounting to Rs 1108672 and Rs 2117634, respectively for cauliflower production. The total external cost of health damage due to untreated wastewater irrigation in cauliflower production is Rs 3181681 for the whole study area (741 acre) and Rs 4294 per acre. Hence, the net benefit after deducting the values of these externalities become negative which is Rs 3500 per acre and Rs 2593327 for the entire study area (Table 6). Under the assumption that similar condition prevail for all the four crops grown in a year in wastewater area, net benefit of wastewater after internalising these cost of externalities is also negative, amounting to Rs 10373307 per annum for the whole study area and Rs 13999 per annum per acre. However, in order to increase the reliability of the results it is preferable to conduct future research based on annual data for all four crops being grown in the study area.

4. CONCLUSION AND POLICY SUGGESTIONS

The main objective of this study is to carry out cost-benefit analysis in cauliflower production with and without externalities due to wastewater irrigation in peri-urban areas of Faisalabad. Total costs of production of cauliflower without externalities are Rs 18824 and Rs 12757 per acre for freshwater and wastewater areas, respectively. Per acre gross revenue for freshwater and wastewater growers are Rs 42516 and Rs 37243, and net benefits are Rs 23692 and Rs 24486, respectively. It is observed that both total cost and gross revenue are higher for freshwater users but net benefits of wastewater users are higher in cauliflower production. The benefit or value of wastewater use is Rs 794 per acre and for the whole study area it is Rs 5882354. The simple cost-benefit analysis (when cost of externalities are not included) clearly indicating that it is profitable to use wastewater in cauliflower production.

Wastewater farmers have high probability of getting sick compared to those who are irrigating their land with canal or tube well water. Total economic value of labour productivity loss due to different kind of sicknesses is estimated to be Rs 1214748

(US$ 20245) and Rs 106076 (US$ 1768) for cauliflower production in wastewater and freshwater areas, respectively. The difference in labour productivity and medical expenditure loss for two groups is Rs 1108672 (US$ 18478) and Rs 2117634 (US$ 35294), respectively in cauliflower production. Total cost of health externalities of wastewater use in cauliflower production is Rs 3181681 and Rs 12.7 million for the whole year in the study area. After internalising the costs of externalities, the cost of cauliflower production in wastewater area has significantly increased compared to freshwater area and the negative value of net profit with wastewater use is Rs 3500 per acre and Rs 2593327 for the whole study area (Table 6). It implies that cauliflower production with wastewater is not economically feasible when cost of externalities is considered. In Faisalabad more than five thousand acre of land is being irrigated with wastewater and population of approximately fifty thousand is exposed to wastewater [Jeroen, *et al.* (2004)]. Under the assumption that per acre cost of health externalities remain the same for all crops and for all seasons then total cost of health externalities in peri-urban vegetable production sector of Faisalabad city (5283 acres) is accounted to be Rs 90.7 million in a year. In order to make the cauliflower production profitable from wastewater use, the price of cauliflower has to increase higher than the existing market price in order to cover the cost of health externalities. Now the question is whether society can pay higher prices? If not, then society has to reconsider the policy of untreated wastewater use in vegetable production. The possible options are as follows:

(1) At the macro level, government needs to interfere to resolve the issue of wastewater use. One possible approach is to supply the wastewater after proper treatment, and the cost of treatment should be paid by the government. The government can install the treatment plant and its cost can be recovered within a couple of years by saving the cost of medical expenditures which is shouldered by the government in terms of providing medical facilities at the rural side.

(2) A second possible option is to impose a tax on different industries which are emitting this polluted water in the drain equal to the cost of health damages. The revenue from taxation can be used to instal the treatment plant. The imposition of tax will also encourage the industrialists to instal treatment plants in their industries to clean polluted water before disposal in the drain. In the present situation owners of those industries omitting wastewater are enjoying high level of profitability due to low cost of production but at the cost to the farmers (in terms of health damages). Since, property rights are not well defined that who will pay for the externalities and therefore, government need to interfere to correct the welfare distribution among different segments of the society.

(3) The last option is that the government should pay a subsidy equal to the labour loss (forgone labour earnings) and medical expenditures to the inhabitants of that area.

Among these options, installation of a treatment plant through taxation on industrialists is one of the most feasible and practically viable options to provide immediate relief to the inhabitants of the area we studied.

APPENDIX-I

Just and Pope (1979) proposed the following three stage estimation technique to get the asymptotically efficient αs of Equation 1.

(1) In the first stage nonlinear least square (NLS) regression of Y_{it} on $F(X_{kit}, \alpha_k)$ is applied to Equation 1 to obtain coefficients $\hat{\alpha}$ and $F(X, \alpha) = \exp[(\ln X) \alpha]$. The NLS estimation in step 1 leads to consistent estimates of αs, (say $\hat{\alpha}$), the parameter of $F(X)$. There are two reasons that why estimation beyond first stage is important—(i) at the first stage of estimation, we are not in a position to examine the effect of input use on risk; (ii) even if risk is not important, the efficiency of estimates (at least asymptotically) can be improved after taking into account the problem of heteroscedasticity. It is possible to estimate μ by using the αs estimated in step 1 as follows:

$$\mu = Y - F(X, \hat{\alpha}) = \varepsilon h^{-1/2}(X, \beta)$$

(2) In the second stage an ordinary least square (OLS) regression of

$\ln|\mu| = \ln|Y - F(X, \hat{\alpha})|$ *on* $\ln X$ to obtain $\hat{\beta}$ is applied as presented below,

$$\ln|\mu| = \beta_0 + \frac{1}{2}(\ln X)' \beta + \varepsilon$$

where

$\ln h(X, \hat{\beta}) = (\ln X)' \hat{\beta}$ and this implies that

$$\ln h^{-1/2}(X, \hat{\beta}) = -\frac{1}{2}(\ln X)' \hat{\beta}$$

(3) In the third stage, for asymptotically efficient $\tilde{\alpha}$s, Just and Pope (1979) suggested a weighted *NLS* regression of Y on X with weights $h^{-1/2}(X, \hat{\beta})$. In mathematical notations, an *NLS* of $\overset{*}{Y} = Yh^{-1/2}(X, \hat{\beta}) = Y \exp[(-1/2)(\ln X)' \hat{\beta}$ on $\dot{F}(X, \alpha) = \exp[(\ln X)' \alpha - (1/2)(\ln X)' \hat{\beta}]$ to obtain the consistent and asymptotically efficient $\tilde{\alpha}$s is employed.

APPENDIX-II

Results of Production Function for Pooled Data of Two Groups
(Freshwater and Wastewater)

Variables	1st Stage	2nd Stage	3rd Stage
Intercept	8619.613^{***}	13.269^{*}	72.624^{***}
	(3.07)	(1.77)	(9.78)
Fertiliser	-0.005^{ns}	0.008^{ns}	-0.005^{ns}
	(−1.30)	(0.02)	(−0.32)
Seed	-0.026^{ns}	-0.115^{**}	0.045^{**}
	(−1.09)	(−2.24)	(2.70)
Labour Hours	-0.059^{ns}	-1.635^{ns}	0.534^{***}
	(−1.08)	(−1.30)	(15.69)
Irrigation Hours	0.074^{**}	0.021^{**}	0.069^{*}
	(1.98)	(2.03)	(1.87)
Pesticide Cost	0.001^{ns}	-0.011^{ns}	0.010^{***}
	(1.57)	(−0.66)	(6.24)
Education	0.003^{**}	0.016^{ns}	-0.004^{***}
	(2.17)	(0.48)	(−3.32)
Dummy for Soil	0.140^{***}	-0.192^{ns}	0.182^{***}
	(11.42)	(−0.68)	(14.45)
Dummy for Seed Source	0.036^{**}	0.506^{*}	-0.157^{***}
(Home=1, Otherwise=0)	(2.04)	(1.27)	(−11.02)
Dummy for Source of Irrigation	0.037^{ns}	-0.656^{ns}	0.268^{***}
(Wastewater=1, Otherwise=0)	(0.77)	(−0.60)	(7.13)
R^2	**0.62**	**0.10**	**0.83**
Adj-R^2	**0.59**	**0.08**	**0.81**

*** = significant at 1 percent, ** = significant at 5 percent, * = significant at 10 percent, ns = not significant.
Figures in parentheses are *t*-statistics.

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Urban Informal Sector: How Much Women Are Struggling for Family Survival

Tasnim Khan and Rana Ejaz Ali Khan

The paper analyses the contribution of informally employed women (for the age group of 16–60 years) to their household budget. The urban informal sector largely absorbs women workers. We examine the determinants of their contribution to their household budgets for the survival of the families. Applying the OLS model to 937 observations, it is found that women as heads of household, women's education, and ownership of assets by woman have a positive effect on their contribution. The burden of the large family size, household poverty, and loans availed by the household are shared by the informally employed women, as these variables positively affect their contribution. Age of the woman has a non-linear effect on woman's contribution. The contribution first increases and then decreases by an increase in the age of the woman. Married women and women living in nuclear families contribute more to the household budget. The household per capita income and number of children (5–15 years) in the household have shown a negative effect on the contribution of women to the household budget. The household's economic vulnerability due to unemployment of husband and lower productivity caused by lower education of husband are also largely shared by the urban informally employed women, i.e., they struggle more for family survival. However, the number of adult males in the household decreases the volume of contribution by women and the burden on women is relaxed.

INTRODUCTION

Women labour force participation rate in Pakistan, according to old data collection technique, was exceptionally low at just 14.4 percent, as compared to 70.3 percent for men,[1] while unemployment rate was 16.5 percent for women and 6.7 percent for men [FBS (2003), pp. 15, 30]. The share of women's earnings in earned income of household was 26 percent of that of men earnings while their economic activity rate as percentage of that of men was 40 percent [MHDC (2000)]. According to revised data collection technique of Federal Bureau of Statistics, women's participation rate has been increased to 50 percent instead of 14.4 percent in 2003. According to revised data collection if a

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[1]Women labour force participation in Bangladesh was 42.4 percent; India, 32.4 percent; Myanmar, 43.4 percent; Nepal, 42.5 percent; and Sri Lanka, 36.8 percent in the same time-period.

woman is involved doing work such as harvesting, sowing seeds, cotton-picking, maize and rice husking, livestock and poultry breeding, agricultural farming activities, construction work, collection of fire-wood and cotton sticks, fetching water, making clothes, sewing, knitting, marketing and preparation of goods and material, she will be included in labour force. It explained that informally employed women have increased the labour force participation rate of women up to 50 percent. How much these women are contributing in their households' incomes and GDP is still unexplored, along with determinants of their contribution.

Informal sector employment is generally a larger source of employment for women than for men in the developing world. In the developing countries, 60 percent or more women workers are informally employed (outside agriculture), though in Asia the proportion of women and men is roughly equivalent [ILO (2002)]. Informal employment include all remuneration work, both self-employment and wage-employment, that is not recognised, regulated, or protected by existing legal or regulatory framework and non-remunerative work undertaken in an income-producing enterprise. Most informal workers including both self-employed and wage-workers are deprived of secure work, workers' benefits, social protection, and representation or voice. The self-employed have to take care of themselves and their enterprises. Moreover, they often face a competitive disadvantage *vis-à-vis* larger formal firms in capital and product markets. Informal wage workers also have to take care of themselves as they receive few (if any) employer-sponsored benefits. Moreover, both groups receive little (if any) legal or social protection. As a result of these and other factors, a higher percentage of people working in the informal sector, compared to those working in the formal sector, are poor. In the situation women employed in informal sector are vulnerable to exploitation. But they are struggling for their family survival by contributing in their household budgets. What determines their contribution needs attention to make the policy proposals for increasing their contribution.

The women labour force participation in informal sectors (as well as in formal sector) has been analysed by a number of studies but the contribution of women in their household budget that makes proxy for struggle of women for family survival has not still been examined for Pakistan. We assume that ratio of contribution of a woman is a better indicator of her struggle for family survival than her employment or income. This draws attention to the analysis of women's contribution in household budget. Moreover, majority of the women in Pakistan is working in informal sector, i.e., 73 percent of all economically active women and 61 percent of urban working women are involved in informal sector.[2] It needs to focus on informally employed women.

Generally, economic literature has stressed on working women irrespective of the situation that they are working in formal sector or the informal sector. However, significant part of the literature has analysed the informally employed women. Many areas of these women are still to be explored, i.e., the typology of their work which differs from region to region, skill requirement by these women, credit constraints faced by them, exploitation by employers/contractors/sub-contractors, their health status and working environment, their living conditions and status in the household,

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[2]While in Bangladesh 83 percent, India 41 percent, Nepal 80 percent, and in Sri Lanka 9 percent of working women are engaged in the informal sector.

marketing problems if they are producers, role of NGOs or semi-government institutions for their welfare, and even the bonded labour in some professions, etc. One of the aspects extremely ignored by the researchers is their contribution in household budget that is focus of present study. A major hurdle in the way seemed to be the lack of data about these women [see Charmes (2000)]. We tackle this problem by taking primary data.

A few studies have attempted to analyse the determinants of contribution of informal sector women in their household budgets by using primary data. For instance, recently Khan and Khan (2007, 2008) have analysed the contribution of women in household budget for overall areas (urban and rural). The phenomenon of urban informal sector is conceptually different from that of informal agricultural and non-agricultural rural informal sector. Although urban and rural informal sector workers often have the same individual and household characteristics and it seems an artificial division of economy that researchers and policy-makers have created. It further reflects their lack of understanding of multiple economic roles that individuals play in either urban or rural informal settings. But justification of this division in practical terms, is that the urban informal sector is generally more accessible to researchers and thus yields more complete data. When studying the informal sector with a view to education, training and micro-finance, it seems likely that greater coverage and efficiency can initially be achieved in the urban settings. However, it would be overly ambitious to implement recommendations which are feasible in urban areas to overall areas. It may be hoped that lessons learned in the urban context may be useful in the formulation of future comprehensive plans for development which may take place in rural areas. It is necessary to analyse the rural and urban areas separately.

The objective of our study is to estimate the determinants of contribution of urban informal sector women that stand for their struggle for family survival, by using the primary data. On the basis of results we will make some policy proposals.

LITERATURE REVIEW

In the earlier studies Bell (1974) estimated the contribution of working women in family income. The study concluded that women who held some employment contribute only 16 percent of total family income, median income of these families was 23 percent higher than in families with non-working wives. The full-time working wives provided 39 percent of total family income. The families where the wife has a full-time job enjoy a median income more than 50 percent higher than those where the wife is not employed outside the home. The share of family income, however varies significantly between occupations. The highest percentage contribution comes from professional and managerial workers, who provide about 38 percent of the total family income. The lowest percentage comes from the women who are employed as service workers that amount on average to one-fifth of their total family income. Concerning the wife's contribution in household income, Cancian, *et al.* (1991a) have focused on changes in the level and distribution of earnings of men and women and their impacts on the distribution of family income among married couples, and among all households. The study concluded that husbands earnings rose very little and wives' earnings increased substantially between 1968–1988. The rise in married women's earnings reflected an increase in the proportion

of married women who work as well as increased weekly earnings for working wives. As an impact of wife's earnings on household income, it is estimated that without wives' earnings, 9.2 percent of families would have been below the poverty line, and 26.4 percent would have had income between one and two times the poverty line. Over the period, the increased mean earnings of wives were only able to offset a small part of the decline in the growth of their husband's earnings. Borooah and Mckee (1996) have analysed the role of wife's income in income inequality in United Kingdom. One of the causes of rise in income inequality was found as growing polarisation between dual-earners and no-earner families. For US, Cancian, *et al.* (1991b) found that wives' earnings reduced inequality by about 20 percent. For Britain, a same type of study by Machin and Waldfogel (1994) measured the impact of wives earnings on family income inequality. It concluded that wives' earnings reduced inequality by about 27 percent. The study further concluded that a substantial contribution was made by the husbands and a relatively minor contribution by the wives towards income inequality.[3] Charmes (2000) have analysed the contribution of informal sector and of the women involved in informal sector to GDP in African countries [see also, Charmes (1998) for Kenya]. It aimed highlighting the underestimation of women's activities in national accounting. The study estimated that in most countries, the share of women in informal sector GDP is much lower than their share in informal sector employment. Hoffmann and Leone (2004) have estimated the women's contribution in household income and its impact on inequality in household per-capita income for Brazil for the years 1981-2002. The decomposition of the Gini index by income shares has shown a decrease in the contribution of men's earnings, and an increase in the contribution of both women's earnings and pensions, in the inequality of per-capita household income. The increase in the contribution of women's earnings to inequality is mostly due to significant increase in the share of their earnings in the household income. Shaw (2005) suggested that women have made both direct and indirect contribution to increase in trend productivity in Europe. The direct contribution has come from their role as workers in the paid economy. They have contributed indirectly to increase productivity and long-run economic growth through unpaid work, both at home raising children and in their communities.[4] Khan, *et al.* (2005 for Pakistan) have investigated the contribution of women and children involved in home-based work[5] in family income. They have also analysed the impact of increased earnings of women on household nutrition, health and education.

Plethora of studies in Pakistan has probed the contribution of women in household income. These women were from different areas, employment sectors and age-groups. Shaheed and Mumtaz (1981) conducted a study on informally employed women in Kot Lakhpat (Lahore). The study seemed to be the first on concerning informally employed

[3]See also the other studies who focused on women's earnings causing inequality in household: Karoly (1991), Wion (1990) and Danziger (1980) for UK.

[4]See also Camps-Cura (1998) for women's and children's earnings impact on family income and household structure; Buvinic and Gupta (1993) for female-heads contribution in household; Louat, *et al.* (1993) for welfare effect on household by female heads; and Gonzalez (2004) for single mother's work and income impact.

[5]There are studies who have focused on different industries, professions, jobs and employment categories of informal sector. For instance, Mohiuddin (1982) for female handicrafts of Pakistan; Pangestu and Hendytio (1997) for textile, garment and footwear industry of Indonesia; Ramachandran (2001) for Indian village workers; Khatak and Sayeed (2000) for sub-contracted women workers in Karachi; and La Ferrara (2002) for informal settlements of Nairobi.

women. Majority of the women were found working in their homes. *Purdah* (veil), male-resistance, pre-occupation in the household chores were the hindering factors for better jobs outside the home which may increase their contribution. Mohiuddin (1982) investigated the socio-economic aspect of the female domestic servants specifically focusing on female-headship[6] in Karachi. The women were found poorest of the poor despite their contribution in household income. Kazi and Sathar (1986) mainly focused on productive and reproductive behaviour of informally employed women in urban areas of Karachi. They found that informal nature of the job attracts the women to work and support their families.[7]

There are plenty of studies who have focused on the determinants of work decision of women, working hours and income/wages in formal and informal sector. They may be connected with the contribution of women in household budget and help us for identification of variables to see the determinants of contribution of women in household income. Hartog and Theevwes' (1986) econometric analysis is based on Heckman's (1974) participation-cum-hour model to estimate the integrated labour force participation and hours of work. They have also compared the results of maximum likelihood model with probit model to identify the possible biases. Sultana, *et al.* (1994) analysed the labour force decision of women by tobit and OLS models. The study was based on Beckerian approach. The results indicated that poor women were more likely to do paid-employment. The age, education, male-wage rate and distance of main market from home negatively affect their labour force participation.[8]

In the recent studies, Azid, *et al.* (2001) have analysed the economic behaviour of female workers involved in the business of embroidery in Multan. The study has shown that poverty force the female members of the household to engage in economic activity in informal labour market. Naqvi and Shahnaz (2002) have indicated that the women who were older, better educated, head the household, or come from smaller, better off urban families were more empowered to take employment decisions on their own. About the impact of provision of infrastructure on women's time allocation among market work, leisure and water collection is investigated by Illahi and Grimard (2000). The study was based on home production and time allocation framework developed by Becker (1980). The results have shown that time allocated to market work declines with distance to collect water. A positive relationship between household poverty and poor infrastructure existed. An improvement in water supply infrastructure may lower poverty through increase in time for income generating activities by women.[9] Mehrotra and Biggeri (2002) have attempted to estimate the

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[6]The socioeconomic status and work decision by female-head of household, married women and single mothers differs based on the need for their contribution in household income. Some studies have focused on these specific groups of women. See for instance, Jones, *et al.* (2003) for married women's labour supply and Gonzalez (2004) for single mother's work supply.

[7]See also earlier studies who have recognised the significant part of women's contribution in household income: Hamid (1991) for poor settlements of formal and informal sector of urban areas of Rawalpindi; Alderman and Chistie (1991) for market oriented work of rural women of Pakistan; Kazi and Raza (1991) for working women in Pakistan; and Buvinic and Gupta (1993) for women-headed and women-maintained families in developing countries.

[8]See also, Hamid (1991) for determinants of female labour supply in Pakistan; Duncan, *et al.* (1993) for women's labour market decisions; Hafeez and Ahmed (2002) for labour force participation decision of Pakistani women; Naqvi and Shahnaz (2002) for why women decide to work in Pakistan; and McGrattan and Rogerson (2004) for changing working hours of women.

[9]See also, Hartog and Theevwes (1986) for work participation hours of women; and McGrattan and Rogerson (2004) for changing working hours of women.

determinants of income and health status of home-based women workers in five Asian countries; two lower-income (India and Pakistan) and three middle-income (Indonesia, Thailand and Philippines) where home-based work is widespread. For India and Pakistan, the age of the woman, input like the use of electricity, and years of experience of woman have shown non-significant results. Education of women influenced the productivity positively. Membership of women's association also influenced the productivity positively. Fafchamps and Quisumbing (2003) have investigated that how human capital, learning by doing, gender and family status affect the division of labour within household. The data was taken from 12 rounds of household survey conducted by International Food Policy Research Institute (IFPRI) in four districts of Pakistan.[10]

There are studies having focused on other areas of women employment but they ultimately are related with women income and contribution. Escriche, *et al.* (2004) have explained the existence of gender discrimination in labour market and focused on the intergenerational transmission of preferences related to the women's approach towards jobs and market. The results explained the process of convergence to a non-discriminatory steady state, which has been evidenced by narrow gender gap in most western countries. Eapen (2004) has attempted to analyse the issue of segregation of jobs and its perpetuation over time as a disadvantage for women workers. The study found that in informal sector women are more mobile between establishments for higher remuneration but hardly have obtained vertical mobility. Almost all the studies concerning informally (as well as formally) employed women reveal that they are struggling for their family survival.[11]

The studies reviewed above have analysed the contribution of women in household income and GDP, labour force decisions of women, working hours, or wage/income of the women. They are inter-linked with each other. The link between working hours, wages/income and contribution seems strong but in fact for informal sector it may be weakened. For the informal sector, there are no fixed working hours and wage/income. Even the labour force activity is frequently disconnected and re-continued. For instance, if the daily/weekly hours are higher and wages are lower the contribution may be lower and vice-versa. Similarly, if the income of a woman is high but the household income is comparatively high, the woman's contribution will remain low. The notion leads to analyse the determinants of contribution instead of working hours and wages/income. It is the woman's contribution which enhances her status and bargaining power within the household. Even it may pull the household out of poverty. That is why, we are interested to estimate the determinants of women's contribution in household budget. We will focus on urban informal sector women. The use of primary data will be another novelty of the study.

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[10]See also the other studies who have focused on factor and determinants: Irfan (1983) for Pakistan; Kozel and Alderman (1990) for urban Pakistan; Alderman and Chistie (1991) for rural Pakistan; Hamid (1991) for Pakistan; Duncan, *et al.* (1993) for marital status and children's impact on labour market choice; Lokshin, *et al.* (2000) for effect of childhood development programmes on female labour force participation in Kenya; Coady, *et al.* (2001) for impact of community programmes on women labour force participation in China; Iacovou (2001) for fertility as determining factor of female labour supply; Hafeez and Ahmed (2002) for labour force participation of married women; and Jones, *et al.* (2003) for work decision of married women.

[11]See other recent studies who accepted the contribution of women: Khattak and Sayeed (2000) for subcontracted women workers in Pakistan; ILO (2002) for informal sector of developing countries; Eapen and Kodoth (2002) for women in Kerala (India); Hafeez and Ahmed (2002) for women in Punjab (Pakistan); and Hoffmann and Leone (2004) for Brazil.

CONCEPTUAL INTERPRETATION OF WOMEN'S STRUGGLE

Women working in the informal sector are at the lowest end of the socio-economic spectrum. They are uneducated, work as low status worker, having lack of capital and mostly live below poverty line. Generally these women are ill-informed about the market and mostly depend upon contractors and middle-man having no legal protection. The women in this sector are mostly engaged in home-based enterprises like piece-rate workers, family business, domestic workers, self-employed enterprises and casual workers. These women usually take up such jobs because they are unable to get alternative employment. There are strong rigid cultural constraints, which restrict their mobility and handicap them for having employment outside the home for remuneration. However, their struggle for their family survival is accepted. In this section we will see how different socio-economic factors (although cultural, political and religious factors are equally significant) affect their struggle that is proxied by their contribution. On this basis we will select the variables for our analysis. The life cycle of an adult may affect his/her financial support to household budget. Two hypotheses about the effect of a woman's age on her contribution in household income may be postulated. Firstly, the increase in age may raise her contribution due to (i) larger family size and income dilution effect (ii) work experience and high wages in the latter age, (iii) awareness positively correlates with age, (iv) presence of offspring in the household to look after household chores freeing mothers for labour, and (v) the fact that older women have more and relaxed social contracts as compared to younger women. Second hypothesis is that elder women have comparatively elder off-spring as compared to younger mothers and in poor households the children give financial support to household by participating in the economic activities so women in latter age are less required to contribute in household budget. In the empirical studies, which are mostly concerned with work participation of women, Hartog and Theevwes (1986) opined that younger women are more concerned with participation decision while older women are more concerned with working hour's decision. Lockshin, *et al.* (2000) have revealed that mothers in the age group of 26–35 years are more likely to be economically active as compared to other age groups. As concerns the formal and informal sector, formal sector employees reach at their maximum earnings in between 35-45, and informal sector employees reach at their maximum earnings between 35-54 years of age [Kozel and Alderman (1990)]. La Ferrara (2002) has found a negative relationship between age and woman's time allocation to work. Azid, *et al.* (2001) have found a linear positive relationship between age and woman's participation in economic activities. La Ferrara (2002) concluded that earnings of the women increase with age and job experience but returns increase at decreasing rate.[12] Illahi and Grimard (2000) have concluded that age of the woman has concave relationship with time spent in work. Time spent in work rises reaches a maximum, and the falls again. Naqvi and Shahnaz (2000) have estimated a positive relationship between age of the woman and her economic activity (for the age group of 15–49 years). All these studies are differing on the matter, but life-cycle of the woman affects the work participation. We are concerned with contribution of woman in household budget. It may be postulated that age of the woman affects her contribution in the household budget. We will include the age of the woman as an explanatory variable for her contribution.

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[12]Fafchamps and Quisumbing (2003) have taken the age and age-squared of the woman as a proxy of job experience and found a positive relationship between income and job experience.

Individual characteristics of the women influence the level of her contribution in household budget. Education is perceived as the major characteristic, though in the informal labour market, the employed-women have comparatively lower educational level. The educational level of a woman may work in two ways to affect her contribution. For example, if education increases her productivity in home tasks then she would prefer to stay at home and contribute nothing to household budget but if the opportunity cost of staying at home is larger, then she would devote time in the market for earning and contribute to household budget. The third option may be combination of the both. In the previous literature, the education has shown contradicting effects on labour force participation decisions and earned income. La Ferrara (2002) concluded that education of both male and female workers in informal sector has no significant effect on their earnings. Naqvi and Shahnaz (2002) estimated that more-educated women are more likely to participate in labour force. Hamid (1991) concluded that educational level of women negatively affects their labour force participation decision. Eapen and Kodoth (2002 for India) explained that improved endowment rates in India has not played the transformative role as expected, even higher education has not motivated the women to challenge the gender role assumptions. Despite these contradicting evidences of role of education in work decision, working hours and gender discrimination challenges, the struggle of the women for family survival may be hypothesised to be positively affected by the education of the women. It may be through the enhanced productivity and awareness.

The marital status of a woman is not only concerned with whether a woman is married or not but it has reference of dowry system, family structure and inheritance of property rights. These references are ultimately connected with their struggle for family survival. Eapen and Kodoth (2002) concluded that families mediate employment and education of women towards the marriageability of girls. It is further evidenced [see, Pangestu and Hendytio (1997); La Ferrara (2002)] that socio-economic status of an individual within household is determined by his/her marital status. For the work decision, Gonzalez (2004) concluded that married women (with or without children) devote more time to work than never married [see also, McGrattan and Rogerson (2004)]. Naqvi and Shahnaz (2002) concluded that married women are less likely to participate in economic activities. Jones, *et al.* (2003) have also shown that married women and single women have different approaches towards work-hour and wage rate. For the urban informal sector, we hypothesised that woman contribution in household budget may have different pattern concerning marital status of women. Women in this strata usually do not work before marriage and if they work they show a casual approach towards work. They usually support their mothers' work in household enterprises and home-based contracted work. Even some time they go out for factory work if they are skilled. All that is done to collect the dowry. They do not have commitment to their work but after marriage they are forced by their circumstances to seek employment in order to support their growing families.

Head of the household is a person who bears the chief responsibility of economic maintenance of the household. Alternatively, head of the household is the person, who provides most of the needs of the household and is familiar with all the activities of the household. In the absence of any male head of household, female heads the household.[13]

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[13]Though Abadian (1996) reported that sometimes woman does not act as head of household, even when woman is the sole source of economic support in the household.

Female-headed households are identified as vulnerable households. They are increasing in number and needing policy attention [Buvinic and Gupta (1993)]. Although, female-headed household as a marker for poverty and vulnerability has come under criticism.[14] Widow-headed households are particularly vulnerable households. Srinivasan and Dreze (1995) opined that single widows as well as widow-headed households with unmarried children are among the highest poverty stricken households. Mason and Lampietti (1998) narrated that female-headship is one of the most useful indicators of vulnerability in the absence of anything better. Ray (2000) concluded that in South Africa, female-headed households are unconditionally poorer but in Pakistan, in the presence of economies of household size and adult/child consumption relativities the female-headed households are poorer than others, but not in the per-capita income perspective. Female-heads are identified as indicators of family disintegration. Life is difficult for them, not least because of prejudice, but social stigma. They have far more difficulty in maintaining their families. They are generally more common in Latin America, Africa and Caribbean than in Asia and Pacific—where widows, divorcees and lone women are likely to be absorbed into extended family households. In Pakistan, social norms discourage the second marriage of females but the relatives usually care for widows and abandoned women, though the economic circumstances of such women are not so good at large. Our objective to include the women as head of household as an explanatory variable is to see, does such women's contribution in household budget differ from their counterparts, where heads of household are men.

The ownership of assets by a woman is an important indicator of the socio-economic standing of a working woman in informal sector. The ownership of assets implies a relative degree of security to woman. Theoretically the ownership of assets may impact the contribution of a woman by two ways. In one way, the assets make the woman/household richer and financially stable through the un-earned income and woman is less likely to contribute in household budget. In the other way, if the woman owns assets, it may be easier for her, specifically in informal sector to work at household-enterprise. Generally, in the low-income households, the presence of assets increases the demand for labour, which is partially filled by working women of the household. Sultana, *et al*. (1994 for rural Pakistan) have used asset value as a proxy for non-wage income of the household and found that a change in non-wage income has a negative effect on a woman's time allocation in the market as well as at home since it increases the consumption of leisure. We will include a binary variable, i.e., whether the informally employed woman has assets or not, in our model. If a woman having assets contribute more, policy may be proposed to increase the assets of the women.

The characteristics of household members also play an important role to determine the struggle of a woman for family survival. The life-cycle, education, gender, income level and employment characteristics of the adults in the household are important actors.

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[14]Critics have pointed out the diversity of female-headed households, in particular the difference in economic conditions between single-person elderly (usually widowed) female-headed households and households with children headed by females in the absence (temporary or permanent) of adult males [Varley (1996)]. The latter category often fails to distinguish sufficiently between whether or not economic support is provided by the absent males [Rosenhouse (1989)]. Some have argued that the differential poverty of female-headed households may be small and have little welfare effect given their different spending patterns [Louat, *et al.* (1993)].

Specifically the characteristics of husband and head of household play a vital role. In a society like Pakistan, husband usually acts as head of household and is always the main bread winner of the household and steers the activities of household members. We will include the life-cycle, education and employment status of the husband as explanatory variables for women's contribution in their household incomes. The variable will help us to identify the characteristics of the households whose wives are contributing more or less in the household income. Though in the previous literature, there are conflicting views about the effect of husbands' education on female labour force participation. Duncan, *et al.* (1993) have concluded that husband's education positively affects the probability of a woman's earning income while Sultana, *et al.* (1994) revealed that husband's education has negative impact on work participation of women.

As concerns the husband's employment status it may be a critical variable for a woman's contribution in household budget. Generally woman's contribution is determined by household's economic vulnerability which depends upon employment status of the husband who is usually head of the household and responsible for household expenditures. Sultana, *et al.* (1994) have found that an increase in male wage rate reduces the female's time in market work. For the informal sector, the unemployed husbands often rely on their women. Even men do not try hard to find work and remain unemployed. They take women employment as substitute of their employment [Khan, *et al.* (2005)].

According to neoclassical economists, education of a woman is the key determinant of her labour force participation decision. We may connect it with her contribution in the household. A woman with higher level of education is more likely to enter labour market [see Becker (1980)]. On the other hand structuralist school argues that there are many other factors besides education which compel a woman to enter labour market [see Benham (1980)]. The major one of them is household income. A woman is more likely to enter labour market, if she belongs to a household of lower-income group. Along with this, an understanding of the inspiration and motivation of a woman to enter labour market and contribute in household budget is important for analysing her share of contribution. Aspiration is determined by socio-cultural and economic factors like cultural influences, education, religion, and norms adopted by the community (the value, position and role of women accepted by the community), unemployment level in the region and general standard of living. Most of all, a woman has aspiration for financial welfare of the household. In this way household income determines the motivations of a woman to work and contribute in household budget. Alderman and Chistie (1991) argued that an increase in household income reduces work by women in the market leaving work at home unchanged. To investigate the perception that informally employed women belonging to lower-income households contribute more or less in their household budget, we will use per-capita household income per month (in hundred rupees) as an explanatory variable in the model.[15]

[15]Some studies have used the characteristics of adult members of the household like the educational level and employment status of head of household as a proxy for household income, due to the problem of endogeneity of explanatory variables. To overcome the problem of endogeneity of household per capita, we have used the sensitivity test, i.e., by including and excluding the HHPCY (household per capita income) in the model the econometric estimates remained unchanged. So we have included the household per capita income as explanatory variables in the model.

Conceptually, two alternative hypotheses may be postulated about the impact of household size on a woman's struggle for family survival. One is that in a larger household, there is surplus of labour supply within the household and a woman needs less to contribute in household budget. The other equally compelling argument explaining the mechanics of larger household is that there are more mouths to feed so a woman has to contribute more to the household budget. Furthermore, in a larger household, the family members may support a woman in house-keeping and child-care and make her free to economically contribute in household budget. Such type of support may be provided by sisters, daughters, or mother in-law. Alderman and Chistie (1991) have found that an increase in number of adult females in the household reduces the work burden of a woman at home and an additional male or child increases such work-load.

Household size and structure are inter-related concepts. In determining a woman's contribution in household budget the household structure (nuclear family system or combined family system) becomes relevant. Joint family system is prevalent in Pakistan. In a joint family system a woman apart from her husband and children, lives with her in-laws comprising her husband's parents, grand parents, brothers, sisters and some-times some other family members. In a nuclear family she simply lives with her husband. For a working woman nuclear family system has disadvantages in child-care, home-management, and care for husband. On the other hand in combine family system the disadvantages are the zero-saving by woman due to extra-burden of in-laws and some times working woman may be dictated by in-laws. Her mobility may be subject to permission by co-residents which hinder her to have some paid-activity. Furthermore, the distribution of resources within the household is influenced by bargaining power of the individuals or groups within the household which may reduce the contribution of a woman, as generally in-laws have higher bargaining power. On the other hand, in nuclear family system a working woman has advantages of absence of interference from co-residents and in combined family system, the co-residents support in home-care management making her free to contribute in household budget. To detangle the effect of household size and nuclear family structure on a woman's contribution in household budget, we will include two types of explanatory variables in the model. They are (i) continuous variable, i.e., number of household members, and (ii) binary variable, i.e., whether the household is nuclear or have combined family. The variables will help us to identify that whether the larger households are taking more contribution for women or the smaller ones. Similar identification will be for the nuclear or combined households.

The volume of a woman's contribution in her household budget may be influenced by demographic characteristics of the household like the number of children, their gender and age. Even the activities of these children, i.e., child labour, schooling or home-care may also determine the contribution of a woman. The infants and school-age children in the household may differently affect the mother's contribution in household budget as both require different tasks of child-caring. The infants need full-time care and presence of mothers with them in the absence of other household members caring for them, while school-age children comparatively need less time from mothers. An additional requirement by the school-age children may be the help in home-work of schools. But school-age children consume more of the household resources on food, clothing and specifically on education. In this case, mother may increase household resources by

contributing in household budget. As concerned the school-age children, Camps-Cura (1998) explained that with the beginning of second industrial revolution child labour was replaced by that of woman, even by that who was reported as housewife in the Municipal Census. A smaller number of children and their mandatory schooling along with an improvement of woman's position within the factory with respect to man explain this substitution. Duncan, *et al.* (1993) argued that the presence of children in the household significantly affect the probability of a woman's labour force participation.[16] In a society like Pakistan, where worth of a woman is attached with the number of children (especially boys) she bears, the number of children in the household may exert an impact on her contribution in household budget. The pressure of household tasks on woman due to presence of the children in the family may cause woman to spend more time at home and may limit her financial contribution in household budget. Furthermore, if the children are involved in paid-work, that is a prevalent phenomenon in poor communities of Pakistan, the contribution by these children may substitute the woman's contribution. The number of children may exert pressure on woman's contribution in household budget in other ways, i.e., (i) large number of children need more household resources which are partially provided by woman's contribution, and (ii) the households containing a large number of children are more likely to be living in poverty. For example, in Pakistan poor households have 75 percent more children as compared to non-poor households [ADB (2002)]. It may compel the woman to contribute more in household budget. We will include the number of school-age (5–15 years) children in the household as an explanatory variable for the contribution of a woman in her household budget.

In the Pakistani culture, the primary responsibility for a mother is home-care and child-care while head of household (usually husband) is mainly responsible for living cost. A woman's contribution in household budget is determined to some degree by comparing her productivity at home and in the labour market. Infants require constant care, so mother's productivity at home is higher in this case than potential returns from outside work. Lokshin, *et al.* (2000) concluded that economic incentives in the form of child-care centres by public sector have a powerful effect on the work behaviour of a woman. Unlike the developed economies, there is less opportunity of day-care centres in developing countries. In Pakistan specifically, where the fertility rate is higher and women have larger number of children, the concept of day-care centre is invisible. So the number of infants in the household is speculated to influence the woman's contribution in household budget negatively.[17] Empirical evidences have shown conflicting effects of number of infants on labour force decision of the women. For example, Iacovou (2001) has found that children under five years of age have no effect on their mother's labour. Khan and Khan (2008) have estimated a negative impact of number of infants on woman's contribution in household budget.

The adult members of the household generally in the combined family system are comprised of the prime-age children, brothers and sisters of the head of household, father and mother of the head of household, and similarly, brother, sister, father and mother of the wife of the head of household. Even sometimes, the spouses of the children, if they

[16]Though, Sathar and Kazi (1989) concluded that working status of the women affects the fertility and desired family size.

[17]The exemption may be where woman is employed in home-enterprise and there is great likelihood of flexibility of working hours, thereby woman's work does not conflict with child-care.

are married and brothers and sisters of the main couple (head of household and his/her spouse) becomes the members of the combined family system. In the nuclear family, the adult members may be the prime-age children.

The presence of prime-age children (16 years or above) in the household may differently affect the contribution of a woman in the household income as compared to infants and school-age children. The prime-age children belong to working-age group so they may increase household resources by joining labour force and may decrease the contribution of a woman. Even the presence of male and female prime-age children in the household may differently affect woman's contribution as female prime-age children have comparatively less opportunity for labour force participation and more consumption expenditures due to be in marriage-age group and presence of dowry system. We will include the number of prime-age male children and number of prime-age female children as explanatory variable in our model. The other adult members of the household may also affect the contribution of a woman in household budget in a number of ways, i.e., (i) through their characteristics like education, gender, age, employment and income status, (ii) through their time consumption in home-care activities and production activities, (iii) their behaviour towards the female contribution in household budget which is basically based on the socio-cultural norms of the household and community, (iv) allocation of resources within the household adult members, and (v) bargaining power of the members or groups of members within the household. So brothers and sisters of the major couple may differently affect a woman's contribution from mother and father of the couple. We will divide the adult members into two groups, i.e., adult males and adult females.

It is usually accepted that access to financial services significantly impacts the lives of the poor. Empirical evidences have shown that, among the poor, those who participated in micro-financing programmes were able to improve their living standard, both at individual and household level, much better than those without access to financial services. For example, the clients of BRAC (Bangladesh Rural Advancement Committee) increased their household expenditures by 28 percent and assets by 112 percent. Similarly, the impact studies have shown that in poor households with access to financial services, children were not only sent to school in large number, including girls, but they also stayed in school longer time. In Bangladesh, almost all girls in Grameen client households had some schooling, compared to 60 percent of non-client households. It explained that financing availed by the woman or household make the woman to contribute more in household budget. It further makes the woman more confident, more assertive, and better able to confront systematic gender inequalities. Loaning enables poor women to become economic agent of change by increasing their employment opportunities, productivity, and income accessing markets and information, and decision-making. In Indonesia, female client of Bank Rakyat Indonesia (BRI) were more likely than non-client to make joint decisions with their husbands regarding allocation of household money, children's education, use of contraceptive and family size, and participation in community events.

The most common loans for informal workers are micro-credit loans. These loans are enough for hard-working micro-entrepreneurs to start or expand small business such as raising live stock, buying whole sale products to sell in a market, and buying embroidery and sewing-machines, etc. Incomes from these businesses provide better

food, housing, health-care and education facilities for entire families. Most importantly, additional income provides hope for a better self-employment.

The literature on informal sector has shown that most of the families working in informal sector of Pakistan were highly indebted. These loans were taken from the *thekadar* (contractor) or sub-contractors for the purpose of treatment of a household member, house construction or marriages. These workers were reported to be exploited through payment less than the contracted rates [Khattak and Sayeed (2000)]. Some times these loans were also used for investment. There are lesser facilities of loaning from the formal institutions so majority of the informal workers take loans from informal sector. As concerns the women, it is very rare, that women involved in informal sector activities are taking loan from formal sector. We will include in our study, a binary variable representing whether the household is availing the loan (either from formal sector of informal sector) or not. If the household is availing loan and woman is contributing more in the household, from the policy perspective the results may have a significant measure to increase the contribution of women.

ANALYTICAL FRAMEWORK

The phenomenon of market-based informal sector in different from home-based informal sector. The women are mostly involved in home-based informal sector but market-based informal sector also absorbs the females. Our concern would be the contribution of women so broadly the informal sector comprising of both market-based and home-based will be covered. In our framework, we will take two types of the variables, i.e., the variables to identify the women who are struggling comparatively more for their families, so the economic significance of these women for their households may be explained. For instance, the variable may be the age of the woman and we suppose that estimation shows that older women are contributing more or struggling harder for family survival. The target group may be the older women for explaining their significant struggle and maintaining their contribution or younger women for a need to increase their contribution. The other identifying variables are the marital status, headship of the household, husband's age education and employment status, nuclear status of the household, household per-capita income, poverty status of the household and household size and its composition. The second type of variables may demonstrate the policy proposals to increase the contribution of women. The variables are education of the women, ownership of assets by the women and loan availed by the household. In this way, the analysis have two dimension, firstly to identify the women who are struggling harder than others for family survival and secondly to frame the policy proposals to target these women. The data collection, defining of variables and model specifications are presented in the next section.

DATA COLLECTION AND ESTIMATION MODEL

We have used primary data[18] that was exclusively collected for the study by cluster sample technique. The informally employed women are residing in clusters of poor

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[18]The official data on women's labour force has serious problems and underestimations, inconsistencies, and biases. Some are based on projections rather than actual figures, others have known biases, and many are extrapolated from partial information [Behrman and Rosenzweig (1994); Srinivasan (1994); Chanie (1994)]. Even the reliability and compatibility of the gender-disaggregated tables produced by UNDP or the World Bank are also questioned [see Srinivasan (1994)].

community. These clusters are formed spontaneously by the demand of informal labour market. For instance the women working on ladies dresses are present in inner city and domestic servants and home-based handicraft workers are present in slums of city, so cluster sample technique has been adopted. A survey of 945 urban households of district Bahawalpur in March and October 2005 which have at least one working woman in the age group of 16–60 years made the information valid.[19]   Keeping in mind the variation of income in different seasons, survey has been done in two sessions. The sample was consisted of six clusters having variations of socio-economic situation but concentration in informal employment. Data was collected by door to door survey and questions were asked to working women. Income of the working women was taken in rupees per month. Income in the form of kind, which is frequent in informal sector, was converted into cash at market price. In the case woman was working on piece-rate or self-employed, that is usual for informal sector, the value added in the product or the rate agreed between contractor and women was the wage/income received by the woman. Market price for the used products given as wage and food was taken from the market near to the cluster or from the market of used goods. Similarly, the daily or weekly income of the woman and household is converted into monthly income. If the woman is employed in a household enterprise and the whole family work for it, the share of the woman has been segregated by the share of the number of working hours on the assumption that capital and resources were equally contributed to the enterprise.

To capture the contribution of informally employed women in the household budget (in urban areas) we estimated on the OLS model, in which contribution of a woman was a function of several socio-economic variables. These socio-economic variables are related with women characteristics (woman's age, education, marital status, woman as head of household, ownership of assets by the woman),[20] and household characteristics (husband's age, education and employment status, household per capital income, household poverty status, household size, nuclear or combined family structure, number of children in the household, number of infants in the household, adult male members of the household, adult female members of the household and the loan obtained by the household).[21] The community characteristics are also important for determining the woman's contribution. They may be presence of working women's association, presence of any micro-financing institution in the community, community-based child-

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[19]Though a significant part of the females under 16 years of age is economically active in Pakistan and they are contributing a lot in household income but we assume them child labour. Naqvi and Shahnaz (2002) have analysed the working women in the age group of 15–49 years. In this case the upper age limit is low, as after 49 years of age women remain involved in economic activity.

[20]Some other woman characteristics like the health status of woman [Mehrotra and Biggeri (2002); Eapen (2004) for India and Pakistan], type of the job, work experience of the woman [Mehrotra and Biggeri (2002)], learning by doing characteristics, childhood nutrition measured by height [Fafchamps and Quisumbing (2003)], skill obtained from any formal institution, vocational or technical training of the woman, membership of any working women's organisation and *prudha* (veil) [Azid, *et al.* (2001)] are equally important factors determining the contribution of women in household but due to time and data constraint we have not included them in the study.

[21]The other household characteristics that may affect the contribution of women are provision of electricity in the household [Illahi and Grimard (2000); Mehrotra and Biggeri (2002)], provision of water supply in the household [Illahi and Grimard (2000)], earned and non-earned income of husband, distance of the household from market [Sultana, *et al.* (1994); Azid, *et al.* (2001)], household living index, ratio of school-going children to school-going-age children and distance to school from the household [Khan, *et al.* (2005)], and wages offered to other household members [Lockshin, *et al.* (2000)], etc.

care centres [Eapen (2004)], dowry-related customs and crimes [Eapen and Kodoth (2002)], inheritance of property rights, and occupational segregation. These variables are out of the scope of present study.

Khan and Khan (2007) have analysed the contribution of women in household income focusing on the individual characteristics of the women. Khan and Khan (2008) have focused on household characteristics of urban and rural women involved in informal sector. The contribution of women in both studies was defined as the ratio of the woman's monthly income to the total income of the household. It may have some degree of slack in measuring the contribution of women, in cases like that if the woman has obtained loan for the household enterprise and she is paying it back from her income. Similarly, some part of the income may go to the transport expenditures for the woman that may be significant amount in urban areas. Some times dress and food are provided by the employee to woman involved in informal sector, so we have taken the contribution as the ratio of woman's expenditures for the household to total expenditures of the household. Another originality of the present study is that it has focused on the urban areas as they have different socio-economic status of the women, infrastructure, labour market, skill development opportunities, transport and energy facilities, micro-credit facilities and household living cost. The contribution of woman in household budget was defined as the ratio of the woman's monthly expenditures to the total monthly expenditures of the household.[22] Though Doss (1996) concluded that income controlled by the woman is spent differently than income controlled by men, but we have assumed that income earned by a woman working in informal sector becomes the part of the household budget. The economic activity is defined as the paid-employment, self-employment, or employment in family enterprise.[23] Some studies [see for instance, Pangestu and Hendytio (1997)] have defined the working women as women who are working for other people or legal entities and are compensated in financial terms or payment in kind. They have ignored the self-employed and women involved in family enterprises. In Pakistan specifically in urban informal sector, a number of women are involved in these two kinds of employment. So we have considered these women as labour force participating women. The reference period for woman contribution was taken two months as informal sector has the characteristic of change of job frequent occurrence of transitory unemployment along with seasonal unemployment. The reference period for husband employment is taken one month.

The widespread prevalence of working women in every country gives the contemporary mathematical models. For instance, Duncan, *et al.* (1993) have used probit model, Sultana, *et al.* (1994) OLS and Probit model, Illahi and Grimard (2000) have used probit, OLS and tobit models for a series of functions, Naqvi and Shahnaz (2002) logit and probit model, Mehrotra and Biggeri (2002) ordered logit model and Fafchamps and Quisumbing (2003) tobit model, and Khan, *et al.* (2005) have applied binary logistic model.

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[22]The use of wage rate and working hours as continuous variable are conventional in the literature to proxy for employment status and income [see for instance Azid, *et al.* (2001) and Hartog and Theevwes (1986) who have used working hours]. It may be proxy for contribution of woman in household budget. As the wage rate or working hours in the informal sector is much fluctuated and it is difficult to obtain the information in the survey due to preconceptions of the individual, so we have taken the ratio of the monthly expenditure to household budget as contribution of women in household budget.

[23]We are concerned with only economic activities of the women, if all the activities of women would have been taken in the model (assuming that all activities contribute to household budget, directly or indirectly), the activities would be paid-employment, self-employment, employment in household enterprise, and home-care activity, and/or combination of some or all of these.

All of these studies were concerned with work decision of women having binary variable or limited variables. Most recently to estimate the contribution of woman in household income Khan and Khan (2007, 2008) have used OLS model. We are also concerned with the contribution of a woman that is continuous variable, so we have estimated contribution of woman in the household budget through OLS model. The function is

$$COW = f(X_1............X_n) \qquad … \qquad … \qquad … \qquad … \qquad … \qquad … \qquad (1)$$

Where *COW* is the contribution of women in household budget. X_1………X_n are the exogenous socio-economic variables influencing her contribution. To check the presence of multicollinearity, we have used Durbin-Watson test. One common problem encountered in cross-sectional studies is heteroscedasticity, whose existence renders the OLS estimators inefficient. White's heteroscedasticity test is carried out to examine whether heteroscedasticity is a problem in our study, and estimation procedure is adopted accordingly. The definitions of dependent and explanatory variables are shown in Table 1.

Table 1

Definitions of Dependent and Explanatory Variables Used in the Model

Variables	Definitions
Dependent Variable	
COW (Woman's contribution in household budget)	• Ratio of woman's monthly expenditures in the household to the total monthly expenditures of the household
Independent Variables	
WAGE (Woman' age)	• Her age in completed years
WAGESQ (Woman's age squared)	• Her age squared
WEDU (Woman's education)	• Her completed years of education
WLIT (Woman's literacy status)[24]	• 1 If she is literate, 0 otherwise
WMAR (Woman's marital status)	• 1 If she is married, 0 otherwise
WHEAD (Woman as head of household)	• 1 If she is head of household, 0 otherwise
WASST (Woman's ownership of assets)	• 1 If the woman owns assets, 0 otherwise
HAGE (Husband's age)	• Husband's age in completed years
HEDU (Husband's education)	• Husband's completed years of education
HLIT (Husband's literacy status)	• 1 If the husband is literate, 0 otherwise
HEMP (Husband's employment)	• 1 If husband is employed, 0 otherwise
HHCPY (Household's per capita income)	• Household's per capita income (in 00 Rupees) per month
POVTY[25] (Household's poverty status)	• 1 If household's per capita income per month is Rs 848.79 or below, 0 otherwise
HHSIZ (Household/family size)	• Number of household/family members
HNUC (Nuclear status of household)	• 1 If household is nuclear, 0 otherwise
NCHILD (Number of children in household)	• Number of school-age children (5-15 years) in the household
PRIMM (Number of male prime-age children in household)	• Number of male children (more than 15 years) in the household
PRIMF (Number of female prime-age children in household)	• Number of female children (more than 15 years) in the household
INFANT (Number of infants in household)	• Number of infants (up to 5 years) in the household
ADLM (Number of adult males)	• Number of adult males in the household
ADLF (Number of adult females)	• Number of adult females in the household
HLOAN (Household's availability of loan)[26]	• 1 if the household availed loan, 0 otherwise

[24]The official definition of literacy in Pakistan is "one who can read a newspaper and write a simple letter". Though the literacy so defined cannot be accepted "functional literacy" that is what an individual needs to function in a society which is becoming increasingly complex, we have included the official definition of literacy in the model due to the fact that working women in informal sector are poorly literate.

[25]The official Poverty Line of Pakistan is Rs 848.79 per capita per month [Pakistan (2004)].

[26]Loan utilisation includes loaning from formal and informal modes of financing.

RESULTS AND DISCUSSION

The summary statistics and OLS results are given in Table 2. The majority of the results are statistically significant and are consistent with the theoretical implications of women' contribution in household budget. The Durbin-Watson test clears the presence of multicolinearity among the explanatory variables. The White test encountered the problem of heteroscedasticity.

Table 2

Summary Statistics and OLS Results for Women's Contribution to Household Budget

Variables	Mean	Standard Deviation	Standard Coefficient Beta	T-values
Constant	–	–	179.946	2.8765
WAGE	31.7352	25.2187	1.79092	1.4256*
WAGESQ	983.24	207.269	–0.0258	–1.9678**
WEDU	3.0162	9.6141	0.1380	2.0667**
WLIT	0.3766	0.5347	0.3009	2.6291**
WMAR	0.6931	0.5973	6.0191	1.7072**
WHEAD	0.1668	0.5248	1.2714	1.7674**
WASST	0.2943	23.6971	2.9886	1.2674*
HAGE	39.4850	23.6576	1.2756	0.6557
HEDU	3.5918	12.1338	–0.1815	–1.7938**
HLIT	0.4251	0.6934	–1.2713	–2.0953**
HEMP	0.5395	0.3128	–2.0017	–2.6941**
HHPCY	770.37	698.25	–1.9485	–1.9367**
HPOVTY	0.5983	0.5460	1.1473	2.8567**
HHSIZ	8.1435	1.3294	1.6467	2.0285**
HNUC	0.3273	0.2475	1.8140	1.6473**
NCHILD	3.2464	1.9732	–1.0931	–1.9763**
INFANT	0.2735	0.1637	–1.9555	–1.8668*
PRIMM	0.2417	0.1469	1.2139	2.1581**
PRIMF	0.3763	0.1973	–2.0153	–1.9259**
ADLM	0.2340	0.1283	–2.7354	–2.6473**
ADLF	0.3485	0.2160	–4.0718	–0.3786
HLOAN	0.1945	0.1802	2.9245	2.4057*

Number of Observations	937
R-squared	0.7319
Percent Correct Predictions	0.7456
Durbin-Watson Stat	2.1046
F-statistic	1648.3049
Prob (F-statistic)	0.0000

** Indicates significant at 5 percent level, and * indicates significant at 10 percent level.

The following features of the results are worth noting.

Woman's Age

It is found that for the women in the age bracket of 16–60 years, there exists a non-linear relationship between age of the woman and her contribution in household budget. The contribution increases by increase in age but in the later age the contribution decreases.[27] It may have different explanations, foremost may be that age alternatively job experience does not enhance the income in a linear way. Secondly, in the age group of 16–60 years, the comparatively younger women are physically more productive where unskilled labour is concerned and that is the characteristic of informal sector, while in the older-age group the women are physically less productive. Thirdly, in the older-age group women have adult offspring, which contribute household budget consequently woman's contribution decreases. We have mentioned in the analytical framework that age of the woman is included in the model to identify the women/households where women are struggling more rather than less. The results explain that in urban households where women are employed in informal sector activities, the households having middle-age women (in the age group of 16-60 years) take more contribution in household income as compared to the households having younger and latter-age women. To increase the contribution, the households with younger women and older women would be the target households in policy framework.

Woman's Education

To capture the effect of women's education on their contribution, we have included two types of explanatory variables regarding women' education,[28] i.e., continuous variable r[epresenting the number of completed years of education of a woman, and binary variable representing whether the woman is literate or illiterate (same types of variables have been used to capture the effect of husbands' education on women contribution).[29] The objective for inclusion of this variable is to reach the policy proposals to increase the contribution of women by educational facilities. We have found a positive relationship between the number of years of education (as well as literacy status as a binary variable) and contribution of woman to family income. It supports the neoclassical hypothesis [see Becker (1980)] that a woman's labour market activities are positively related with level of education. It also supports the views of structuralist school [see Benham (1980)] that within a specific income group an increase in education results in to increase in supply of a woman labour force and its returns. Our results make it imply on the income group of informally employed women workers of urban areas of Pakistan. Alternatively, the literate women are successfully struggling for their family survival. The possible explanation may be that level of education among women implies to improve their skill through training. It creates an opportunity for them to adopt changing technology. The better-trained workers lead to increased productivity and wages. The other aspects of women's education on her contribution in

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[27]The contribution is maximum at the age of 35.2 years as coefficient of woman age = 1.7909 and woman age square = –0.0258.

[28]The educational level of women may stand proxy for wages or earned income, so we have not included the wage rate of women in our analysis as an explanatory variable.

[29]To make a comparison of literate women to illiterate women, we have used binary variable of literacy status of women.

household budget may be: the education increases a woman's efficiency in household task and reduces the time in home production, so more time is devoted to paid work and more contribution is done in household budget; females with more education may have a strong tendency to perform fewer household chores; education is positively associated with women's control over earned-income, which provide an incentive to paid-work and contribute in household budget; education makes the exposure of a woman to the other world and enhance aspiration for quality of life, which give motivation to earn more and spend on household items, children's education and family health; and education positively influence a woman's health, which results into higher productivity/earned income and higher contribution in household budget. From the policy perspective, provision of female education may play an important role to boost the contribution of a woman in household budget and ultimately her status.

Marital Status of Woman

We have estimated that married women are contributing more to their household budgets as compared to single women. On our sample they comprised of 69.31 percent of the women. It supports the notion that circumstances most probably the expenditures of rearing the children force the married women to contribute in household budget and to become second earners of the household. On the other hand, based on our assumption that contribution of women reflects her status in the household, it may be concluded that married women are enjoying better status in the household. The results are corroborated by the coefficients of woman age, i.e., the contribution of woman increases up to the age of 35.2 years. This age shows that women have been married as in the informal sector households usually females are married in earlier age. But the contribution decreases after this age, though the women have been married. One explanation may be that after this age there is initiation of these women to become mother-in-law due to earlier marriages of their children.

Woman as Head of Household

We have found that women as head of household are contributing more to their household budget.[30] An important and clear explanation may be that no-body other than children or old-age household members are present in the household and burden of household members, specifically children compel them to contribute more and more in household budget. From the policy perspective, the target group needing support for increment in household contribution would be the female-heads of the household. In our sample 16.68 percent of the women heads the households. As we have assumed that greater contribution by the women in the household stands for her good status in the household is confirmed by the results.

Ownership of Assts by Woman

The ownership of assets by the woman, as a variable was included in the model for policy formulation. That is, whether by enhancing the ownership of assets can increase

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[30]It contradicts the findings by Naqvi and Shahnaz (2001), that is female heads of the household are less likely to participate in economic activity.

the contribution of women or not. We have found that if the woman involved in informal sector has assets, she contributes more to the household budget.[31] The possible explanation may be that ownership of assets by the woman enhance the productivity, ultimately she contribute more to the household budget. The ownership of assets makes availability of financing to the woman for an enterprise which enhance the income of the enterprise and contribution of woman in household budget. In the policy formulation, it may be recommended to increase the ownership of assets by the women.

Husband's Educational Level and Employment Status

We have estimated that husband's education (as continuous variable as well as binary variable) negatively affects the contribution of women. Conceptually it may be a unique result because educated husbands are assumed no-biased towards negative social and cultural norms and encourage the wives for paid-work and to enhance financial status of the household for the welfare of household members. But for the informal labour market, where women are involved, the households have unique characteristics, i.e., illiteracy, poverty, under-employment and socio-economic backwardness. When husbands are likely to have more income due to more years of education, it results into comparatively good economic status of the household so wife's contribution remains low. It may be explained on the assumption that if leisure is a normal good, the husband purchases more leisure as his income increases. Traditionally, it may be in the form of wife's non-participation or less participation in labour market. Such effect is caused by transfer of intra-household income from husband to non-earning or less-earning wife. We have further found that a woman from literate husband (as a binary variable) contributes less in household budget. It again shows that uneducated husbands have low productivity in the labour market so the income level of households remains low and women of the household have to contribute more to household budget. It may also be argued that uneducated or illiterate husbands have larger number of children as compared to educated husbands so the household is more likely to be poor. Furthermore, illiterate head of household and larger number of children are the characteristics of poverty. In this perspective, poverty of the household is the main factor causing woman to contribute more in household budget and make more struggle for financial status of the household.

We have further found that a woman from unemployed husband contributes more in household budget. The driving force behind the contribution of woman in household budget is to supplement family income that has been eroded by unemployment of husband. The other explanation may be that in the absence of social security benefits, woman's income is the only source of household expenditure, if husband is unemployed.

Household Per Capita Income

It is estimated that mean per-capita household income in the sample is Rs 770 per month. The poverty line for Pakistan is Rs 848.79 per capita, per month [Pakistan (2004)]. By this benchmark, on average the households having informally employed women are living below poverty line. The variable of household per-capita income was

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[31]We have included in the model the ownership of house, shop, land, and business assets like machinery and equipment, etc., as asset.

included in the analysis to identify the household in the aspect of household income, for which the woman is contributing more or less. Econometric estimates have shown an inverse relationship between household per-capita income and contribution of a woman. This implies that a woman belonging to low per-capita family is more likely to contribute in her household budget and harder to struggle for family survival. In other words women choose to work to support their poor households [see also Hafeez and Ahmed (2002) for Pakistan; Kazi and Raza (1991)]. The results are logically supported by a number of studies. For instance, Lodhi and Haroon (1996 for Pakistan) demonstrated that an improvement in the economic status of households leads to decreased probability for paid-work. On the other hand, as we have assumed that higher contribution by women in the household budget represents her better status in the household, becomes trivial. Our results explain that women in the lower per-capita income households enjoy good status in the household but evidences show that in the lower strata households women have no status even they are economically active [see Naqvi and Shahnaz (2002)].

Household Poverty Status

Conceptually, it is assumed that the distribution of a woman's time between labour market, household enterprises, non-market work (domestic processing and maintenance) and leisure is effected by the household poverty. We have included the household poverty status as a binary variable (whether the household is living below national poverty line or not) to explain that informally employed woman living in the household below poverty line is contributing more in the household or *vis-à-vis* a woman living in household above poverty line. Our analysis has shown that a woman from the household living below poverty line is contributing more in the household budget. Out of the sample households, 59.83 percent are living below poverty line. It supports the notion that burden of poverty is shared by the informally employed women by their contribution [see also Khan and Khan (2008) for urban and rural areas].

Household Size and Structure

We have found that contribution of a woman is positively related with the household size. More precisely, it is income dilution effect, i.e., larger family size compels a woman to contribute more in the household budget. The other explanation may be that, adult household members other than the working woman, especially non-working members, may participate in household chores and substitute the working woman as child-care providers when she works. Furthermore, the families where women are involved in informal labour market, they live at their subsistence level and an increase in the number of household members increases living expenditures which compels a woman to contribute more. One of the characteristics of informal sector is that it absorbs women and children. On the other hand the households involved in informal economy depends upon women and children's income. The adult males specifically married ones remained economically inactive which increases the women's contribution. Our study further indicated that a woman from nuclear family contributes more to her household budget.[32] It may be explained

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[32]It contradicts the findings of Naqvi and Shahnaz (2002), where women living in nuclear families are less likely to participate in economic activities.

that in nuclear family the earning member may only be the husband so the ratio of the contribution of the woman in the household budget remains high. It may be concluded that in informal sector the household depends upon the woman's income [see also Khan, *et al.* (2005); Khan and Khan (2008)]. The results signify the struggle for family in the larger households.

Number of Infants and School-age Children

We have found that presence of infants in the household decreases the woman contribution in household budget. The explanation may be that the woman devotes more time for infants within the household so her contribution remains low. As concerned the day-care centres, they rarely exist in urban areas. The informally employed woman has no access to these centres due to cost as well as distance. The nature, place and timings of the work of an informally employed woman varies time to time so chid-care centres utilisation becomes impracticable for her. Here the woman may take the advantages of combined family system. For the policy formation, the provision of day-care centres may increase the contribution of women. It is found that school-age children in the household negatively impact the woman's contribution in household budget.[33] It explained the phenomenon that woman contribution is substituted by children income as in such households, children are involved in economic activities.

The Adult Members of the Household

It is found that presence of male prime-age children decreases the contribution of a woman in household budget and presence of female prime-age children increases the contribution.

The presence of adult male members in the household has shown negative effect on the contribution of a woman in household budget. The phenomenon has shown a substitution effect, i.e., the adult male member of the household and working woman in informal sector are substitutes for their contribution in the household.

Financing Availed by the Household

In our sample, 19.45 percent of the households have availed the loaning facility either from formal or informal financing institutions. It is concluded that a woman from the household having loan is contributing more to her household budget as compared to a woman belonging to household without loan. The explanation may be that burden of the loan on household compresses the household members specifically women to contribute more in their household income. If the loan was utilised for a small business adventure the woman is participating in the business of the household and if the loan was utilised for consumption, the woman is sharing the consumption expenditures of the household. Precisely, a woman involved in informal sector shares the burden of the loan, availed by the household.

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[33]The gender of the child also accounts for the contribution of a woman, as there exists a gender disparity in the consumption and investment on children. Due to data constraint we have included only the number of children irrespective of their gender.

CONCLUSION AND POLICY RECOMMENDATIONS

The results have important economic and policy implications. The main finding of the analysis is that economic burden of the household in the form of woman's contribution (who is informally employed in urban labour market) in the household income increases by all the aspects of poverty, i.e. household per-capita income, poverty status according to the official poverty line, and unemployment and lower-educational status of husband as an indicator of poverty. It reflected that majority of the women working in informal sector are mainly contributing in household budget due to pressure of unmet household budget. They are struggling for family survival. So an increase in income and productivity of informally employed urban women may have trickle down effects on reduction of household poverty and burden on women. Following recommendations are made to increase the contribution of women.

- To enhance the contribution of a woman in household budget, the policy on women's employment is to be carefully planned. As poverty is the main cause of women' contribution, the minimum wage legislation should receive the great deal of attention.[34] If minimum wage legislation is maintained, it should be further ensured that the increases in wages be realistic.
- The government can intervene for the establishment of educational and training institutions for adult women, so that they can increase their productivity and contribution, and support the financial burden of the household.
- The government should also ensure the provision of subsidised childcare facilities. In this way the mothers may get relaxed from child-care duties and could participate in economic activities and can enhance their contribution in household budget.
- The lager households have been identified as the households absorbing more of the contribution of women. It signifies the women contribution in the household. Such type of women/households needs attention of Department of Labour and Manpower, and Department of Social Welfare for their wages/income and health and safety measure as they may be the main bread-winners of the households.
- Woman as head of household has been found to contribute more in household budget. As female-headed households are more vulnerable to poverty so this group of women be targeted in the policy formation from the income and wage perspective.
- The life cycle of a woman has shown that her contribution in household income increases by increase in age but decreases after some years. It may be maintained by providing them social security benefits, standard wages, benefits of annual increments and benefits like pension and employee's old-age benefits. All they lie within the responsibility of Provincial Department of Labour and Manpower, Department of Social Welfare and Pakistan Old-age Benefits Institutions.
- As an increase in the household per-capita income has shown sliding down effect on the contribution of a woman, it shows that poor households absorb

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[34]Under the Labour Protection Policy 2006 workers in the informal sector would be benefited from minimum wages where an employer-employee relation is evident [Pakistan (2006)].

more contribution of women. It identifies the poor households are as policy target to enhance their welfare by further increasing the productivity and income of the women.

- The more contribution of a woman in her household budget from low per-capita household, and belonging to low-educated, illiterate, and unemployed husband reflects that the informal sector is absorbing lower strata of female labour force. Woman is sharing the burden of poverty, and household vulnerability in the case of unemployment of husband. Such type of identified households, although they are already taking significant part of their expenditures from women contribution needs attention in the perspective of social security benefits for women from Department of Social Welfare. In this regard these households may be kept at specified level of living. Otherwise they may further fell into poverty.

- The women in informal sector who have availed loan contribute more to the household budget. The ownership of assets like machinery, shop, business equipment, etc., may be a good measure to increase the contribution of women in household budget and ultimately elevating the household welfare. In this regard the financial institutions, NGOs, Bat-ul-Mal can play an important role.

- Programmes may be designed to provide credit to informal sector households without collateral, so the informal sector households can remove economic constraints for the income-generating activities. The micro-credit institutions like the micro-finance bank, Khushhai Bank along with the first woman bank can play an important role. The NGOs may also participate in financing enterprises and projects with women workers in the informal sector.

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Book Reviews

Shahid Javed Burki. *Changing Perceptions, Altered Reality: Pakistan's Economy under Musharraf, 1999–2006.* Karachi: Oxford University Press, 2007. 373 pages. Hardbound. Price not given.

This book is another addition to Shahid Javed Burki's work whose writings have been pivotal for understanding Pakistan's social and economic transitions. The book examines various sectors of the economy that could become the source for sustainable growth. Thoughtful public policies in the high-potential areas are suggested with the claim that these could help the country join the ranks of Asia's rapidly growing economies.

Based on the weekly columns by the author published in the daily DAWN, and focusing on the 1999-2006 period, the tenure of President Pervez Musharraf, the book analyses the economic and social problems faced by Pakistan. It then discusses the opportunities that exist for the country in light of its geographical situation, and the rapid changes in the structure of the global economy. The issues explored in the book include the reasons for the rapid growth of the economy from 2003 onwards, as well as its impact on poverty and income distribution. It is suggested that these high rates of growth would not be sustained into the future unless a number of changes in the structure of the economy were introduced.

The book consists of eight chapters. The first chapter starts with a brief discussion of the country's economic history as well as the situation in mid 2000 (associated with high growth rates). It then continues to analyse the factors responsible for such growth with the caution that the economy still needs more measures before labeling it to have been set on a course of a high level of sustainable growth. In this regard the obstacles particularly related to infrastructure and governance are discussed raising crucial points and suggesting suitable measures. The chapter identifies various areas that need urgent attention by the policy-makers advising them to understand the true nature of the 'determinants of growth' and how they will affect the incidence of poverty and equality of opportunity.

The next chapter, Chapter 2, deals with Pakistan's geographical situation which has bestowed advantages to the country not enjoyed by many states in the developing world. Following David Landes' book, *The Wealth and Poverty of Nations,* Economists have begun to emphasise the role of geography and location in understanding the structure of economies and their development over time. In this context, the author explores the potential benefits associated with Pakistan's geographical location, that is, adjacent to China and India. In addition to provide an overview of Pakistan's relation with China and India, the authors explores Pakistan's emerging relations with the countries in west Asia as well as discusses the possibilities of building new partnership with the Muslim countries of Central Asia. The chapter also has a section on the United States which discusses how the superpower approaches the world while tackling the problem of international terrorism.

International commerce is discussed in Chapter 3 which, according to author, is a very important determinant of growth and poverty alleviation but the country has done poorly in this area. In addition to an overview of South Asia's approach towards international commerce, as well as of the economy of and patterns of trade in the region, the chapter discusses the reasons for the poor integration of the region's economies to the world economy. It then continues to look at the attempts made by the South Asian countries to promote Intra-regional trade as well as examines the role of global trading system in increasing regional trade. The chapter also discusses the importance of the WTO for the conduct of trade by the South Asian countries.

Chapter 4 deals with the development of Human Capital. It starts by discussing the state of education in Pakistan as well as describes the evolution of the sector over the years. It extends the discussion on state of education to the Muslim world. The roles and influences of the donor agencies in the development of education in Pakistan are discussed particularly in the light of the roles played by World Bank and USAID in the country's development. The knowledge accumulation and its contribution in sustaining growth at high levels as well as in integrating the domestic economy with the world economy are dealt by particularly investing the role of higher education in this context. The chapter ends by offering suggestions for the design of public policy for promoting higher education.

The subject of agriculture is discussed in Chapter 5 that the author views as a much neglected sector. After providing an overview of the sector the author suggests a substantial reorientation of the government's approach towards agriculture in the subsequent periods. There is a long discussion on the controversy regarding the building of the Kalabagh dam. Later in the chapter the author argues why a movement away from a land extensive form of agriculture to the production of high value added crops is crucial. He then continues to discuss the distribution of land ownership.

Chapter 6 deals with the migration of workers to other parts of the world. The author deviates from the conventional line of reasoning presented by the economists regarding the 'brain drain' reflecting the loss to the society if a person migrates and settles abroad. According to the author those who migrate contribute to the society but in a different way, and the sum total of their contributions may be even greater than would have been the case had these individuals stayed behind. The author calls this line of analysis 'diaspora economics'. The chapter describes how the Pakistani diasporas were formed in three parts, Europe, Middle East, and North America, of the Globe and how these communities began to interact with the homeland. It then continues to discuss the attempts made by some Pakistani administrations to tap into the wealth and income of the various diasporas as well as the role the government could play in benefiting from the presence of large communities in the world's developed parts.

Chapter 7 deals with the issue of Kashmir, the problem that Pakistan has faced ever since it came into existence. The chapter points to the enormous cost the country has borne by keeping the Kashmir problem on the front burner and provides a rough estimate of the economic damage done by the policy-maker's proclivity to keep alive the Kashmir issue and to use it as a device for constituency building. Though the author agrees that Pakistan should not give up the effort to find a solution to the enduring problem of Kashmir, he suggests that Pakistan should try some other approaches. According to the

author an economic development programme for the state of Kashmir could be formulated that would rely heavily for its success on greater trade among India, Pakistan, and Kashmir. The plan could be built around five central elements: (a) developing the state's water resources with a view to generating electric power, (b) rebuilding and expanding the tourism industry, (c) developing forestry and high value added agriculture, (d) improving physical infrastructure, and (e) developing the human resources to engage the young in the more productive sectors.

The last chapter pulls together some of the themes developed in the earlier chapters. It suggests that in 2005 Pakistan may have reached what Rostow in 1960 called the stage of take-off. It had been there before, in 1965, but it pulled back then for a variety of reasons, among them the war with India over Kashmir. It seems to be pulling back again in 2006, this time because of the inability or perhaps unwillingness on the part of the policy-makers to allow the political and social development in the country to proceed at the same pace as the modernisation of the economy.

As mentioned by the author in the introduction, the main purpose of this book is to help formulate the debate on important issues dealing with economic development. For a number of reasons, the country could not construct a durable economic and political system. Over a long period, various political and economic developments within and some interactions with the world have produced many tensions in the society. These could be released only with the development of durable institutions that allowed people to interact with one another within rule-bound frameworks. Burki's present book has provided an informed discourse on a number of economic issues vital for Pakistan's economic and political development and social stability.

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S. S. Khanka. *Human Resource Management: (Text and Cases).* New Delhi: S. Chand & Company Ltd. 2007. 449 pages. Paperback. Indian Rs 300.00.

Human Resource Management (HRM) is a process of procuring, developing, maintaining and controlling competent human resource in the organisation so that the organisational goals are achieved in an effective manner. HRM has undergone tremendous change in its functions over the past 20-30 years. Many years ago, large organisations looked at the "Personnel Department," mostly to manage the paperwork around hiring and paying people. But more recently, organisations consider the major role of HR Department as staffing, training and helping to manage people so that people and the organisation perform at the highest level of their capacity. The modern HRM views manpower as resource and asset of the organisation rather than just considering it burden on the resources. Usually large national and international businesses utilise these services due to their multidimensional operations and sizable employment. Small businesses carry out these activities by themselves to save cost associated with full-or part time help. However, they generally ensure that employees have—and are aware of—personnel policies conform to prevailing regulations. These policies are developed by the HRM professionals in the form of employee manuals and handbooks.

Today's business world is truly a global village that is closely integrated and without geographic boundaries. In the current setting, HR must understand the implications of globalisation of businesses, technology changes, workforce diversity, changing skill requirements, continuous improvement initiatives, the contingent work force, decentralised work sites and employee involvement. The core function of HRM is now to ensure that employees can operate in the appropriate language and work in multicultural groups. Communications are understood by a multilingual work force who can operate in cultures that differ on variables such as status differentiation, societal uncertainty, assertiveness, individualism. It takes into account the global dimensions of assertiveness, future orientation, gender differentiation, uncertainty avoidance, power distance, individualism/collectivism, in-group collectivism, performance orientation, and humane orientation. It is pertinent to note that not all HRM theories and practices are universally applicable. HRM must understand varying cultural values. The changing world of technology has altered the way people work, changed the way information is created, stored, used, and shared.

The move from agriculture to industrialisation created a new group of workers—the blue-collar industrial worker. Since WWII, the trend has been a reduction in manufacturing work and an increase in service jobs. The emphasis is on technology that makes organisations more productive, helps them create and maintain a competitive advantage, provides better and more useful information. The changing world of technology is affecting HRM Practices, i.e., recruiting, employee selection, training and development, ethics and employee rights, motivating knowledge workers, paying employees market value, communication, decentralised work sites, skill levels, legal concerns, workforce diversity. It is the era of "Knowledge Worker"—individuals whose jobs are designed around the acquisition and application of information. The challenge is to make organisations accommodating to knowledge worker and diverse groups of people. In today's workforce, minorities and women have become the fastest growing segments, the numbers of immigrant workers and older workers are increasing. This is increasing the importance of HRM through its different functions for better management of workforce.

Human resource development (HRD) is one of the major functions of an effective HRM system. But many people include HRM in HRD explaining that HRD includes the broader range of activities to develop personnel inside of organisations, e.g., career development, training, organisation development, etc. While HRM functions start from staffing of organisation and goes to management of employees training, their development, compensation, and implementation of personnel and management practices conform to various regulations besides their performance evaluation. The book under review "Human Resource Management: Text and Cases" logically explains all aspects of HRM in a simple and effective manner and enable readers to understand the key elements of HRM. The book is divided into 7 sections according to the main functions of HRM. The first section deals with the nature and scope of HRM, its evolution and development and strategic aspect. The section also explains the main objective, scope, and function of the HRM.

The section on acquisition and absorption includes the discussion on human resources planning, job analysis and design, recruitment, selection, placement, induction and socialisation. These functions provide the sound basis for organisation's future performance in the business world. Career planning and development is presented in the book with different models and explained with the help of case studies. The relationship among different HRM functions is elucidated by flow-charts. The depiction of relationship in this way is simple and effective. The next section is devoted to the discussion on employee's development. It covers career planning and development including training, executive development and organisation development. The issues of internal mobility and separations are also discussed in the section to highlight the importance of retaining good employees during the recessionary times. The discussion on salary and compensation is part of Section IV which mainly deals with the maintenance and retention. The concept of incentives is taken up in the section in the context of motivation. The discussion includes both monetary and non-monetary aspects of incentives to motivate employees for higher productivity and performance. Industrial relations and the role of trade unions is also discussed at length in the section that is another important aspect of employees participation in the decision-making process. Section V of the book includes the human resources accounting and need for the HR information systems. HRM in the international setting and its role in the virtual organisations is discussed in section VI. The discussion in this section highlights the importance of HRM in the changing environment. The last section is devoted to the case studies from Indian organisations which enhances the utility of the book for students.

The book is an important addition on HRM by taking into account all aspects of the subject and gives a well-knitted and balanced coverage of theory, contemporary issues and practical examples. Employee empowerment, potential appraisal, successful planning, strategic HRM in changing environment, leadership in new millennium are some of the emerging topics discussed in the book. Mr S. S. Khanka, the author of the book, is the Head of the Department of Business Administration and Dean of School of Management Studies, Aassam University. He has a teaching experience of more than 20 years and also international exposure.

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Fasih Uddin. *Pakistan under IMF Shadow*. Islamabad: Institute of Policy Studies, 2008. Paperback. 128 pages. Price not given.

Pakistan like many other developing countries has been experiencing both financial and fiscal instability. This is mainly because it has miserably failed to generate sufficient resources required for its economic development. Consequently, to supplement its meager domestic resources, it has been mostly seeking foreign assistance. At times when 'friends of Pakistan', for their own ulterior motives, such as support for the cold war and war on terror, have helped Pakistan through project and programme aid, it has kept striving to move towards a higher path of economic growth despite poor governance and mismanagement of the economy by its planners and economic managers. At other times, when the 'friends' have been slow to coming forward, Pakistan has looked for financial aid from international financial institutions including the International Monetary Fund (IMF) and the World Bank. These institutions always attach stringent conditions to financial assistance. As a result, these institutions remain (implicitly) instrumental in the formulation of short- to medium-term economic policies of Pakistan, with outcomes that are always considered as sub-optimal.

This concise book focuses on the Pakistan-IMF relations in a historical perspective and skilfully provides an analysis of issues that have always dominated these relations. The author examines the compulsions that have frequently led to resorting to IMF arrangements—the circumstances that have led the country to fall back to IMF again and again, with increasing the degrees of IMF involvement in Pakistan's economic management and policy-making.

The first chapter of the book is written by Khurshid Ahmed. This chapter critically reviews the role of the IMF in its relations with developing countries in general and with Pakistan in particular. The rest of the book is divided into five chapters.

The central argument is that the IMF approach has not been based on economic and financial prudence; it is often influenced heavily by the political agenda of the advanced nations. Pakistan's necessities have forced it to be a part of this global agenda.

On the question of the influence of the IMF on the policies of aid-receiving nations, it is generally observed that the IMF supports a country at the request of the Member State which selects the specifics of the programme, whereas Pakistan's official stand is that it always follows a 'home grown' agenda. The IMF authorities claim that policy changes designed are sufficient to overcome the balance-of-payments problem and fiscal imbalances, and that these do not cause unavoidable harm to the country.

The book rightly points out that all the IMF programmes assume that poverty reduction and social development will automatically follow the adoption of sound fiscal policies. It has never happened! In fact, it is well-documented that the IMF programmes do not directly address the issues of employment and poverty but influence them only through the second-order effects. Had the IMF programmes been successful, the author maintains, Pakistan would never have reverted to the Fund for aid. He convincingly argues that the problem lies not only with the IMF programme but with the implementation of it by the Government of Pakistan. The government often complies with some conditions and ignores others, using the leverage of international political environment and the IMF to push through only those policies that benefits domestic élites and lobbies and please the creditors.

The book points out that the decade of the 1990s was the era of institutional decay in Pakistan. This was manifested through increased political meddling in the management of public enterprises and institutions. The IMF programmes during the period were *conspicuously* silent and did not push for a stronger emphasis on institutional and regulatory reforms. Attempts to meet fiscal deficit targets led to the frequent adoption of *ad hoc* tax adjustments and expenditure cuts that often negatively affected the social sector budget, with dire consequences for the poor classes.

The author testifies that the IMF pressure resulted in designing of such programmes that promised more than could be delivered, downplayed the risks, and disregarded focus on real issues. Based on such conditions, he concludes that economic management in Pakistan continues to remain under the 'IMF shadow'.

In a nutshell, this book successfully evaluates important events in Pakistan's relations with the IMF. It reminds us of different episodes, prescriptions, and outcomes of this relationship. It rightly warns that if the course of domestic policies and planning does not change, Pakistan will keep on returning to the IMF. Using a simple methodology, the author also provides the benchmarks of fiscal deficit, balance of payments, and stock of public debt, along with critical success factors that need to be adopted to avoid going again to the IMF for assistance. Nevertheless, ignoring all this, Pakistan has gone back to the IMF!

I would strongly recommend this book to all the stakeholders of the economy, for it provides a simple but critically useful analysis of Pakistan's relations with the IMF.

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Shorter Notices

Waleed Haider Malik (ed). *Judiciary-led Reforms in Singapore: Framework, Strategies, and Lessons.* Washington, DC: The World Bank. 2007. 115 pages. Paperback. Price not given.

Recently, Singapore's judiciary has become known for its efficiency, technological sophistication, and accessibility in the world. In the 1990s, its judicial system was considered as inefficient due to delays, lack of access, high costs, weak administrative capacity, and other such problems. A world class judicial system has been achieved through judiciary led reforms, which include a combination of organisational, procedural, administrative, cultural, and legal measures.

The book 'Judiciary-Led Reforms in Singapore' describes the recent development in Singapore's judicial system including the conceptual framework and strategies for judicial reforms. The book is divided into six chapters. The first chapter introduces the focus of the book; second chapter explores socio-economics conditions in Singapore while the third chapter brings to light the profile of the judicial system currently prevailing in the country. In chapters four and five, the author describes the conceptual framework and strategic reforms implemented by the government for judicial reforms. In this context, the process used for judiciary-led reforms has been highlighted and salient aspects of the strategy, vision, leadership, and action plans have been identified.

In concluding the chapter, the author has postulated that in Singapore's reforms experience, strategic thinking and business planning are central to institutional success. Institutional reforms must be tailored for and targeted at the house that the institution serves. Knowledge and technological innovation are critical components of these reforms. Judicial reforms are also complemented by a stable economy and an efficient political system. The author has also said that after implementing the modern reforms, the court system has become more efficient, more responsive to user needs, and more respected. All these measures have enhanced the country's economic and social development. While accounting for the particular economic and political conditions, Singapore's reform process has much to offer nations looking to improve their court system.

This well written book will undoubtedly help those interested in working in the domain of institutional reforms especially in context of the judiciary. (*Nasir Iqbal*)

Saeed Parto and Brent Herbert-Copley (eds). *Industrial Innovation and Environmental Regulation: Developing Workable Solutions.* New York: United Nations University Press. 2007. 305 pages. Paperback. Rs 2093.00.

This volume combines theoretical and conceptual analysis with empirical case studies of particular firms and industries in both industrialised and developing countries.

It approaches the issue from a different standpoint and examines the way in which environmental regulations interact with the characteristics of particular industrial sectors and firms in different socio-economic systems to influence the development of

environmental technologies. It largely focus on understanding how environmental regulations fit into an overall innovation system, complete with context-specific institutional landscapes and less on the design of optimal environmental policy measures. It try to integrate and explore the scope for environmental and innovation policy-making processes. The volume put forward the need for comprehensive investigation of the regulation-environmental innovation nexus through understanding the formal and informal institutions that govern and transform industrial activity over time.

Environmental and innovation policies are not adequately integrated in most countries. But it is broadly accepted that there is constant interaction between innovation, environmental protection, and further innovation. Given that numerous countries have at least a formal environmental policy and an innovation policy, therefore the next logical step is to attempt to assimilate the objectives of the two policies. Hence providing support for R&D in the development of environmental technologies will explicitly ensure the application of innovation policy toward environmental protection.

The book is comprised of eleven chapters with ten case studies from numerous countries. The concluding Chapter (Eleven) provides a synthesis of the case studies put forward some broad insights into the interplay between environmental regulation, innovation as a process and a policy objective, and the implications for integrated policy-making geared toward better protection of the environment and improved economic performance.

This thought-provoking book will be of interest to those working in the areas of environment, growth, and innovation. (*Hafiz Hanzla Jalil*)

The World Bank. *Pakistan Promoting Rural Growth and Poverty Reduction.* Sustainable Development Unit. 2007. 164 pages. Paperback. Price not given.

Despite impressive achievements—in agricultural growth, rural incomes, rural poverty, and social welfare indicators—there is little reason for satisfaction, as around 35 million people in the rural areas remain poor, representing about 80 percent of Pakistan's poor. Unequal distribution of land and access to water for the rural poor in Pakistan limit the scope for agricultural growth. This report on rural growth and poverty reduction argues that agricultural growth is necessary but not sufficient to alleviate rural poverty in Pakistan. However, ensuring efficient use of water and building partnerships with the private sector can help fulfill agriculture's potential for diversification and growth.

The study puts emphasis on an effective poverty reduction strategy, however, must also address the rural non-farm economy and the needs of the rural non-farm poor. The report says that social mobilisation can empower the poor, enabling them to have a greater role in the development process, not only to improve delivery of public services, but also to increase their market power by building the voice and scale in the farm and non-farm sectors.

The report highlights two critical elements underpin the necessary transformation of the rural sector. *First,* is the efficiency of public institutions and the need to make them more accountable and flexible. *Second,* is the capacity to organise the "people sector" so that farmers, communities, and villages can gain voice and reach the scale needed to attract the private sector and financial services and to strengthen the demand side of development by making government more accountable.

Lack of participation and influence of rural poor households are the major reason for the limited impact of rural development efforts in Pakistan, the report articulates. This limits effective demand for public services and reduces the efficiency in development programmes. Although inclusive economic growth should be the main mechanism for reducing poverty, increased social protection efforts are needed to protect the most vulnerable.

Moreover, too often a top-down approach is implemented—one that sees the rural poor simply as beneficiaries of public programmes supplied by the government. Instead, the report suggests, the development paradigm should be changed to one that puts the household and its community at the origin of development initiatives. Empowering the rural poor to take on this role, however, requires social mobilisation.

The report concludes that social mobilisation, along with economic empowerment, should be at the heart of the rural livelihood development strategy, as the benefits of broad economic growth trickle down very slowly when the poor have little access to key physical, social, and financial endowments. To overcome highly unequal distribution of these endowments and achieve rapid pro-poor growth, poor people need new opportunities to organise, and to generate business, and also to link with mainstream development activities. (*Faheem Jehangir Khan*)

John Briscoe and Usman Qamar. *Pakistan's Water Economy: Running Dry.* The World Bank. 2005. 121 pages. Paperback. Price not given.

Water management and supplies are the central development challenges facing Pakistan today. This report argues for dramatic changes in policy and approach to enable Pakistan to build and maintain new infrastructure, besides securing the water required for the future generations.

The report highlights a set of challenges which have to be addressed—how to maintain what has been built, what major new system-wide infrastructure needs to be built, what infrastructure needs to be built for populations who have not been served and for environmental protection, and how to build institutions that will manage the resource effectively in the looming era of scarcity.

Focusing on two basic issues the country's major water-related challenges, and ways of addressing them the report calls for reinvigorated public water policies and institutions to sustain water development and management in the future. *First* is rehabilitation and maintenance. Many elements of the vast hydraulic system are now reaching the end of their design lives, and have to be rebuilt. There is an enormous backlog of deferred maintenance. *Second* is the urgent need for construction of major new storage on the river Indus. *Third*, there are needs for large investments in meeting the needs of those who do not have water and sanitation services in cities, towns and villages. *Fourth*, Pakistan has been accumulating an "environmental debt" by not investing in municipal and industrial wastewater. It is clear that this has to change, and that it is going to take large amounts of investments. *Fifth* and finally, Pakistan has to invest simultaneously in infrastructure and in develop the institutions required for the sustainable management of increasingly-scarce water.

The report highlights three essential tasks the government faces. *First*, is to set priorities for the short and medium term. *Second*, to define the principles which will

govern what proportions of the initial and recurrent costs are paid by taxpayers and by users. *Third*, government has to ensure that the limited financial resources are used very efficiently. This is obviously not happening in the "business-as-usual" model at present. It is going to mean exploring a whole set of mechanisms for introducing competition, for paying for output not inputs, and for increasing accountability.

Arguing that water development and management is one of the central development challenges facing Pakistan, this report examines the evolution of the management of Pakistan's waters. Drawing heavily on documents by eminent practitioners and policy analysts, it suggests what changes should be considered in how to manage the transition from past practices in a principled and pragmatic manner. (*Faheem Jehangir Khan*)